

SPORTS LEADERSHIP AND MANAGEMENT (SLAM) MIDDLE SCHOOL (BROWARD)

CHARTER SCHOOL APPLICATION

Submitted to Broward County Public Schools August 1, 2013



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APPLICATION COVER SHEET

NAME OF PROPOSED CHARTER SCHOOL:

Sports Leadership and Management (SLAM)) Middle School (Broward)

NAME OF NONPROFIT ORGANIZATION/MUNICIPALITY UNDER WHICH CHARTER WILL BE ORGANIZED OR OPERATED:

Sports Leadership and Management Foundation, Inc.

Provide the name of the person who will serve as **the primary contact** for this Application. **The primary contact** should serve as the contact for follow-up, interviews, and notices regarding this Application.

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NAME OF EDU	CATION SERVICE	PROVIDER (if any):	Academica
NAME OF PART	TNER/PARENT O	RGANIZATION (if any): _	
Projected School	Opening: 2014		
School Year	Grade Levels	Total Projected Student Enrollment	Student Enrollment Capacity (if known)
First Year	6-8	Up to 374	Up to 750
Second Year	6-8	Up to 600	Up to 750
Third Year	6-8	Up to 725	Up to 750
Fourth Year	6-8	Up to 750	Up to 750
Fifth Year	6-8	Up to 750	Up to 750
complete and accurate application process considered. The p	urate, realizing that a s or revocation after	ny misrepresentation could r award. I understand that in ontact person for the applicati	all information contained herein is esult in disqualification from the complete applications will not be on is so authorized to serve as the
Signature	my		Governing Board Chair Fitle
Rene Ruiz, Esq.			July 15, 2013
Printed Name		Date	



I. EDUCATIONAL PLAN

Section 1: Mission, Guiding Principles and Purpose

The mission statement should, in a few concise sentences, indicate what the school intends to do, for whom and to what degree. A school's mission statement provides the foundation for the entire application.

The mission of Sports Leadership and Management Middle School (Broward) is to prepare middle school students for high school and careers beyond through an innovative, engaging and rigorous educational program that promotes sports leadership career exploration.

Students at Sports Leadership and Management Middle School (Broward) -hereinafter referred to as "SLAM" - will be able to explore career interests prior to entering high school through relevant real world experiences and relationships with career mentors and partners. Students will have the opportunity to pursue a course of study leading to high school academy programs aimed at preparing student for future careers in sports management, marketing, recreation, or health.

A. Describe how the school will utilize the guiding principles found in section 1002.33(2)(a), F.S.

In accordance with the law, charter schools shall be guided by the following principles:

- Meet high standards of student achievement while providing parents flexibility to choose among diverse educational opportunities within the state's public school system.

In accordance with the law, SLAM will meet high standards of student achievement through implementation of the educational program and strategies (fully addressed in this application) by:

- Providing a curriculum that fully incorporates the Common Core State Standards (CCSS)
 and applicable Next-Generation Sunshine State Standards (NG-SSS) using research-based
 technology and project-based initiatives that encourage success for every student (See detailed
 activities in Section 4 Curriculum Plan)
- Providing opportunities for active and genuine involvement of students, families, and community partners in the school's implementation in an effort to create a richer, more nurturing educational experience for all (See more detail in Section 3—Educational Program Design)
- Setting clear and measurable expectations for student success while providing ample opportunities for students to have ownership of the learning process (See detailed goals and objectives in Section 5 Student Performance, Assessment and Evaluation)
- Implementing quantitative and qualitative mechanisms to continuously monitor, assess, restructure and improve curriculum and instruction to achieve continuous student improvement annually (See Assessments in Section 5 Student Performance, Assessment and Evaluation)

The charter middle school program will offer students in grades 6-8 early exposure to career pathways in the sports leadership and management arena. By providing foundation skills through elective

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programs in these middle grades, as well as mentors and opportunities for real-world immersion activities, the school will prepare students to enter the 9th grade with a career focused program of study. The School will inform parents and the community through The District of the availability of this choice program using an open-enrollment, non-discriminatory marketing plan (see Section 13, Student Recruitment and Enrollment) Thus, the inception of the charter school will provide parents with the "flexibility to choose among diverse educational opportunities" as per the legislation.

- Promote enhanced academic success and financial efficiency by aligning responsibility and accountability.

As a nonprofit, tax-exempt organization authorized to operate charter schools, SLAM is accountable to the public. Consequently, a fiduciary duty exists between the Board, officers, management employees, and the public, which carries with it a duty of loyalty and fidelity. The Board, officers, and management employees have the responsibility of administering the affairs of corporation honestly and prudently. Accordingly the board has established academic and financial accountability policies and procedures in order to promote enhanced academic success and financial efficiency in carrying such responsibilities including, but not limited, to:

- Annually adopting and maintaining a sound operating budget
- Exercising continuing oversight over the schools' operations and reporting its progress to the Sponsor and state
- Retaining the services of a certified public accountant for the annual financial audit
- Reporting progress to its sponsor on student performance data
- Reporting the financial status of the school, including revenues and expenditures, at a level of detail that allows for analysis of the ability to meet financial obligations

As a public charter school, SLAM is accountable to students, parents, the community and all stakeholders in its responsibility to provide an adequate and relevant education for all students. Thus, the school will participate in the statewide assessment program created under s. 1003.43, Florida Statutes and will use state standardized assessment scores, and school-based and district adopted assessments to measure student progress toward mastery of the CCSS and applicable NGSSS across all grade levels. The School will be responsible for promoting enhanced academic success by identifying and meeting each student's educational needs as described in the school's detailed Curriculum Plan (*Section 4*) and by meeting the prescribed goals set forth the School Improvement Plan. To meet these needs, SLAM will gather applicable baseline student data and subsequently set goals to target student performance and achievement annually. The school will continuously monitor student progress using district and state-based assessments and data systems.

The school will report such progress:

- To students through data-chats and teacher evaluations
- To the governing board at governing boards meetings
- To parents through parental workshops, conferences, IEP and ELL Committee Meetings report cards and one on one conferences etc.
- To the sponsor through audits and required compliance reports

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- To the public through School Advisory Council meetings, published state accountability reports, School Improvement Plans governing board and other publicly held meetings

SLAM will promote continuous academic success and financial efficiency by upholding and communicating specific educational goals and financial responsibilities to its stakeholders (governing board, staff, students, parents and community members) thus aligning responsibility with accountability.

- Provide parents with sufficient information on whether their child is reading at grade level and whether the child gains at least a year's worth of learning for every year spent in the charter school.

SLAM students will participate in the statewide assessment program created under s. 1008.22. The school will thereby provide parents with assessment results on a yearly basis for each year their child participates in the state assessment and EOC examinations (as applicable) and any other district based examinations. The Department of Education reports student assessment data pursuant to s. 1008.34(3)(c) and the school will then report the information to each parent of a student at the charter school, the parent of a child on a waiting list for the charter school, the district, and the governing board of the charter school.

The School will also provide its parents with student performance reports from the Baseline and Interim Assessments results with specific information regarding their child's progress and learning gains. This means of communication informs parents whether or not their child is reading at grade level and whether or not their child has gained a year's worth of learning for each year spent at the School.

Through detailed assessment of academic performance using standardized test scores and other assessments the School will:

- Identify students who are below grade level, at grade level, or above grade level; and communicate this to parents through interim progress reports and parent conferences.
- Identify those students not making adequate progress and institute applicable measures for improvement and communicate the baseline, intervention strategies, and progress of those interventions as described in Section I-5 herein; and
- Report student progress throughout the academic school year via a standards-based means of grade assignation for report cards.

Communication regarding student progress will also occur through interim progress reports and report cards. The school will also host parent conferences, open house meetings, parental workshops, and coordinate other appropriate methods of communication with parents/guardians, as necessary.

- B. Describe how the school will meet the prescribed purposes for charter schools found in section 1002.33(2)(b), F.S. In accordance with the law, charter schools shall fulfill the following purposes:
 - Improve student learning and academic achievement.

Through SLAM's educational model, students will explore career options in the middle grades as they develop character and leadership skills and prepare to enter career academies in high school. The School will offer a middle school program centered on sports marketing, sports medicine, broadcasting

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and management by offering a standards-based curriculum allowing for Project Based learning activities and electives in these career pathways. Mentorship programs, quarterly guest speakers, career day, and community engagement activities through partnering organizations will enhance the students' educational experience and bring real world connections to the program. This program will allow students to take ownership of the learning program by meeting self-imposed goals and standards for their academic and career goals.

The curriculum is specifically tailored to ensure that all students meet and/or exceed the requirements for middle school promotion while allowing for advanced preparation through high school electives and honors coursework. The curriculum is standards-based and addresses current CCSS and applicable NG-SSS.

SLAM intends to improve student learning and academic achievement by:

- Delivering an innovative career exploration program that encourages students to continuously strive for success;
- Designing and implementing a continuous improvement methodology (through RtI) wherein student assessment results offer opportunities for differentiated and targeted instruction that is tailored to students' individual needs, ensuring consistent increased student achievement outcomes;
- Expecting and encouraging students to pursue their highest academic potential, especially in the core subjects of language arts/reading, mathematics, science and social sciences, and provide the means for these students to reach their potential;
- Establishing and maintaining sound, mutually beneficial partnerships with local businesses and sports franchises such as the Miami Heat, The Miami Marlins, University of Miami, Florida International University, and other institutions to provide mentorship and an array of opportunities for career exploration (see Section 13 for complete list of partnerships).

This academic plan provides a comprehensive blueprint to improve the academic performance of students from year to year. Its use requires the ongoing collection and analysis of student performance data, setting of priorities for program improvements, rigorous use of effective solution strategies, and ongoing monitoring of results. The plan will provide a structured means to improve teaching and learning to meet state content and performance standards.

- Increase learning opportunities for all students, with a special emphasis on low-performing students and reading.

According to research on the "career academy" model conducted by the University of California (Berkley), "academy graduates are more likely to have low-income, minority backgrounds. However, career academy students are more likely to graduate than other students in their districts, indicating that academies help low-income students finish high school and college...career academies are distinguished by their durability, definability, and dependability in producing student success." Other researched studies confirm earlier findings that "students in career academies earn more credits toward graduation and are more likely to participate in activities like volunteer projects," than students in traditional environments.

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One of the most important aspects of ensuring the success of low performing students is monitoring their academic progress. Once students have been identified as needing multiple levels of intervention following the RtI Process and based on the Florida Continuous Improvement Model, instruction shall be modified to address areas of need.

SLAM will first identify students not making adequate progress and/or not demonstrating mastery of NGSSS/CCSS using baseline data, previous year's performance on standardized tests, most current assessment data etc. Students who are not performing at grade level will be placed on a Progress Monitoring Plan (PMP).

Data will be used on a regular basis to monitor the implementation of reading programs and will include:

- FAIR Assessments
- In-program assessment data (CIRP and SIRP)
- Teacher-made assessments
- Interim assessments
- Differentiated targeted instruction in the six essential components of reading instruction: oral language, phonological awareness, phonics, vocabulary, fluency, and comprehension.

Struggling Readers will be place in appropriate courses when identified to have reading deficiencies **Intensive Reading -** All FCAT Level 1 and 2 students (based on 2014 test results), regardless of whether they are fluent, will be placed in the appropriate reading class.

The District Comprehensive Research-Based Reading Plan (CRRP) will be instituted with fidelity and each teacher will be required to follow the plan. Teachers and staff will have training in, and access to, instructional materials to reinforce language arts skills. Some examples are: Structured Independent Reading, Reciprocal Teaching, Read and Retell Learning to Write – Writing to Learn, Vocabulary Development, Accelerated Reader Program, CRISS (Creating Independence through Student-owned Strategies), Book Sharing, Cooperative Groups, and Graphic Organizers.

- Maximize student learning with targeted instruction in the different reporting categories:
 - Vocabulary provide a variety of instructional strategies and activities that include vocabulary word maps, concept maps, word walls, personal dictionaries, instruction in shades of meaning and context, affix and root words, reading from a wide variety of texts.
 - O Reading Application provide a variety of instructional strategies and activities that include making inferences, drawing conclusions, returning to text as support for answers, analyzing stated vs. implied main ideas, using graphic organizers to analyze text, interacting with text, understanding text structures and summarizing text.
 - O Literary Analysis provide a variety of instructional strategies and activities that include identifying methods of development and words that signal relationships, reducing textual information to key points, using poetry to study figurative language, reading closely to identify key details through the use of graphic organizers and concepts maps.
 - o Informational Text/Research Process provide a variety of instructional strategies and activities that include building strong arguments to support answers, exploring shades

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of meaning, using reciprocal teaching and question-answer relationships, questioning the author, and summarizing.

- Students will be expected to attend tutoring after school (and possibly on Saturdays, as needed) to accelerate their progress. In addition, students performing at grade level will be offered similar opportunities in order to maximize their potential and advance their progress.
 - Encourage the use of innovative learning methods.

Through exploration of sports related fields, students will learn through innovative "hands-on" opportunities with the support of staff, parents, community members, and our partners including community-based organizations. The School will maintain a commitment to the *CCSS* and NGSSS in applicable subjects toward students' mastery of the standards. Therefore, will use the most effective and innovative ways to deliver curriculum for the majority of students as we while targeting individualized learning needs through differentiated instruction, project-based learning, community engagement and high expectations for performance in all subjects-- but especially in content area coursework.

SLAM will use innovative learning initiatives focused on career exploration in the areas of sports leadership and management to better prepare middle school students for career academy programs upon entering the 9th grade. For example, the school will implement Career Portfolios, wherein students will create self-imposed performance goals geared at community engagement and personal development. At the beginning of the school year, students will create self-imposed goals for their career portfolios through Language Arts classes and building upon each goal every year thereafter as follows:

- Academic and/or Career Goal These goals may range from "building and developing work habits necessary to effectively learn subject matter" or "increasing one letter grade in their lowest performing subject" etc. Through development of this goal, students will gain greater autonomy and realize their potential as they monitor and reflect on their progress through the school year.
- Self -Esteem and Character Development Goal: students will be able to identify their learning strengths, challenges, and passions; evaluate this knowledge in terms of their short-and long-term goals; and create a plan of action for their life-long learning based on this evaluation. They will be challenged by their mentors and peers and will be expected to learn to take responsibility for managing their own behavior in these situations. Students will be given opportunities for leaderships and character building projects to attain their goal.
- Community Service Goal Through this goal, students will participate in a project that provides a service to the overall school and/or community through their Social Sciences program. The program will expose student to volunteerism and community service.

To supplement career exploration, students will have access to a career resources office through which they will have access to information about career pathways, industries, job markets and searches, mentoring, career development portfolios, co-operative education, internships, service learning etc.

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- Require the measurement of learning outcomes.

SLAM will participate in the statewide assessment program created under s. 1003.43, Florida Statutes and will thereby require the measurement of all learning outcomes. SLAM will use state standardized assessment scores, district and school-based assessments to measure student progress toward mastery of the *CCSS* and NG-SSS across all grade levels. SLAM will implement the Sponsor's testing calendar and measurements, and frequency of assessments therein as amended from time to time in accordance with district and/or statewide assessments.

In addition to all required state and district assessments, the school will incorporate other measurement tools, such as teacher-made assessments, career portfolios, computer-assisted assessments, expositions, fairs, and other formal and informal means to measure individual student performance growth and school-wide learning outcomes. Based on these various measurements, teachers will modify their instruction, monitor student progress, select appropriate classroom activities, and use assessment results more effectively. These methods will inform teachers of the effectiveness of their teaching, as well as student learning gains in order to ensure continuous progress.

- C. Describe how the charter school will fulfill, the optional purposes of charter schools found in section 1002.33(2)(c), F.S. This section is optional. In accordance with the law, charter schools may fulfill the following purposes:
 - Create innovative measurement tools.

SLAM will offer an innovative curriculum that will expose students to career exploration in the sports leadership. The curriculum will stress communication, problem solving, teamwork, business and technology, as well as real world immersion through mentorship programs.

The school will establish partnerships to support student's ability to create career portfolios to measure learning outcomes. Beginning in grade six, students will start the process of creating a portfolio that will be maintained and updated throughout their middle school career and will continue seamlessly into the 9th grade academy track of their choosing. By working with individuals who are established and successful in the sport leadership and management workforce, students will gain real-life and hands on experiences.

- Create new professional opportunities for teachers, including ownership of the learning program at the school site.

The School will generate an opportunity for teachers to participate in an exciting and innovative venture; one that allows them to take ownership over the learning process and feel free to incorporate their unique teaching styles into the classroom. Teachers at the School will feel encouraged to take part in the advancement of their students' educational lives, communicate with their colleagues, and share effective techniques in an effort to promote the spread of best practices and cutting edge methods. In order to best utilize research-based strategies and implement the school programs, all teaching staff will receive ongoing professional development on the various components of the programs, respectively, to ensure effective implementation.

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Teachers and staff will be involved in the development and implementation of all programs, thus making them an integral part of the educational process. In addition, at the time of program review, teachers and staff will be invited to offer their comments, discuss findings with colleagues, and make the necessary modifications to ensure students' success.

All instructional staff will be encouraged to participate in professional development programs, conferences, or workshops in order to progress academically, enhance their skills, and network amongst other professionals who share their same curricular expertise and have the ability to stay current in their areas of curriculum. SLAM will also promote communication amongst colleagues, for example, regarding effective techniques used in the classroom.

Section 2: Target Population and Student Body

A. Describe the anticipated target population to be served.

If applicable, applicants should describe if they will target, in accordance with the law, certain populations defined in section 1002.33(10)(e), F.S.

SLAM will have an anti-discriminatory open admissions policy serving any student in grades 6th through 8th (approximately 11 to 14 years of age) who would qualify to attend a public school in the school district. The District's Demographic Profile 2012-13 reflects that Broward County serves a diverse student population (White 50.81%, Black 40.26%, Ethnically Hispanic 29.04%, Asian 3.65% Native American or Native Alaskan 1.68%, Native Hawaiian or Pacific Islander 0.13% and Multiracial 3.47%).

The program, by design, is intended to attract an at-risk student population and/or students from both existing choice programs and traditional program public schools throughout the county and those seeking future career/vocational high school programs in the sports leadership and management arena.

SLAM expects to serve all eligible students who apply (within the constraints of charter and building capacities) and therefore expects to have a racial/ethnic population that reflects the demographics of school district.

Admissions Policy - In accordance with federal and state anti-discrimination laws and in accordance with the Florida Educational Equity Act, Section 1000.05(2)(a), the School will not discriminate on the basis of race, ethnicity, national origin, gender, disability, or marital status against a student in its school admission process. An open admissions policy will be implemented wherein the School will be open to any student residing in the County. Any eligible student, as described in Fla.Stat.§1002.33(10), who submits an application (prior to the posted deadline) shall be considered, unless the number of applications exceeds the capacity of the program, class, grade level, or building. In such case, all applicants shall have an equal chance of being admitted through a random selection process. If the number of applications falls short of the established capacity, supplemental registration periods may be held for the purpose of reaching student capacity.

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Enrollment Preferences - In accordance with Florida's charter school legislation, Fla. Stat. 1002.33(10)(d) the charter school may give enrollment preference to the following student populations:

- Students who are siblings of a student enrolled in the charter school.
- Students who are the children of a member of the governing board of the charter school.
- Students who are the children of an employee of the charter school.
- Students who are the children of an active duty member of any branch of the United States Armed Forces.

In order to minimize any traffic impact caused by the school and ensure that the school is available to serve the residents of the neighborhood where the school is located, the Governing Board of the charter school may elect to limit the enrollment process to target students residing within a reasonable distance of the school as provided under Fla. Stat. §1002.33 (10)(e).

B. Provide the following projection for each year of proposed operation: the grades that the school will serve, the projected number of students to be served in each grade, the number of students expected in each class, and the total number of students enrolled.

Projected Student Enrollment Breakdown - The numbers provided below are estimates, and may fluctuate within each grade level depending on student enrollment and/or attrition in the respective grade levels. The projected student-to-teacher ratio shall be consistent with those required by the Class Size Reduction Act, as applied to charter schools. The school's staffing plan correlates with enrollment projections and is designed to employ sufficient personnel to ensure that the student-to-teacher ratio is followed in accordance with the law.

Middle School - Student Enrollment Breakdown by Year

School Years	Grade Levels to be Served	Core Classes**	Enrollment per Grade Level*	Total Enrollment
Year 1	6-8 th grade		Grade 6-8= up to 374	Up to 750
Year 2	6-8 th grade		Grade 6-8= up to 600	Up to 750
Year 3	6-8 th grade	Up to 22 students	Grade 6-8= up to 725	Up to 750
Year 4	6-8 th grade		Grade 6-8= up to 725	Up to 750
Year 5	6-8 th grade		Grade 6-8= up to 750	Up to 750

C. Provide a description of how the student population projections were developed.

South Florida is filled with sports fans, sports players, and fitness-minded individuals and certainly reflects the nation's enthusiasm for sports and fitness. As such a large community, it should be expected that South Florida is host to a number of popular sport teams and sporting events. Some are recurring, like the Sony Ericsson Open and NASCAR Series; some rotate the country, like the NFL

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Super Bowl, MLB World Series, and NBA Finals; and yet others began their first year in 2009, like the South Beach Women's Polo Cup. Relevant employment opportunities abound for coaches, instructors, referees, umpires, personal fitness and athletic trainers, recreation workers, and sport reporters and correspondents. Despite serving such a large industry, there are no schools offering such preparatory programs for this field in the area.

SLAM intends to provide an educational program for students choosing to pursue such careers by allowing a seamless progression into one of the SLAM high school's career academies. The existing SLAM middle and high school which opened this past year in Miami-Dade County, has received a combined total of 2,200 applications to date with room for only approximately 900 students.

The student population projections were also based on Broward County's five-year enrollment projection of student enrollment¹. As noted in the Public School Facilities Element of the Broward County Comprehensive Plan.² The plan projects that enrollment in charter school is expected to increase by 14,058 students by 2016-17.

Summary of Enrollment Projections in Broward Schools 2011-2017

School Type	2010-11 20th Day Enrollment	2011-12 20th Day Enrollment	2011-12 Increase/(Decrease) Over 2010-11 20th Day Enrollment	2016-17 Projected 20th Day Enrollment	2016-17 Increase/(Decrease) Over 2011-12 20th Day Enrollment
Pre- Kindergarten	4,465	4,345	(120)	4,345	0
Elementary (K-5)	101,344	99,252	(2,092)	94,624	(4,628)
Middle	52,369	50,890	(1,479)	48,675	(2,215)
High	69,516	68,921	(595)	66,702	(2,219)
Centers	5,904	5,906	2	5,906	0
Charters	23,274	29,489	6,215	43,547	14,058
TOTAL	256,872	258,803	1,931	263,799	4,996

Consequently, enrollment projections for the middle school were based on several factors including:

- Parent and student interest for career in the South Florida community;
- Lack of similar choice programs in Broward County and ever-increasing demands of this industry⁵;
- Evidence of demand for such a program (as noted by the existing SLAM schools' waiting lists)
- Broward County's Projected enrollment increase in choice programs over the next five years

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² www.broward.org/.../ComprehensivePlanning/Documents/PSFES



Section 3: Educational Program Design

A. Describe the school's daily schedule and annual calendar, including the annual number of days and hours of instructional time.

The school day shall consist of at least 360 minutes, and all hours of instructional time will be aligned with state and district requirements. It is anticipated the School will operate a seven-period day from 7:30 am - 2:30 pm as follows:

Sample Schedule					
Description	Start Time	End Time			
Student Arrival	7:00 AM	7:25 AM			
Period 1 and Attendance	7:30 AM	8:25 AM			
Period 2 or 3	8:30 AM	10:20 AM			
Period 4 or 5 (including lunch)	10:25 AM	12:35 PM			
Period 6 or 7	12:40 PM	2:30 PM			

Annual Calendar: The School will follow the annual public school calendar established by the Sponsor, which requires a minimum of at least 180 actual instructional days per school year in accordance with Florida Statute 1011.60(2).

B. Describe the proposed charter school's educational program.

SLAM, Inc., the non-profit that will operate the School, is a subsidiary Mater Academy, Inc., one of the nation's most acclaimed charter school organizations for successfully preparing minority students for college. Accordingly, The school's educational model is derived from research-based strategies practice at Mater Academy schools and proven successful in raising student achievement with similar student populations. SLAM will be a replication of Mater Academy's successful programs but with a unique emphasis on Sports Leadership related fields. This program will integrate state academic standards (NGSSS and CCCS) into the core curriculum while exposing students to foundation skills in Sports Business, Marketing, Health, and Communications.

The School's instructional model ultimately revolves around the philosophy of the three R's: Rigor, Relevance, and Relationships in the learning process. This model is a staple of the Mater Academy middle high schools, and has proven successful in raising student achievement both locally (at Mater Academy schools) and across middle and high schools nationwide. Based on the R's model, thematic lessons to be developed by SLAM teachers (as described in Appendix B herein) to provide real-world relevance to core subject matter while addressing rigorous content and key areas of the curriculum in alignment with NGSSS-CCSS. SLAM will actively seek and encourage both parental and community involvement in the school's programs in order to foster relationships that empower students to continuously strive for academic and personal success. The program will promote higher levels of student engagement in the curriculum through mentoring opportunities, community service projects, career advisors and athletes

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as role models, allowing for students to build positive relationships with their peers, their teachers and their community (Refer to *Section 13* herein for community partnerships and initiatives).

SLAM will use motivational engaging elective courses connected to the sports leadership arena to add **Relevance** to the **Rigor** of the core curriculum. Emphasizing specific measures of performance, standards-based instruction will incorporate:

- Opportunities for active and genuine Relationships among students, families, and community
 mentors within the career exploration model to create richer learning communities that hold all
 stakeholders accountable for success;
- Relevant learning opportunities through career-related projects, real-world application initiatives and community service.
- Project-Based Learning initiatives emphasizing individual and collaborative projects as the foundation for learning;
- Performance-based curricular objectives in alignment with NGSSS /CCSS
- Curriculum pacing of essential standards based on nine-week intervals, in each content area;

The School approach to implementing the three R's is based on two dimensions of higher standards and student achievement:

- I. The Knowledge Taxonomy based on the six levels of Bloom's Taxonomy depicting the increasingly complex ways in which we think: (1) awareness; (2) comprehension; (3) application; (4) analysis; (5) synthesis; (6) evaluation. The low end of this continuum involves acquiring knowledge and being able to recall or locate that knowledge in a simple manner. At the higher end, students are expected to analyze, synthesize, and evaluate acquired knowledge. Assimilation is also often referred to as a higher-order thinking skill since, at this level, the student can solve multistep problems and create unique work and solutions.
- II. The Application Model created by Dr. Willard R. Daggett³, describes five levels of how we apply knowledge in an action continuum: (1) knowledge in one discipline; (2) apply in discipline; (3) apply across disciplines; (4) apply to real-world predictable situations; (5) apply to real-world unpredictable situations.

The Application Model describes putting knowledge to use. While the low end is knowledge acquired for its own sake, the high end signifies action — use of that knowledge to solve complex real-world problems and to create projects, designs, and other works for use in real-world situations.

The CCSS standards incorporate Webb's Depth of Knowledge and Bloom's Taxonomy and thus the cognitive demand of the standards rises across the grades levels. Using the CCSS and NGSSS standards

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³Willard R. Daggett, Ed.D.,CEO of the International Center for Leadership in Education is recognized worldwide for his proven ability to move education systems towards more rigorous and relevant skills and knowledge for all students. He has assisted a number of states and hundreds of school districts with their school improvement initiatives, many in response to *No Child Left Behind's* demanding adequate yearly progress (AYP) provisions.



aligned to the Knowledge Taxonomy described above, the curriculum will demand that students use higher order thinking skills and combine their knowledge in both logical and creative ways. Through innovative projects and mentorship programs, SLAM will engage students in Quadrant 3-5 of the Application Model by preparing them to think critically and apply knowledge across disciplines, and in real world predictable and unpredictable situations.

Curriculum Delivery Based on the SLAM Model - The three R's (Rigor, Relevance, and Relationships) framework allows for all stakeholders to assess and reevaluate what students are actually experiencing and learning in each learning community or academy cluster. Below is an example of the how the school will use the Rigor, Relevance, and Relationship framework to guide instruction delivery aligned to authentic assessments both in and out of the classroom. This model will also be used as a guide for collaborative discussions among teachers and to conduct professional development for teachers and community mentors.

The Rigor, Relevance and Relationship Framework⁴

	RIGOR	RELEVANCE
CONTENT	Instruction is grounded in content that is: - Complex - Ambiguous - Provocative - Emotionally or personally challenging	 Instruction is: Inherently meaningful Engages students in multiple domains Stimulates intellectual curiosity Offers value beyond the classroom
INSTRUCTIONAL PROCESS	 Students engaged in active participation, exploration and research Focus on competence, not coverage (work shows evidence of understanding, not just recall) Clear expectations define what students should know and be able to do Teachers and students set learning goals and monitor progress toward academic excellence Activities draw out perceptions and develop understanding Students develop resilience, flexibility, and confidence by facing academic challenges 	 Teacher utilizes the diversity and culture of <i>each</i> student to build effective learning experiences. Learning activities represent issues that require a personal frame of reference for the students (activities invite an emotional or internal commitment on the part of the student, in addition to a cognitive interest) Students make decisions about their learning with their teachers/peers/mentors Learning activities develop within each student the habits and curiosity associated with life-long learning
	- Assessment tasks extend beyond traditional "paper and pencil"	- Assessments are not strictly evaluative: they are an opportunity

⁴Coalition of Essential Schools Northwest/Small Schools Project (2004)

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ASSESSMENT	tests Students exhibit higher order thinking through: Substantive conversations, Project Based Learning Activities Portfolios and Performances and Expositions for teachers to reflect on instruction and modify teaching to meet the changing needs of their students. Students. Students have voice in the design and type of assessments. Assessments are meaningful to students, and offer students insights into their own learning. Assessment tasks sometimes ask students to communicate their knowledge, present a product or performance, or take some action for an audience beyond the teacher, classroom, and school building				
	RELATIONSHIPS				
TEACHER - STUDENT RELATIONSHIPS	 Teachers know students (and often families) so well that instructional and learning opportunities can be tailored to the needs of each student Teachers know students (and often families) so well that instructional and learning opportunities can be tailored to the needs of each student. Teachers model integrity and open-mindedness for their students. Teachers are intentional in creating safe, nurturing, democratic classrooms so that self-esteem and trust develop in students. Teachers know students (and often families) so well that instructional and learning opportunities can be tailored to the needs of each student. Teachers model integrity and open-mindedness for their students Students trust their teachers so well they grant teachers the authority to challenge them 				
STUDENT - STUDENT RELATIONSHIPS	 The community of learners is strong so that students are committed to their own success, as well as the success of their peers Students embrace a sense of ownership in their learning community or academy because their voice impacts the direction of classroom activity 				
STUDENT - COMMUNITY RELATIONSHIPS	Students often communicate and collaborate with people beyond their classroom (i.e. community members, other students, experts and other staff members.) Learning activities develop within each student a sense of belonging and responsibility to the local and global community Students see themselves as active and conscientious citizens.				

Through motivational engaging lessons and career exploration electives, the curriculum will emphasizes rigor, relevance, and relationships, while allowing for all students to acquire and apply the skills and competencies in alignment with CCSS expectations.

C. Describe the research base for the educational program.

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A Research - Based Educational Model - Attributed to the research of the Bill and Melinda Gates Foundation,⁵ the three R's represent the essential components that must be in place to effectively prepare students for the demands of the 21st Century. A study conducted by Ronald Newell and Mark Van Ryzin of EdVision Schools, a Gates Foundation project, found that simply making greater demands on students will not ensure long-term success "...especially for the students who have had little success in traditional settings." The study, entitled "The Hope Study," analyzed the effects of Rigor, Relevance, and Relationship in bringing about educational reform. It claimed that academic gains "will be short-lived if not accompanied by deeper levels of change in the learning community along the lines of the Rigor, Relevance, and Relationships."

The following is a description of the major components of SLAM's program design as validated by research:

1. **Autonomy:** having choices, setting your own goals and timelines, choosing what to study and when, viewpoints are accepted. We believe that students rarely adopt higher academic learning goals in response to "surface" reforms, such as changes in curriculum or subject matter; however, if the reforms permit higher levels of autonomy for students, encourage higher levels of peer and teacher support, and provide higher levels of "task" goal orientation, then academic results will not only appear but will be longer lasting.

Research - Autonomy affects motivation and has a direct relationship to persistence and engagement, as well as graduation rates (Deci, Nezlek, & Sheinman, 1981; Deci, Schwartz, Sheinman, & Ryan, 1981; Flink, Boggiano, & Barrett, 1990; Ryan & Grolnick, 1986; Vallerand & Bissonnette, 1992; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004).

2. Belongingness: perceiving high levels of support from peers and teachers, mentors, and parents in both personal issues and academic issues. Belongingness is a direct measure of *Relationships*. The School will foster these positive relationships through the practice of mentoring and career advisors, athletes as role models and other community partners.

Research - The need for strong, mutually supportive relationships is a fundamental human need (Baumeister & Leary, 1995). In the school setting, belongingness refers to the quality of interpersonal relationships with teachers and peers. High levels of belongingness lead to increases in motivation, positive social behavior and academic achievement (Wentzel, 1994, 1997, 1998; Wentzel, Barry, & Caldwell, 2004; Wentzel & Caldwell, 1997). In contrast, socially rejected students show lower levels of engagement, have higher levels of academic and behavioral problems (DeRosier, Kupersmidt, & Patterson, 1994), and can be at significant risk of dropping out of school and eventually running afoul of the law (Parker & Asher, 1987). Belongingness can also enhance school adjustment, perceived competence, and self-esteem (Barrera, Chassin, & Rogosch, 1993; Cauce, 1986; Kurdek & Sinclair, 1988).

3. Goal Orientation: perceiving high expectations from teachers; belief that effort will be recognized; emphasis on deep understanding rather than shallow recitation. Goal orientation is a good measure of the *Rigor* of an educational environment; Schools that are uniformly rigorous and emphasize deep

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⁵ Bill and Melinda Gates Foundation's *High Schools for the New Millennium*



understanding will see high scores in "task" goal orientation. Both project-based learning and mentoring activities come together to inspire a positive "task" goal orientation.

Research - Students who perceive a positive or "task" goal orientation in school will seek challenges and show persistence in the face of adversity, use more effective learning strategies, have more positive attitudes, and demonstrate more engagement in learning (Roeser, Midgley, & Urdan, 1996). On the other hand, students who perceive a negative or "performance" goal orientation seek to avoid challenge and, in the face of failure, attribute their results to lack of ability and exhibit a "learned helplessness" response, which refers to a negative emotional response and a defeatist attitude (Eccles & Midgley, 1989).

4. Student and Community Engagement: a reflection of the student work ethic, concentration and attention paid to schoolwork; behavioral, and emotional involvement in school. The School will implement Career Portfolios, wherein students will create self-imposed performance goals geared at community engagement and personal development. At the beginning of the school year, students will create goals for their Career Portfolio, building upon each goal every year thereafter (see Curriculum Section – Language Arts). The goals will comprise of 1. Academic and/or Career Goal – (i.e. increasing one letter grade in their lowest performing subject. Through development of this goal, students will gain greater autonomy and realize their potential through the school year as they monitor and reflect on their progress. 2. Self-Esteem/Character Development Goal: students will be able to identify their learning strengths, challenges, and passions and create a plan of action for their life-long learning based on this evaluation. They will be challenged by their mentors and peers and will be expected to learn to take responsibility for managing their own behavior in these situations. Students will be given opportunities for leaderships and character building projects to attain their goal. Behavior management techniques are an important part of the curriculum and increase-self esteem by providing opportunities for academic success. 3. Community Service Goal: The School will expect all students to be active and contributing citizens of their school and community. Students will understand the effect that they have upon the community, and will take the initiative to better themselves and the community as a whole by choosing one community or school-based service goal that they will complete by the end of the school year.

Research - A lower level of engagement usually means a student will not complete work on time and will not learn much of value. An engaged learner will do superior work, obtain a deeper level of understanding, and retain the knowledge and skills for a longer period of time. A higher level of engagement is a reflection of the amount of effort and passion a student will put into learning (Fredricks, Blumenfeld, & Paris, 2004).

5. Project –Based Learning - When only academic gains are measured, there may be an immediate level of growth, but these gains will be short-lived if not accompanied by deeper levels of change in the learning community along the lines of the 3 R's. Simply making greater demands on students will not ensure long-term success, especially for the students who have had little success in traditional settings. But when long-term changes in the learning community are geared towards *Rigor*, *Relevance and Relationships*, long-term academic success is more likely. Therefore, our program will incorporate Project-Based Learning into our career academies to create *Relevance* for students, which will increase their academic achievement on a long-term scale.

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Through PBL tasks, teachers will:

- implement challenging, multidisciplinary curriculum aligned to CCSS and NGSSS standards;
- engage students in complex, real-world projects through in which students develop and apply skills and knowledge through portfolio presentations;
- require students to draw from many disciplines in order to solve problems;
- encourage student decision-making;
- discuss problems are presented without a predetermined solution;
- put students in charge of accessing and managing the information that they gather; and
- expect students to reflect and evaluate their own learning continuously.

Research - Project-based learning enables students to pursue their own interests and passions, what is "in the moment' rather than imposed. Project-Based Learning emphasizes individual and collaborative projects as the foundation for learning and includes very little of the whole-class instruction typically found in traditional secondary schools (Newell, 2003).

D. Explain how the educational program aligns with the school's mission.

The mission of SLAM is to prepare middle school students for high school and careers beyond through an innovative and engaging educational program emphasizing sports leadership career exploration. The mission and goals are specifically tailored toward addressing at-risk students' learning needs and ensuring that all students are prepared for high school and beyond. The proposed educational program aligns with SLAM's mission in that it is will engage students in activities preparing them to think critically and apply knowledge across disciplines, and in real world predictable and unpredictable situations. The middle school years are critical to whether a student drops out of high school. A study conducted by the University of California's Linguistic Minority Research Institute in 2008 revealed that "poor academic achievement, as early as elementary school, is one of the strongest predictors of dropping out." In addition, "dropout rates are generally higher for Blacks, Hispanics, and Native Americans than for Asians and Whites." SLAM's unique program intends to address the current gap in educational opportunities in this community by providing at risk middle schools students with an innovative educational option that sets high academic standards for all students, engages and enables them to succeed through real world application initiatives and empowers them through relationships with community mentors.

The educational program is the mechanism through which the mission will be achieved. In order to produce career-oriented graduates, SLAM must provide *Rigor*, *Relevance and Relationships* in the educational program. These attributes are incorporated in the specific instructional strategies within each courses stated above. Thus, through the implementation of this highly motivating educational program, middle school students at SLAM will be on track for high school at an earlier age.

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 $^{^{6} \ \}underline{\text{http://www.slocounty.ca.gov/Assets/CSN/PDF/Flyer+-+Why+students+drop+out.pdf}}$



E. Explain how the services the school will provide to the target population will help them attain the Next Generation Sunshine State-Common Core Standards, as required by section 1002.33, F.S.

Serving the target student population – As a charter middle school program, SLAM's "career" focused approach will offer students a unique opportunity to explore career options through partnerships with local sports franchises and electives in the areas of marketing, business, communication and health. SLAM will provide a program for students choosing to pursue future careers in Sports Leadership and Management by aligning the middle school curriculum to allow for a seamless progression into a SLAM High School career academy (if they choose this educational option).

Research has proven that career focused models improve successful school-to-work transitions without compromising academic goals and preparation for college⁷.

"Originally created to help inner-city students stay in school and obtain meaningful occupational experience, career academies and similar programs have evolved into a multifaceted, integrated approach to reducing delinquent behavior. Career academies allow youth who may have trouble fitting into the larger school environment to belong to a smaller educational community and to connect what they learn in school with their career aspirations and goals."

- U.S. Department of Justice - Office of Juvenile Justice and Delinquency Prevention

"Career academies help to keep students in school and to obtain high school degrees. Approximately two years after leaving high school, more than 92 percent of former academy students had a high school diploma or equivalent, compared with 82 percent of students from other programs."

- W.E. Upjohn Institute for Employment Research

The SLAM curriculum is specifically tailored toward addressing the learning needs of all students, with special emphasis on at-risk student populations as described above, through engaging and innovative instructional activities in each core area as well as in extracurricular programs.

The educational program requires the use of standards-based, state-adopted texts and research-based instructional materials, aligned to CCSS and NG-SSS, and high-yield educational strategies proven to improve student achievement. Therefore, the implementation of this program, with fidelity to all practices and standards described in this petition, will help **all** students to attain mastery of state standards and to better prepared for high school and beyond.

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⁷Improving High Schools through Rigor, Relevance and Relationships - The National Conference of State Legislatures http://www.ncsl.org



In order to support delivery of a rigorous yet engaging program that implements research-based strategies and innovations to raise student achievement, SLAM will adhere to:

- Performance-based curricular objectives in alignment with the -CCCS and NGSSS as applicable;
- Continuous review of curriculum to ensure a year's worth of learning of all state benchmarks;
- An emphasis on differentiated instruction for learning styles;
- Integration of technology across all major disciplines;
- Ongoing professional development workshops for staff on CCSS and applicable instructional strategies;
- Targeted interventions, tutoring, and extended day support for struggling students performing below grade level;
- Integration of "Project Based Learning" activities related to Sports Leadership and Management; and
- A culture of high expectations wherein all students will be encouraged to maximize their academic potential by taking the most rigorous program in which they can be successful.

If the school intends to replicate an existing school design⁸:

F. Provide evidence that the existing design has been effective and successful in raising student achievement.

The effectiveness of an existing school design can be demonstrated by providing evidence of organizational viability and the success of the academic program, including compliance with legal requirements, as well as a direct relationship between program elements and student achievement.

SLAM's thematic approach will offer students a unique opportunity to explore career choices through partnerships with local sports franchises. SLAM intends to provide a seamless progression into one of the SLAM high school's career academies. As state above, the school design is modeled after the existing SLAM middle school and high school, which opened this past year in Miami-Dade County as is part of the Mater Academy Inc. network of schools.

The SLAM schools are under the operation of The Sports Leadership and Management Foundation, Inc., a wholly-owned subsidiary company of Mater Academy Inc., a Florida non-profit corporation. Mater Academy Inc., the parent organization, is the sole member of Sports Leadership and Management Foundation, Inc. and retains specified corporate functions (as detailed in the Articles of Incorporation - Appendix C). Accordingly, the proposed program will be a replication of the current existing SLAM schools and part of the Mater Academy network of schools.

Mater Academy, Inc., the parent corporation, has been operating high performing and fiscally sound charter schools in Florida for over 15 years, with over 25 charter schools currently serving over 9,000

For example, a plan to implement a specific program, such as a widely-used curriculum, would not be categorized as the replication of an existing school design.

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⁸ An applicant is considered to be replicating an "existing school design" if:

The proposed school is substantially similar overall to at least one school, and

The individuals and/or organization involved in the establishment and operation of the proposed school are deeply involved in the operation of the similar school(s).



students across Miami-Dade County. More than half Mater schools are Title I, serving economically disadvantaged student populations with 77% of students receiving free/reduced (64% free /13% reduced) lunch meals. The average student population is 96% minority and 14% of students receive ESOL and 10% receive ESE services as per data from the 2012-13 school year. The organization has made significant strides towards closing the achievement gap and increasing the level of education, especially for minority and economically disadvantaged students as evidenced by student performance data under the state's accountability system:

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2012 FCAT Performance Results - Mater Academy, Inc. Schools

School Number	Mater Academy, Inc.	2012 Score	2012 Grade					
	Elementary Schools							
0100	MATER ACADEMY	601	Α					
0312	MATER GARDENS ACADEMY	707	Α					
1017	MATER ACADEMY OF INTERNATIONAL STUDIES	458	С					
3100	MATER ACADEMY EAST CHARTER	628	Α					
	Middle Schools							
5045	MATER GROVE	670	Α					
5046	MATER BRICKELL PREPARATORY	n/a	n/a					
5047	MATER ACADEMY MIAMI BEACH	572	Α					
6047	MATER ACADEMY MIDDLE SCHOOL OF INTERNATIONAL STUDIES	653	Α					
6009	MATER EAST ACADEMY MIDDLE SCHOOL	539	Α					
6012	MATER ACADEMY CHARTER MIDDLE	681	Α					
6033	MATER ACADEMY LAKES MIDDLE SCHOOL	604	Α					
6042	MATER GARDENS ACADEMY MIDDLE SCHOOL	678	Α					
	High Schools (FCAT components only)							
7014	MATER PERFORMING ARTS & ENTERTAINMENT ACADEMY	672	Α					
7016	SPORTS LEADERSHIP ACADEMY OF MIAMI	n/a	n/a					
7018	MATER ACADEMY LAKES HIGH SCHOOL	511	В					
7024	MATER ACADEMY HIGH SCHOOL OF INTERNATIONAL STUDIES	534	Α					
7025	MATER BRICKELL PREPARATORY ACADEMY	n/a	n/a					
7037	MATER ACADEMY EAST CHARTER HIGH SCHOOL	513	В					
7160	MATER ACADEMY CHARTER HIGH	657	Α					

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Mater Academy, Inc. Middle School's Historical Report Card (Inception - 2011-2012 SY)									
School	Year	Grade	Sum Points Earned	Meeting High Standards in Reading	Meeting High Standards in Math	Meeting High Standards in Writing	Meeting High Standards in Science	Free/ Red Lunch	Minority Rate
	2011-12	A	669	68	76	91	56	80	98
	2010-11	A	587	75	80	90	53	81	98
	2009-10	A	556	75	77	87	43	82	97
Mater Academy Charter Middle	2008-09	A	561	71	73	95	40	79	98
School	2007-08	A	551	69	68	95	40	75	96
School	2006-07	В	513	65	66	94	35	76	96
	2005-06	A	426	68	62	83		73	96
	2004-05	A	413	58	62	91		74	95
	2003-04	C	373	54	47	91		76	94
	2011-12	A	672	75	76	95	71	65	93
Mater Gardens Academy	2010-11	В	541	81	74	90	70	51	93
Middle School	2009-10	A	563	79	76	82	58	50	94
Wilder School	2008-09	A	611	83	75	100	60	43	94
	2007-08	C	480	79	59	92	39	37	91
	2011-12	A	597	66	69	82	43	76	94
	2010-11	В	523	70	73	87	36	68	94
Mater Academy Lakes Middle	2009-10	A	554	69	72	92	32	62	92
School	2008-09	A	527	57	62	89	29	52	94
	2007-08	В	516	59	64	85	34	47	94
	2006-07	С	450	55	55	91	21	51	94
	2011-12	C	527	49	44	79	39	93	99
	2010-11	C	490	57	61	81	36	88	98
Mater Academy East Charter	2009-10	В	515	60	60	82	34	81	97
Middle School	2008-09	C	494	57	50	92	26	90	97
Middle School	2007-08	A	547	64	71	100	51	87	98
	2006-07	A	584	76	86	90	34	85	99
	2005-06	A	504	84	76	97		90	97
	2011-12	A	638	66	65	100	66	85	99
Mater Academy Middle School	2010-11	A	551	71	56	92	63	84	98
of International Studies	2010-09	A	549	75	59	97	44	78	99
	2008-09		516	40	57	100	39	88	94

Although the column label/identifier are different for this year's data than in previous years (this year the numbers represent percentages and points at the same time) notwithstanding, every percentage point is equivalent to a point that and therefore the proficiency component is equivalent to meeting High standards.

Relationship Between Program Elements and Student Success – SLAM Charter High School in Miami-Dade County opened in 2011-12 in a temporary facility while awaiting construction of its permanent location across form Miami Marlins Park. Due to the space constraints of sharing a facility with another charter school, SLAM opened with limited enrollment and therefore the testing data for 2012 was not available. The baseline data available reflected achievement results of level 1 and 2 from their previous school year. The majority of the students entering the school came from the surrounding communities of Little Havana and Overtown, both predominantly minority and poverty-stricken urban neighborhoods. The majority of these students receive Free and/or reduced meal services and lack academic support at home due to families who lack formal schooling or have little or no English proficiency. Despite these challenges, SLAM students showed significant learning gains on the 2013 FCAT data released, as follows:

- 53% of students made learning gains in Reading
- 63% of students made learning gains in Math
- 73% of the lowest (25%) quartile made learning gains in Reading

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- 52 % of the lowest (25%) quartile made learning gains in Math

Mater Academy High Schools have been graduating high school seniors with both a High School Diploma and an Associates of Arts Degree, simultaneously for the past three years. This is due to Mater Academy's aggressive dual- enrollment program partnerships with local colleges. For example, Mater Academy East High School, located less than 3 miles from the existing SLAM schools, graduated 88% of "At Risk" students in 2012, despite serving a population (79% Minority and 90% economically disadvantaged), which is statistically by national norms expected to underperform. The school was also the National Silver Medalist for College Readiness by *News Week and World Report and* was also the first charter school in the nation to be acclaimed an Academy of Finance from the National Academy Foundation. Currently, 97% of Mater East graduates are attending a college or university, while Mater's academic programs continue to provide students an opportunity for success at a collegiate level. Overall, the network's graduation rate of 91% exceeds the state average (84%) and more than doubles the national graduation rate for minority students, based on data released by the FLDOE for the 2012 school year.

Apart from student performance reports, the network's success is also evidenced by local, state, and national recognitions for their exemplary performance in serving elementary, middle, and high schools students. Some of the accolades earned by Mater schools are as follows:

- Mater East Academy Charter Elementary was the only school in Miami Dade County to receive the 2010 National Blue Ribbon School Award
- Mater East Academy received the Title I Distinguished Schools Award in 2007 and 2010.
- Mater Academy Middle School received the 2010 Breakthrough school Award.
- Mater Gardens Academy Middle School earned 100% passing rate by their 8th graders on the Algebra EOC and 98% passing rate by their 8th graders passed the Biology EOC in 2012.
- Mater Academy Charter High School was one of only 3 high schools in the nation to receive the College Board Inspiration School National Award in 2011
- Mater Academy High School was acclaimed as one of the nation's top 400 high schools in U.S.
 News & World Report's ranking of "America's Best High Schools" 2009 -2012
- Mater Lakes High appeared on U.S. News & World Report's ranking of "America's Best High Schools - Gold level standing in 2012
- Mater East High appeared on U.S. News & World Report's ranking of "America's Best High Schools Silver level standing 2011- 2012.
- Newsweek magazine listed Mater Academy High School in the top 1% of approximately 18,000 public high schools, 2009- 2012
- Mater Academy Charter High School was awarded the Breaking Ranks designation by the Center for Secondary Schools Redesign (CSSR) and National Association of Secondary School Principals (NASSP) in 2012
- CollegeBoard selected Mater Academy Charter Middle and High Schools as a Springboard National Demonstration Schools.

In 2010, Mater Academy, Inc. was among one of the first charter school systems in the nation to seek and achieve corporate accreditation for their network of schools. This has allowed Mater to create

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unified standards, policies, and best practices, ensuring that all replicated schools stay true to the organizational vision and mission. Mater's designation as a high-performing charter school system by the Florida Department of Education in 2010-11 school year along with a fifteen-year track record of academic success, serve as evidence of its organizational vitality and commitment toward student success.

SLAM's mission, aligned with the Mater model, is to push students to begin to prepare and dream about a postsecondary education and careers is derived from the network's commitment to get all students, regardless of achievement level, disability or economic challenges, on the path toward college. Accordingly, at SLAM, all students, especially at risk students, will benefit from a rigorous curriculum with intervention and acceleration supports, in a motivationally stimulating and engaging educational setting.

G. Describe the applicant's capacity to replicate an existing school design.

The capacity to replicate can be demonstrated by providing credible and well-defined strategies for replication, including the financial and human resources necessary to replicate the design.

The applicant has the financial and human resources available to replicate a high quality model; having ownership of the existing school design. The founders of the proposed school are the same founders of the existing SLAM program to be replicated. Furthermore, three of the members serving on the SLAM governing board are also members of the Mater Academy Inc. governing board. The individuals involved in the establishment and operation the proposed school are deeply involved in the operation of the existing SLAM programs. These professionals possess the expertise in the areas of curriculum, assessment, finance, law, school management and governance to be able to replicate the existing design.

Strategies for replication of the existing program design are detailed in the sections referenced below. These include, but are not limited to, the following:

- Implementing the same core values, beliefs, and core curriculum content of the existing programs (*Section 3-4*)
- Adopting the research-based educational concept for the existing programs (Sections 1, 3-8)
- Utilizing the team of experts (who have experience and/or ownership of the Mater educational program) as consultants who continuously provide training to the proposed school's administrators, faculty and staff (Sections 9 and 11)
- Adopting common expectations of student behavior and parental involvement (Section 8 and 13)
- Adopting common Professional Policies and Standards for staff (Section 10 and 12)
- Implementing the policies for financial management and oversight proven effective in the existing schools (Section 18)
- Providing ongoing communication, training, and support for the school's changing operational needs (Section 9 and 12).

As an accredited school under an AdvancedED Corporate School System, every new school in the Mater Academy network will adhere to a unified set of best practices, operational policies, standards and strategies which drive the organizational framework of all schools. The strategies to be replicated at

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SLAM, are modeled after specific practices of Mater Academy Inc., which have yielded significant academic results for Mater Academy students. Outlined below are some of the research-based strategies aimed at maintaining the organization's culture, academic success, and human capital, which and are aligned to the organization's mission and goals:

- <u>Early Intervention</u> Incoming grade six students will be enrolled in a foundations course in middle course. Students will be assessed using district and state baseline data and provided targeted interventions including on site-tutoring, counseling, enrichment, transition coursework for high school, and exposure to high school rigor. In Grades 7/8, students will be expected to take a minimum of (1) high school credit course in Mathematics, Science, or Foreign Language. These strategies will afford students the opportunity of dual enrollment as early as Grade 10.
- <u>High Quality Standards</u>- The School will utilize the Common Core State Standards, the Common Core Literacy Standards and Next Generation Sunshine State Standards as applicable to course and/or grade level. The School will also embrace and support the transition to Common Core State Standards assessments that measure student progress toward college and career readiness. Using instructional materials aligned to CCSS, the School will provide an instructional loop that begins with the standards for college success to ensure all students are prepared to enter college without the need for remediation. Units of instruction within and across all grade levels will provide a vertically articulated curriculum framework that scaffolds the skills and knowledge that students need.
- <u>Professional Development</u> In order for this program to provide seamless transition from one educational level to the next, the following professional activities will be conducted: (1) Mater Best Practices Workshops for lead administrators; (2) Annual professional development training sessions to be delivered by CollegeBoard and other college partners; (3) Professional Development sessions for alignment of *CCSS* curriculum; (4) faculty meetings on-site at least once quarterly; (6) Professional Development workshops on research-based strategies to support *high need* student achievement.
- <u>Parental Component</u> parents will attend informational college sessions a minimum of three times per year. Eighth grade students and their parents will be invited to participate in local college tours that include seminars on college costs, financial aid, entrance requirements, and the college application process. Dual language parent workshops will be offered Saturdays or in the evenings as necessary a component of the established program

Mentoring Principals and system-wide support - The principal to be hired for the school will benefit from the support of all Mater Academy network schools and specifically from the current principal of the sister school, SLAM Charter Middle and High School in Miami Dade County. Mr. Alejandro Tamargo, will serve as a mentor principal to the incoming principal and will thereby assist to further the SLAM mission and vision, while ensuring that the program is replicated with fidelity.

Mr. Tamargo background in education spans over sixteen years. Throughout his tenure, Mr. Tamargo worked as a sixth grade classroom teacher, a high school English teacher, a baseball coach, and a

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charter school principal. In 2009, Mr. Tamargo accepted a position as Principal of Mater Academy East Charter Middle-High School. He opened the new facility in Little Havana, a poverty-stricken urban community. The school's population has steadily grown by 100 students each year and it's expected to reach capacity in 2013-14 with a current waiting list of 500 students. Under Mr. Tamargo's leadership, Mater Academy East moved from a "C" to an "A" rating under Florida's School Accountability Grading System.

Over the past four years, Mr. Tamargo has been instrumental in the planning, inception, and implementation of the Sports Leadership and Management Academy (SLAM) Academy. His experience and mentorship will be essential to the school's successful start-up. Through this support, along with the support of the SLAM governing board and the Mater network schools, the proposed school will continue the work of decreasing the achievement gap for minority and disadvantaged students.

Through these strategies aimed at improving student achievement, Mater schools have increased college readiness; improved graduation rates; and cultivated not only college-bound but also college ready students, proving their model and their chosen strategies to be successful with all student populations, including English Language Learners, Special Education Students, and students entering Mater schools below grade level.

Mater's success in preparing student for college lies in the commitment from administration faculty and staff to kindle in students and their families the desire to pursue and attain a post-secondary education, as early as middle school. Likewise, SLAM Middle expects to increase the number of students who are on-track for high school and subsequently who can be on-track for AP and dual enrollment tracks at the high school level, by setting the foundation and preparing students college and/or career paths as early as the sixth grade. As a replication of the current existing educational programs for middle school students, the program is likely to be highly successful once fully implemented.

Section 4: Curriculum Plan

A. Describe the school's curriculum in the core academic areas, illustrating how it will prepare students to achieve the Next Generation Sunshine State-Common Core Standards.

SLAM's curriculum in the core academic areas uses the framework of the Common Core State Standards in English Language Arts (ELA) and Mathematics as well as applicable Next-Generation Sunshine State Standards in other academic areas. SLAM's mission is to prepare students with the skills necessarily to be successful in future schooling and in life though an emphasis on business leadership and career exploration and real-word application. The Common Core State Standards are in direct alignment with the School's mission. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills needed for success in college and careers. Aligned with college and work expectations, the CCSS serve as the framework for SLAM teachers to develop innovative research-based lessons with rigorous content and require application of knowledge through high-order skills.

The CCSS identify what students need to know and be able to do in each grade level in order to be prepared for college and careers. College and Career Readiness (CCR) Anchor Standards will help

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teachers define the cross-disciplinary literacy expectations that must be met for students to be prepared to enter college and workforce training programs ready to succeed. The grade-specific standards will define end-of-year expectations and a cumulative progression to enable students to meet college and career readiness. The ELA Standards (strands in Reading, Writing, Speaking & Listening, and Language) and Literacy standards will emphasize reading and writing in History/Social Science, Science and Technical Subjects and will frame instruction in reading, writing, speaking, listening, and language across all disciplines. The Standards for Mathematical Practice and Standards for Mathematical Content will guide teachers to prepare students with the mathematical skills necessary for success in college and future careers.

Thus the SLAM curriculum will offer a thematic approach to integrating CCSS and applicable NG-SSS expectations into the core curriculum with a concentration on workforce related skills. The curriculum will expose the expose students to the structure of different types of occupations in sports management (Business, Marketing, Health, and Communications) while establishing foundation skills required for them to be successful in school and in life.

Curriculum Delivery

The CCSS allow the teacher to provide students with whatever tools and knowledge their professional judgment and experience identify as most helpful for meeting the goals set out in the Standards. SLAM therefore intends to both provide professional development and planning opportunities and resources for teachers to develop stellar lessons that incorporate the CCSS expectations while engaging students though Sports Leadership and Management related activities. *Appendix B - The SLAM Connection: Resources for Thematic Lessons* list sample resources and lesson plans for teachers to integrate the Sports Leadership and Management (SLAM) theme within the core curriculum and allow for students to apply and practice skills required of CCSS. As teachers build on interdisciplinary connections under the Sports and Leadership umbrella, it is expected that students naturally begin to link information between and among courses, increasing the relevancy of skills and content in such courses. The expectation is that teachers work cooperatively through horizontal and vertical planning opportunities using the Standards to develop these stellar lessons and projects throughout the school year while implementing the following high-yield instructional strategies in the classroom:

Differentiated Instruction - The School's ultimate goal is to provide a learning environment that will maximize the potential for student success. Teachers will use differentiated instruction strategies that connect with individual student's learning needs. Teachers will manage instructional time to meet the standards while providing motivating, challenging, and meaningful experiences for students to receive and process information in ways that require differentiation of experience.

Scaffolding - Teachers will identify the current developmental skills of individual students based on assessments and provide support structures to help students move to the next level. As the year goes on, the student becomes more adept at skills and at directing his or her learning, and becomes more autonomous.

Inquiry-Based Learning - Based on the scientific method, this student-centered strategy will require students to conduct investigations independent of the teacher, unless otherwise directed or guided

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through the process of discovery. Teachers will use this strategy in developing critical thinking and problem solving skills.

Project-based learning - PBL integrates knowing and doing. Students learn knowledge and elements of the core curriculum, but also apply what they know to solve authentic problems and produce results that matter. Though PBL, teachers will engage students in SLAM projects where students can take advantage of digital tools to produce high quality, collaborative products.

Information Processing Strategies - Teaching students "how to" process information is a key factor in teaching students how to strategically organize, store, retrieve, and apply information presented. Such strategies will include memorization, reciprocal teaching, graphic organizers, scaffolding, or webbing.

Other High Yield Instructional Strategies9

Cooperative Learning

- According to the Research: Teachers should limit use of ability groups, keep groups small, apply strategy consistently and systematically and assign roles and responsibilities in groups.
- What This Looks like Classroom: Integrate content and language through group engagement, reader's theatre, pass the pencil, circle of friends, cube it, radio reading, shared reading and writing, plays, science projects, debates, jigsaw, group reports, choral reading, affinity diagrams. Students tackle sample PARCC Prototype Tasks or word problems in collaborative groups and explain their rational for responses.

Identifying similarities and differences

- <u>According to the Research:</u> Students should compare, classify, and create metaphors, analogies and non-linguistic or graphic representations
- What This looks Like in the Classroom: Thinking Maps, T-charts, Venn diagrams, classifying, analogies, cause and effect links, compare and contrast organizers.
 Question/Answer/Relationship (QAR) sketch to stretch, affinity diagrams.

Summarizing and Note Taking

- According to the Research: Students should learn to eliminate unnecessary information, substitute some information, keep important information, write / rewrite, and analyze information. Students should be encouraged to put some information into own words.
- What This Looks like Classroom: Teacher models summarization techniques, identify key concepts, bullets, outlines, clusters, narrative organizers, journal summaries, break down assignments, create simple reports, quick writes, graphic organizers, column notes, affinity

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⁹ Classroom Instruction that Works: Research-based Strategies for Increasing Student Achievement, by Robert Marzano (2001)



diagrams.

Nonlinguistic Representations

- According to the Research: Students should create graphic representations, models, mental pictures, drawings, pictographs, and participate in kinesthetic (hands-on) activities in order to assimilate knowledge.
- What This Looks like Classroom: Visual tools and manipulatives, problem-solution organizers, spider webs, diagrams, concept maps, drawings, charts, thinking maps, graphic organizers, sketch to stretch, storyboards, foldables, act out content, make physical models, etc.

Generating and Testing Hypothesis

- According to the Research: Students should generate, explain, test and defend hypotheses using both inductive and deductive strategies through problem solving, history investigation, invention, experimental inquiry, and decision-making.
- What This Looks like Classroom: Thinking processes, constructivist practices, investigate, explore, social construction of knowledge, use of inductive and deductive reasoning, questioning the author of a book, finding other ways to solve same math problem, etc.

SLAM will use state-approved courses and course descriptions aligned to CCSS as detailed in each core academic area below. The school will adopt researched-based district/state-approved instructional materials and pacing guides aligned to CCSS for pacing of instruction in each core subject areas as detailed below. The following is an overview of the core curriculum program and projected courses be offered:

English Language Arts Curriculum

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Course Name	Course Number	Suggested Text/ Instructional Materials*
Grade 6		
M/J Language Arts I	100101001	McDougal Littel
M/J Language Arts I Advanced	100102001	McDougal Littel
M/J Language Arts I Advanced Gifted	100102002	McDougal Littel
M/J Language Arts I through ESOL	100201002	McDougal Littel with ESOL Strategies
M/J Intensive Reading- Grade 6	100001006	
M/J Intensive Reading Enrichment	1000010 E6	Research-Based CIRP/SIRP (See Reading Curriculum)
M/J Intensive Reading Plus	1000010PL	
Grade 7		
M/J Language Arts II	100104001	McDougal Littel
M/J Language Arts II Advanced	100105001	McDougal Littel
M/J Language Arts II Advanced Gifted	100105002	McDougal Littel
M/J Language Arts II through ESOL	100201002	McDougal Littel with ESOL Strategies
M/J Intensive Reading - Grade 7	100001007	
M/J Intensive Reading Enrichment	1000010 E7	Research-Based CIRP/SIRP (See Reading Curriculum)
M/J Intensive Reading Plus	1000010PL	
Grade 8		
M/J Language Arts III	100107001	Mcdougal Littel
M/J Language Arts III Advanced	100108001	Mcdougal Littel
M/J Language Arts III Advanced Gifted	100108002	Mcdougal Little
M/J Language Arts III through ESOL	100202002	Mcdougal Little with ESOL Strategies
M/J Intensive Reading-Grade 8	100001008	
M/J Intensive Reading Enrichment	1000010 E8	Research-Based CIRP/SIRP (See Reading Curriculum)
M/J Intensive Reading Plus – Grades 6-8	1000010PL	
ESOL Course by Proficiency Level		
M/J Developmental Language Arts Through ESOL (Level 1 Reading)	1002181L1	Visions/Hampton Brown Inside Fundamentals - ESOL Level 1
M/J Developmental Language Arts Through ESOL (Level 2 Reading)	1002181L2	Visions/Hampton Brown Inside Level A - ESOL Level 2
M/J Developmental Language Arts Through ESOL (Level 3 Reading)	1002181L3	Visions/Hampton Brown Inside Level B - ESOL Level 3
M/J Developmental Language Arts Through ESOL (Level 4 Reading)	1002181L4	Visions/Hampton Brown Inside Level C - ESOL Level 4

*The School will use the state-approved McDongal Lit tell Text and state course descriptions in the instruction of language arts and Vision Hampton Brown Inside for Development LA through ESOL. The School's text selection will be modified as per the state's text adoption and updates to the Sponsor's Comprehensive Research-based Reading Plan (CRRP) throughout the duration of the charter. The school will develop standards-based pacing guides for instruction for each academic area.

Research-Based Reading Materials - The programs and curriculum supplements the School intends to use, to deliver language arts instruction and achieve student mastery of the *NGSSS/CCSS* include:

- The Sponsor's K-12 Comprehensive Research Based Reading Plan (CRRP)
- SpringBoard 2014 Revision (online and print materials)
- Reading Plus
- Rewards
- Triumph Learning/Buckle Down
- Local Newspaper and Current Events/Sports Magazines (e.g. USA Today in Education, Time, and ESPN Magazines) will encourage thematic Reading/Writing projects across the curriculum.
- USA Today Newspapers in Education;
- Wilson Foundations (ESE)
- Jamestown Reading Series
- Read XL
- Voyager Journeys

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SLAM will implement research-based strategies that have proven successful in teaching Reading including, but not limited to, designating an uninterrupted reading block for Reading Instruction and utilizing state-adopted textbooks and programs. The School will also implement: structured independent reading time, reciprocal teaching methodology, vocabulary development, CRISS (Creating Independence through Student-owned Strategies), Literature circles, differentiated instruction. The School will also use strategies such as graphic organizers and marginal note-taking, to name a few, and will include instruction and implementation of reading strategies in a variety of professional developments.

Refer to Reading Curriculum Section - 4C below

Intensive Reading courses will be in addition to the required M/J Language Arts course in grades 6, 7, and 8. All FCAT Level 1 and 2 students, regardless of whether they are fluent, will be placed in the appropriate reading class as follows:

- Intensive Reading Plus (IR+) is intended for students with deficiencies in decoding and fluency in addition to vocabulary and comprehension. All students, with the exception of all ELL students, with deficiencies in decoding and fluency, who scored Level 1 or 2 in reading on the 2014 administration of the FCAT 2.0 will be placed in an Intensive Reading Plus (IR+) class.
- Intensive Reading (IR) is intended for students with deficiencies in vocabulary and comprehension. All students, with the exception of all ELL students with deficiencies in vocabulary and comprehension, who scored Level 1 or 2 in reading on the 2014 administration of the FCAT 2.0 will be placed in an Intensive Reading (IR) class. This class will focus on effective reading strategies and differentiated instruction that reinforces whole group instruction and provides opportunity for intervention within the classroom context.
- Intensive Reading Enrichment (IR-EN) is Intensive Reading Enrichment (IR-EN) intended for students whose FCAT scores have regressed from FCAT Level 3 or higher to FCAT Level 2 and students with high FCAT Level 2 scores. All students, with the exception of all ELL students with high FCAT Level 2 scores or who have regressed from FCAT Level 3 or higher to Level 2 on the 2014 administration of the FCAT will be placed in an Intensive Reading Enrichment (IR-EN) class. The class will focus on specific reading strategies targeted to enrich the level of instruction to significantly improve students' vocabulary and comprehension achievement using selected grade level text and novel units.

ESOL Courses: A student identified as ELL will be placed in **two** ESOL courses as applicable to the student's grade level and language proficiency:

- M/J Language Arts Through ESOL content course scheduled by grade level; and
- M/J Developmental Language Arts Through ESOL Language proficiency course scheduled by English Proficiency Level 1-4. If levels need to be combined, the

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Developmental Language Arts Through ESOL placement may be in the best combination of mixed language level courses (ESOL levels 1/2 or 3/4).

Applying the Common Core State Standards - Course content for these courses will be delivered in accordance with course descriptions provided by the FL-DOE and will ensure mastery of Common Core State Standards (CCSS). Teachers will provide instruction in Language Arts using the CCSS to promote academic excellence in Reading, Writing, Speaking & Listening, and Language. The College and Career Readiness (CCR) Anchor Standards will help teachers define college and career readiness expectations while the grade specific ELA standards will guide instruction at each grade level and help ensure that students gain adequate exposure to an increasing complex range of texts and tasks as they progress from grade 6 through 8. The courses will cover the application of the writing process, effective use of speaking and listening and language skills, higher-order critical thinking and literacy skills in preparation for overall post-secondary preparedness.

Below is an overview of the CCR Anchor standards and the Content standards in each Strand¹⁰:

CCR Anchor Standards for Reading – there are 10 standards divided among:

- Key Ideas and Detail
- Craft and Structure
- Integration of Knowledge and Ideas
- Range of Reading and Level of Text Complexity

Grade Level Standards for Reading

- Reading: Literature Grade 6 -8
- Reading: Informational Texts

Reading standard focus on text complexity and the growth of comprehension in reading. The Reading standards place equal emphasis on the sophistication of what students read and the skill with which they read. Whatever they are reading, students must also show a steadily growing ability to discern more from and make fuller use of text, including making an increasing number of connections among ideas and between texts, considering a wider range of textual evidence, and becoming more sensitive to inconsistencies, ambiguities, and poor reasoning in texts.

CCR Anchor Standards for Writing

- Text Types and Purposes
- Production and Distribution of Writing
- Research to Build and Present Knowledge
- Range of Writing

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¹⁰ Derived from: http://www.corestandards.org/ELA-Literacy



Grade Level Specific Standards for Writing

- Text Types and Purposes
- Production and Distribution of Writing
- Research to Build and Present Knowledge
- Range of Writing

Writing standards focus mainly on text types, responding to reading, and research. To build a foundation for college and career readiness, students need to learn to use writing as a way of offering and supporting opinions, demonstrating understanding of the subjects they are studying, and conveying real and imagined experiences and events. The Standards acknowledge the fact that whereas some writing skills, such as the ability to plan, revise, edit, and publish, are applicable to many types of writing, other skills are more properly defined in terms of specific writing types: arguments, informative/explanatory texts, and narratives. They learn to appreciate that a key purpose of writing is to communicate clearly to an external audience and they begin to adapt the form and content of their writing to accomplish a particular task and purpose. They develop the capacity to build knowledge on a subject through research projects and to respond analytically to literary and informational sources.

To meet these goals, teachers will be expected to provide students significant opportunities and time and to writing, producing numerous pieces over short and extended time frames throughout the year.

The integration of PBL projects across the SLAM curriculum will emphasize writing project that require 70% analytical writing (35% opinion and 35% to explain/inform) and 30% narrative writing, with a mix of demand on review-and-revision.

CCR Anchor Standards for Speaking and Listening

- Comprehension and Collaboration
- Presentation of Knowledge and Ideas

Grade Level Specific Standards for Speaking and Listening

- Comprehension and Collaboration
- Presentation of Knowledge and Ideas

Speaking and Listening standards focus on flexible communication and collaboration including skills necessary for formal presentations. Speaking and Listening standards require students to develop a range of broadly useful oral communication and interpersonal skills. Students must learn to work together, express and listen carefully to ideas, integrate information from oral, visual, quantitative, and media sources, evaluate what they hear, use media and visual displays strategically to help achieve communicative purposes, and adapt speech to context and task. To build a foundation for college and career readiness, students must have ample opportunities to take part in a variety of rich, structured conversations—as part of a whole class, in small groups, and with a partner. Being productive members of these conversations requires that students contribute accurate, relevant information; respond to and develop what others have said; make comparisons and contrasts; and analyze and synthesize a multitude of ideas in various domains.

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Language standards focus on effective use of language, conventions, and vocabulary. The Language standards include the essential "rules" of standard written and spoken English, but they also approach language as a matter of craft and informed choice among alternatives. The vocabulary standards focus on understanding words and phrases, their relationships, and their nuances and on acquiring new vocabulary, particularly general academic and domain-specific words and phrases.

- Conventions of Standard English
- Knowledge of Language
- Vocabulary Acquisition and Use

Range and content of student language use - To build a foundation for college and career readiness in language, students must gain control over many conventions of standard English grammar, usage, and mechanics as well as learn other ways to use language to convey meaning effectively. They must also be able to determine or clarify the meaning of grade-appropriate words encountered through listening, reading, and media use; come to appreciate that words have nonliteral meanings, shadings of meaning, and relationships to other words; and expand their vocabulary in the course of studying content. The inclusion of Language standards in their own strand should not be taken as an indication that skills related to conventions, effective language use, and vocabulary are unimportant to reading, writing, speaking, and listening; indeed, they are inseparable from such contexts.

Through Connection projects and lessons (refer to Appendix B herein) the school plans to use digital texts, hyperlinks, and video and audio websites (such as YouTube) as much as possible to give students opportunities to listen to lessons and make class presentations, develop group forums, communicate with program mentors via online tools (Gotomeeting; Skype) allowing for application of speaking and listening skills.

The Connection: Student Self-Evaluation Goals - Below are examples of project-based task/learning activities connecting ELA Standards and skills to the Sports Leadership theme. Teachers can correlate real-world application activities to specific ELA Content Standards in developing thematic lessons (see Appendix B – Resources for SLAM Thematic Lessons).

At the beginning of the school year, students will create **Career Portfolios** in their Language Arts, which will follow them through the English Language Arts course as they progress from grade to grade. The career portfolio will comprise student-managed collection of accomplishments that show progress toward career goals. The portfolio will:

- Display student strengths and abilities.
- Highlights their accomplishments and assist them in planning for the future.
- Increases their self-esteem by showcasing their accomplishments.
- Portfolios will be presented as Binders, Scrapbook, CD-ROM or Video formats allowing for students to modify and update information as they progress through the program

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Students at SLAM will be expected to create self-imposed annual goals for their career portfolios through Language Arts classes and build upon each goal every year thereafter as follows:

- Academic and/or Career Goal students will create a specific goal that they need to meet at the completion of the school year. Goals will be created under the direction of the Language Arts Teacher. These goals may range from "building and developing work habits necessary to effectively learn subject matter" or "increasing one letter grade in their lowest performing subject" etc. Through development of this goal, students will gain greater autonomy and realize their potential through the school year as they monitor and reflect on their progress through the school year. To supplement career exploration, students will have access to a career resources office through the school's guidance counselor which will provide them with information about career pathways, industries, job markets and searches, mentoring, career development portfolios, co-operative education, internships, service learning etc.
- Self-Esteem and Character Development Goal: students will be able to identify their learning strengths, challenges, and passions; evaluate this knowledge in terms of their short- and long-term goals; and create a plan of action for their life-long learning based on this evaluation. They will be challenged by their mentors and peers and will be expected to learn to take responsibility for managing their own behavior in these situations. Students will be given opportunities for leaderships and character building projects to attain their goal. Behavior management techniques are an important part of the curriculum and increase-self esteem by providing opportunities for academic success.
- School and Community Service Goal SLAM expects all students to be active and contributing citizens of their school and community. Students will understand their responsibilities for learning, behavior, and service learning requirement. Students will understand the effect that they have upon the community, and will take the initiative to better themselves and the community as a whole. They will choose either a school-based or a community service project, depending on their grade level and reflect on the accomplishments of this project throughout the school year.

Mathematics Curriculum

The School will follow the state course descriptions for the following courses to be offered in grades 6-8. These courses cover concepts and materials that are aligned to CCSS Standard for Mathematical Content and Standards for Mathematical Practice.

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Course Name	Course Number	Suggested Text/ Instructional Materials*
Grade 6	•	
M/J Intensive Mathematics M/J Mathematics I M/J Mathematics I Advanced M/J Mathematics I Advanced Gifted	120400001 120501001 120502001 120502002	Holt McDougal Mathematics / SpringBoard Holt McDougal Mathematics / SpringBoard Holt McDougal Mathematics / SpringBoard Holt McDougal Mathematics / SpringBoard
Grade 7		
M/J Intensive Mathematics M/J Mathematics II M/J Mathematics II Advanced M/J Mathematics II Advanced Gifted Algebra I Algebra I Honors Algebra I Honors Gifted Geometry Geometry Honors Geometry Honors Gifted	120400001 120504001 120505001 120505002 120031001 120032001 120032002 120631001 120632001 120632002	Holt McDougal Mathematics / SpringBoard Prentice Hall - Algebra I Prentice Hall - Algebra I Honors Prentice Hall - Algebra I Prentice Hall or Key Curriculum Press Prentice Hall or Key Curriculum Press Prentice Hall or Key Curriculum Press
Grade 8		
M/J Intensive Mathematics M/J Mathematics III (Pre-Algebra) Algebra I Algebra I Honors Algebra I Honors Gifted Geometry Geometry Honors Geometry Honors Gifted	120400001 120507001 120031001 120032001 120032002 120631001 120632001 120632002	Holt McDougal Mathematics / SpringBoard Holt McDougal Mathematics / SpringBoard Prentice Hall - Algebra I Prentice Hall - Algebra I Honors Prentice Hall - Algebra I Honors Prentice Hall or Key Curriculum Press Prentice Hall or Key Curriculum Press Prentice Hall or Key Curriculum Press

*The School plans to use either *Holt McDougal Mathematics* text or *SpringBoard* in the instruction of Mathematics and *Prentice Hall* for Algebra and Geometry courses, which are the current state and/or district approved texts. The school will develop standards-based pacing guides for instruction for each academic area. If *SpringBoard* is adopted, the school would follow district pacing by adapting text to match the pacing guides.

Notes: Advanced and Advanced Gifted Courses will be offered depending on the need of the student population. All former Level 1 and 2 students will be required to enroll in M/J Intensive Mathematics. Senior High School Credit(s) - Students may enroll in selected senior high school courses for the purposes of pursuing a more rigorous program of study in both Algebra I and Geometry; however, students are required to adhere to End of Course requirements as stated by the Florida Department of Education. The EOC will be administered to eligible students enrolled in Algebra I and/or Geometry. Students enrolled in Algebra I and or Geometry, or an equivalent course must earn a passing score on the EOC assessment to earn course credit.

Additional resources, and supplements include:

- 1. Math IXL Technology*
- 2. PARCC prototype samples (if applicable)
- 3. Triumph Learning/Buckle Down
- 4. Explore Learning: Reflex & GIZMOS;
- 5. USA Test Prep –Technology*

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*Technology will also be integrated into the mathematics curriculum to enable students to explore, visualize, solve, and better describe the concepts they are learning. Graphing software, calculators, computers, and interactive white-boards are some of critical technology tools that will be used as part of an effective mathematics program.

Teachers will be expected to use the CCSS as the framework for developing lesson plans and pacing of instruction. **The CCSS Standards for Mathematical Content** describe the mathematical skills and concepts all students need for success in college and careers and are organized by grade level in middle school and are organized as follows:

Grade 6	Grade 7	Grade 8	
Ratios and Propo	Ratios and Proportional Relationships		
	The Number System		
Expressions and Equations			
Functions			
Geometry			
Statistics and Probability			

The Standards for Mathematical Practice describe the characteristics of mathematically proficient students. These standards describe how students should use mathematics and provide a mechanism through which students engage with and learn mathematics.

Mathematical Practices

- 1. Make sense of problems and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- 3. Construct viable arguments and critique the reasoning of others.
- 4. Model with mathematics.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.
- 7. Look for and make use of structure.
- 8. Look for and express regularity in repeated reasoning.

The Standards for Mathematical Practice remain the same at each grade level; however, students will engage with and master new and more advanced mathematical ideas as they progress through each grade level. Accordingly, the Practice Standards will be taught and practiced in conjunction with the Content Standards at each grade level.

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GRADE 6 CONTENT OVERVIEW

Ratios and Proportional Relationships

- Understand ratio concepts and use ratio reasoning to solve problems.

The Number System

- Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
- Compute fluently with multi-digit numbers and find common factors and multiples.
- Apply and extend previous understandings of numbers to the system of rational numbers.

Expressions and Equations

- Apply and extend previous understandings of arithmetic to algebraic expressions.
- Reason about and solve one-variable equations and inequalities.
- Represent and analyze quantitative relationships between dependent and independent variables.

Geometry

- Solve real-world and mathematical problems involving area, surface area, and volume.

Statistics and Probability

- Develop understanding of statistical variability.
- Summarize and describe distributions

In Grade 6, instruction will focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

GRADE 7 CONTENT OVERVIEW

Ratios and Proportional Relationships

- Analyze proportional relationships and use them to solve real-world and mathematical problems.

The Number System

 Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Expressions and Equations

- Use properties of operations to generate equivalent expressions.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Geometry

- Draw, construct and describe geometrical figures and describe the relationships between them.
- Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Statistics and Probability

- Use random sampling to draw inferences about a population.
- Draw informal comparative inferences about two populations.
- Investigate chance processes and develop, use, and evaluate probability models.

In Grade 7, instruction will focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

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GRADE 8 CONTENT OVERVIEW

The Number System

Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations

- Work with radicals and integer exponents.
- Understand the connections between proportional relationships, lines, and linear equations.
- Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions

- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

Geometry

- Understand congruence and similarity using physical models, transparencies, or geometry software.
- Understand and apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

Statistics and Probability

- Investigate patterns of association in bivariate data.

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

The Connection: Appendix B - Resources for SLAM Thematic Lessons details sample project-based tasks and lessons connecting Mathematics curriculum to the Sports Leadership arena for teachers to align real-world application activities to specific CCSS Mathematical Content and Practice Standards in developing thematic lessons. Below are some examples of project-based task/learning activities connecting mathematical skills to the Sports Leadership theme.

Graphs and Statistical Data: Practicing skills while watching your next favorite sporting event

During the game students can:

- 1. Average each player's contribution (scores, yards, hits, etc.) in the game
- 2. Compare a team's final stats versus other games for the year (and make a performance graph)
- 3. Measure distances of important field placements (goal-to-goal, basket hoop rim circumference, etc.)
- 4. Calculate probability of each player's scoring potential (using past scoring numbers)
- 5. Create a geometry shape from a typical sports action (record average shape distances)
- 6. Make a pretend fantasy team and hire players using a mock budget
- 7. Figure percentages of increase or decrease of a league's performance (over one year or multiple years)
- 8. Find the mean, median, and mode of a team's players' weight and height

Creating and Applying Statistical Data: Using a Newspaper

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- 1. Open the sports page of a newspaper, and find a box score. Discuss with the students the meaning of statistics. Break down each of the abbreviations in the box, so students understand each the statistics in each section.
- 2. Ask the students to calculate more statistics using the numbers in the box score. For baseball, have students calculate a player's batting average. Divide the hits by the number of times a player is at bat. Calculate the on-base percentage by adding the number of hits and walks with the number of times hit by a pitch, and dividing that number by the sum of the player's hits, walks, times hit by a pitch and sacrifice flies
- 3. Look at other percentages that can be calculated using sports statistics. Find different sports throughout the year.

SLAM Fantasy League

- 1. Assist Students in drafting a fantasy basketball, football or baseball team. Look at the players' statistical track records and different salary-cap values to choose the right players for the team.
- 2. Look at the statistics for the starting players once or twice a week, depending on how often the players play. Look at how many points one player scores compared to another using the game statistics or calculate other statistics using the statistics you have.
- 3. Follow the team throughout the season, increasing the difficulty of the math questions, and incorporating multiplication, addition, subtraction, division, fractions and algebra as appropriate. Change the teams each season, using different statistics to help develop the students' mathematics skills.

The Three R's Framework –The PBL activity below is an example of how the Rigor, Relevance and Relationship Model framework is applied to the curriculum. This lesson depicts how SLAM's engaging and innovative educational model can be applied in and out of the classroom. Students use complex material (Rigor) content that is relevant to their daily lives, offers value beyond the classroom (Relevance), and allows them to communicate and collaborate with people beyond their classroom (Relationships).

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Algebra and Sports Stats

Students can use algebraic equations to interpret athletic performance by calculating statistics for any sport. Teachers first teach students an equation used to find batting averages:

$$A = \frac{x + K}{T + N}$$

In Baseball, if a batter goes into a game with a seasonal batting average of "S" after a total of "T" times at bat, and gets "K" hits in that game for "N" times at bat, the player's new batting average is determined by this algebraic equation.

The teacher then shows how the same equation could be used for other sports statistics: In Basketball, a Miami HEAT player goes into a game with a seasonal free throw average of F after a total number T free throw shots, he scores M free throws in that game for N times at the foul line.

$$A = \frac{T \times F + M}{T + N}$$

In Football, this equation will give you the total seasonal carries where:

"W" = player's average seasonal yards

"Y" = yards in that game

"C" = carries in that game.

$$A = \frac{SC \times W + \#Y}{SC \quad C}$$

PBL Activity - Students use the formula to practice solving equations by determining their favorite athlete's performance stats. They can also create equations for other sports.

CCSS Literacy Connection: students write an explanation of how they determined the results and make predictions regarding next season's results or the probability of player's future status with the team.

Interdisciplinary Extension – Students prepare follow-up questions to conduct an interview a Miami Marlin's player about his seasonal batting average and overall performance and future plans. Through the school's partnership with the Miami Marlins, these opportunities will be afforded to students through career day visits at the schools and fieldtrips to Marlin's Park (Section 13 for partnerships).

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Science Curriculum

The school will implement district-pacing guides, as available, or will develop standards-based pacing guides for instruction in Science. The School will follow the state course descriptions for the following courses to be offered in grades 6-8.

Science	Course Number	Suggested Text/ Instructional Materials*
Grade 6		
M/J Comp Science I	200204001	Pearson/ Prentice Hall Florida Comprehensive Science
M/J Comp Science I Advanced	200205001	Pearson/ Prentice Hall Florida Comprehensive Science
M/J Comp Science I Advanced Gifted	200205002	Pearson/ Prentice Hall Florida Comprehensive Science
Grade 7		
M/J Comp Science II	200207001	Pearson/ Prentice Hall Florida Comprehensive Science
M/J Comp Science II Advanced	200208001	Pearson/ Prentice Hall Florida Comprehensive Science
M/J Comp Science II Advanced Gifted	200208002	Pearson/ Prentice Hall Florida Comprehensive Science
Physical Science	200331001	CPO Science Foundations of Physical Science
Physical Science Honors	200332001	CPO Science Foundations of Physical Science
Physical Science Honors Gifted	200332002	CPO Science Foundations of Physical Science
Grade 8		
M/J Comp Science III	200210001	Pearson/ Prentice Hall Florida Comprehensive Science
M/J Comp Science III Advanced	200211001	Pearson/ Prentice Hall Florida Comprehensive Science
M/J Comp Science III Advanced Gifted	200211002	Pearson/ Prentice Hall Florida Comprehensive Science
Physical Science	200331001	CPO Science Foundations of Physical Science
Physical Science Honors	200332001	CPO Science Foundations of Physical Science
Physical Science Honors Gifted	200332002	CPO Science Foundations of Physical Science
Biology I	200031001	Pearson/Prentice Hall/ Miller & Levine Biology
Biology I Honors	200032001	Pearson/Prentice Hall/ Miller & Levine Biology
Biology I Honors Gifted	200032002	Pearson/Prentice Hall/ Miller & Levine Biology

^{*} The School will use the *Pearson/Prentice Hall* current adopted texts for instruction in Comprehensive Science and Biology and *CPO Science Foundations* for Physical Science. The School's text selection may be modified as per the state and/or sponsor's new text adoption throughout the duration of the charter.

Science Courses are designed to promote a sense of inquiry through laboratory experiences and aim to develop higher-order critical thinking skills for overall post-secondary preparedness. The Science curriculum will prepare students to achieve CCSS and NGSS in Science by incorporating an inquiry based approach to learning of the central science themes. Students will participate in weekly hands-on science investigations/laboratory activities and SECME initiatives. These initiatives expose students to the scientific process and scientific thinking and allow teachers to motivate and mentor students.

Additional resources and materials include:

- Essential Laboratory Activities for Grades 6-8
- GIZMOS;

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Scientific magazines such as Science Weekly/National Geographic

As required by Florida Statutes, the Florida Board of Education, and the school district Human Growth and Development will be an essential topic covered in the Science curriculum middle school curriculum.

The following CCSS Standards for Literacy will provide teachers with the framework for Science instruction with emphasis on the Reading and Writing

Reading

Key Ideas and Details

- CCSS.ELA-Literacy.RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
- <u>CCSS.ELA-Literacy.RST.6-8.2</u> Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- CCSS.ELA-Literacy.RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure

- CCSS.ELA-Literacy.RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6–8 texts and topics*.
- <u>CCSS.ELA-Literacy.RST.6-8.5</u> Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
- <u>CCSS.ELA-Literacy.RST.6-8.6</u> Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Integration of Knowledge and Ideas

- <u>CCSS.ELA-Literacy.RST.6-8.7</u> Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- <u>CCSS.ELA-Literacy.RST.6-8.8</u> Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
- <u>CCSS.ELA-Literacy.RST.6-8.9</u> Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Range of Reading and Level of Text Complexity

• <u>CCSS.ELA-Literacy.RST.6-8.10</u> By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Writing

Text Types and Purposes

- <u>CCSS.ELA-Literacy.WHST.6-8.1</u> Write arguments focused on discipline-specific content.
- CCSS.ELA-Literacy.WHST.6-8.1a Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- <u>CCSS.ELA-Literacy.WHST.6-8.1b</u> Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- <u>CCSS.ELA-Literacy.WHST.6-8.1c</u> Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
- <u>CCSS.ELA-Literacy.WHST.6-8.1d</u> Establish and maintain a formal style.
- <u>CCSS.ELA-Literacy.WHST.6-8.1e</u> Provide a concluding statement or section that follows from and supports the argument presented.
- <u>CCSS.ELA-Literacy.WHST.6-8.2</u> Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

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- <u>CCSS.ELA-Literacy.WHST.6-8.2a</u> Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
- <u>CCSS.ELA-Literacy.WHST.6-8.2b</u> Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- <u>CCSS.ELA-Literacy.WHST.6-8.2c</u> Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- <u>CCSS.ELA-Literacy.WHST.6-8.2d</u> Use precise language and domain-specific vocabulary to inform about or explain the topic.
- <u>CCSS.ELA-Literacy.WHST.6-8.2e</u> Establish and maintain a formal style and objective tone.
- <u>CCSS.ELA-Literacy.WHST.6-8.2f</u> Provide a concluding statement or section that follows from and supports the information or explanation presented

Production and Distribution of Writing

- <u>CCSS.ELA-Literacy.WHST.6-8.4</u> Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- <u>CCSS.ELA-Literacy.WHST.6-8.5</u> With some guidance and support from peers and adults, develop and strengthen
 writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose
 and audience have been addressed.
- <u>CCSS.ELA-Literacy.WHST.6-8.6</u> Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Research to Build and Present Knowledge

- <u>CCSS.ELA-Literacy.WHST.6-8.7</u> Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- CCSS.ELA-Literacy.WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- <u>CCSS.ELA-Literacy.WHST.6-8.9</u> Draw evidence from informational texts to support analysis reflection, and research.

Range of Writing

• CCSS.ELA-Literacy.WHST.6-8.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Using CCCS and NGSSS standards for Science, teachers will develop lessons using strategies that incorporate the following **Essential Science Components:**¹¹

- Preparing Students for Learning and Prior-Knowledge Assessment "frontloading" to elicit prior knowledge related to real-life experiences and applications. Strategies: Using graphic organizer, Concept Mapping, KWL, showing a video clip, conducting a demonstration, using literature.
- **Developing Active Learners** Students can become active learners by providing opportunities for them to construct their own understanding. These situations should require students to organize, classify, interpret, and

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¹¹ Science Leaders Handbook - Division of Mathematics, Science, and Advanced Academic Programs Science Department



draw conclusions about real-life mathematical and scientific problems. <u>Strategies: Posing open-ended questions, real-life scenarios to solve, or situations requiring higher order thinking skills.</u>

- Differentiated Instruction A variety of instructional formats will be used in the classrooms to make sense of the content and to construct meanings from new situations. SLAM will provide opportunities for small-group work, individual exploration, peer instruction, and whole class discussion and inquiry-based instruction. Strategies: Using scientific laboratory equipment, hands-on activities, and technology-based activities.
- Integrated Teaching Multi- and interdisciplinary activities should be included within the classroom that provides connections for students. Students must recognize the various roles that science plays in real life. The connection and application of science will motivate, give meaning to, and reinforce student learning. Strategies:

 Posing authentic problems to solve; bridging and activities that involve students in critical thinking, process skills, and product development.
- Critical Thinking and Higher-Order Questioning Use effective, open-ended questioning techniques that encourage student inquiry. Encourage students to pose their own questions, evaluate the information presented, and make informed decisions about the information. Examples would include, "How would you solve a similar situation?" or "What criteria would you use to ...?" Strategies: Elaborating, analyzing, hypothesizing, and evaluating.
- Continuous Assessment of the Learning Assessment should reflect how and what is being taught. It should be embedded at various points in the lesson to guide the instructional planning and pacing. There is a clear alignment between curriculum, instruction, and how students are assessed. Strategies: Using performance tasks, essays, portfolios, video presentations, and demonstrations.

In developing lesson plans, teachers will be encouraged to use additional instructional materials from:

- The Division of Mathematics, Science, and Advanced Academic Programs Science Department
- The Teaching Channel https://www.teachingchannel.org/ Teaching Channel is a video showcase of inspiring and effective teaching practices. The videos also include information on alignment with Common Core State Standards and ancillary material for teachers to use in their own classrooms
- National Science Teachers Association (NSTA)
- Florida Association of Science Teachers (FAST)
- American Educational Research Association (AERA)
- National Association of Research in Science Teaching (NARST)

The Connection: Teachers can use real-world application activities that incorporate Essential Science Components in developing thematic lessons. Below is a sample project-based lesson activities connecting Science to the Sports Leadership theme. (See Appendix B – Resources for SLAM Thematic Lessons for detailed lesson plan).

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Lesson: Science of NHL Hockey: Newton's Three Laws of Motion Subject Area: Physical Science

Purpose: Students watch a video on the actions involved in playing hockey. Although all sports are subject to Newton's three laws of motion in one way or another, hockey shows particularly clear examples. The activity will help students understand Newton's three laws of motion and how they relate to the conservation of momentum.

Procedure: 1. After the students view the video, discuss Newton's three laws of motion. Have volunteers summarize the presentation of inertia and conservation of momentum in the video, and point out examples of the three laws as they view the video again - perhaps in slow motion or with the sound muted. Emphasize to students that a hockey puck obeys Newton's laws, just as colliding hockey players do. (The same is true for a ball in other sports, such as basketball, soccer, golf, or jai alai.) Students focus on exploring each of the laws, using guided questions to start the discussion.

2. Teacher guides students to design investigations for Newton's three laws by actually practicing with an object/hockey puck or ball in the school gymnasium or cafeteria. In areas where students are not involved with ice hockey, students could video record groups playing a few minutes of their favorite sport(s) and then analyze the motion in the video for examples of the three laws of motion and compare those with the motion in the ice hockey video.

Social Science Curriculum

Social Science Curriculum		
Social Science	Course Number	Suggested Text/ Instructional Materials*
Grade 6		
M/J World History	210901001	Glencoe/McGraw-Hill Discovering Our Past: A History of the World
M/J World History Advanced	210902001	Glencoe/McGraw-Hill Discovering Our Past: A History of the World
M/J World History Advanced Gifted	210902002	Glencoe/McGraw-Hill Discovering Our Past: A History of the World
Grade 7		
M/J Civics	210601001	Glencoe/McGraw-Hill Civics Economics, And Geography
M/J Civics Advanced	210602001	Glencoe/McGraw-Hill Civics Economics, And Geography
M/J Civics Advanced Gifted	210602002	Glencoe/McGraw-Hill Civics Economics, And Geography
Grade 8		
M/J US History	210001001	Glencoe/McGraw-Hill Discovering Our Past: A History of the United States
M/J US History Advanced	210002001	Glencoe/McGraw-Hill Discovering Our Past: A History of the United States
M/J US History Advanced Gifted	210002002	Glencoe/McGraw-Hill Discovering Our Past: A History of the United States

^{*}The School will use the state-approved McGraw Hill Series in the instruction of social science. The School's text selection may be modified as per the state/sponsor's text adoption throughout the duration of the charter.

Research-Based Materials - The programs, adopted- texts and curriculum supplements the School intends to use, to deliver social science instruction and achieve student mastery of the *NGSSS-CCSS* include:

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- Newspapers as literacy enrichment supplement and to incorporate data analysis daily by means of graphs and charts and sports-related statistics, etc.
- Integration of Reading and Writing strategies within the social sciences content using the CCSS Literacy Standards for Social sciences

The comprehensive social sciences program will:

- emphasize content, concepts, and skills from the social sciences, the humanities, and, where appropriate, mathematics, and the natural sciences;
- reflect a clear commitment to democratic beliefs and values;
- encourage civic responsibility and active participation;
- promote high expectations for all students;
- incorporate a multicultural perspective;
- reinforce the development of a global perspective;
- promote understanding of social, political, and economic institutions;
- encourage student involvement in community service;
- focus on the identification of the potential solutions to local, national, and world problems;
- involve students in their learning by using a variety of teaching strategies and instructional materials; and
- promote an interdisciplinary approach to learning.

Instructional Practices - Teachers will be encouraged to use the following instructional practices to increase student learning:

- Reading assignments from longer text passages as well as shorter ones when text is extremely complex.
- Making close reading and rereading of texts central to lessons.
- Asking high-level, text-specific questions and requiring high-level, complex tasks and assignments.
- Requiring students to support answers with evidence from the text.
- Providing extensive text-based research and writing opportunities (claims and evidence).

Character Education components (respect, honesty, responsibility, self-control, tolerance, kindness, citizenship and cooperation) will be emphasized individually through thematic lessons and group projects. The School will also emphasize the following social sciences topics in the social sciences curriculum:

- Florida History, Government, and Geography
- African American History
- Hispanic contributions to the United States
- Women's contributions to the United States
- History of the Holocaust
- Multicultural Education
- Sacrifices made by veterans in protecting democratic values
- History and content of the Declaration of Independence and the U.S. Constitution
- History of the U.S., including the period of discovery, early colonies, the War for Independence, the Civil War, the expansion of the U.S. to its present boundaries, the world

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- wars, and the civil rights movement to the present
- "Celebrate Freedom Week"- Instruction shall be in accordance with Florida Statutes and district guidelines in an effort to encourage patriotism; and

Grade 6 World History focus will range from the world's earliest civilizations to the ancient and classical civilizations of Africa, Asia, and Europe. Students will be exposed to the multiple dynamics of world history including economics, geography, politics, and religion/philosophy. Students will study methods of historical inquiry and primary and secondary historical documents.

Grade 7 Civics Courses will focus on the principles, functions, and organization of government; the origins of the American political system; the roles, rights, responsibilities of United States citizens; and methods of active participation in our political system. The course is embedded with strong geographic and economic components to support civic education instruction. *As per current legislation, beginning in the 2014-2015 school year, students in 7th grade must pass the End of Course Exam in Civics to earn credit for this course. This course will culminate in completion of an electronic Personalized Education Planner, which must be signed by the student, the student's guidance counselor, and the student's parent. Accordingly, middle school students will receive instruction in a range of exploratory/elective areas in order to complete the career choices planner.(describe in the elective section below).

Grade 8 US History will focus on the study of American history from the Exploration and Colonization period to the Reconstruction Period following the Civil War. Students will be exposed to the historical, geographic, political, economic, and sociological events, which influenced the development of the United States and the resulting impact on world history. So that students can clearly see the relationship between cause and effect in historical events, students will have the opportunity to explore those fundamental ideas and events, which occurred after Reconstruction. Instruction of U.S. History will include opportunities for students to interpret and create representations of historical events using mathematical tables, charts, and graphs. United States History EOC assessment will also cover material from all time periods on the following topics:

- Change and Continuity in American Democracy: Ideas, Institutions, Events, Key Figures, and Controversies
- The Gathering and Interactions of Peoples, Cultures, and Ideas
- Economic and Technological Changes and Their Relationship to Society, Ideas, and the Environment
- The Changing Role of America in the World

The school will use the NAEP frameworks and pacing guides as available for United States History as resources for pacing and instruction.

Interdisciplinary Connections - Social Science instruction will include opportunities for students to interpret and create representations of historical events and concepts using mathematical tables, charts, and graphs.

The following CCSS Standards for Literacy will provide teachers with the framework for Science instruction with emphasis on the Reading and Writing:

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Reading

Key Ideas and Details

- CCSS.ELA-Literacy.RH.6-8.1 Cite specific textual evidence to support analysis of primary and secondary sources.
- <u>CCSS.ELA-Literacy.RH.6-8.2</u> Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.
- <u>CCSS.ELA-Literacy.RH.6-8.3</u> Identify key steps in a text's description of a process related to history/social sciences (e.g., how a bill becomes law, how interest rates are raised or lowered).

Craft and Structure

- CCSS.ELA-Literacy.RH.6-8.4 Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social sciences.
- <u>CCSS.ELA-Literacy.RH.6-8.5</u> Describe how a text presents information (e.g., sequentially, comparatively, causally).
- <u>CCSS.ELA-Literacy.RH.6-8.6</u> Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).

Integration of Knowledge and Ideas

- <u>CCSS.ELA-Literacy.RH.6-8.7</u> Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
- CCSS.ELA-Literacy.RH.6-8.8 Distinguish among fact, opinion, and reasoned judgment in a text.
- CCSS.ELA-Literacy.RH.6-8.9 Analyze the relationship between a primary and secondary source on the same topic.

Range of Reading and Level of Text Complexity

• <u>CCSS.ELA-Literacy.RH.6-8.10</u> By the end of grade 8, read and comprehend history/social sciences texts in the grades 6–8 text complexity band independently and proficiently.

Writing

Text Types and Purposes

- CCSS.ELA-Literacy.WHST.6-8.1 Write arguments focused on discipline-specific content
- <u>CCSS.ELA-Literacy.WHST.6-8.1a</u> Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- <u>CCSS.ELA-Literacy.WHST.6-8.1b</u> Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- <u>CCSS.ELA-Literacy.WHST.6-8.1c</u> Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
- <u>CCSS.ELA-Literacy.WHST.6-8.1d</u> Establish and maintain a formal style.
- <u>CCSS.ELA-Literacy.WHST.6-8.1e</u> Provide a concluding statement or section that follows from and supports the argument presented.
- <u>CCSS.ELA-Literacy.WHST.6-8.2</u> Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- <u>CCSS.ELA-Literacy.WHST.6-8.2a</u> Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
- <u>CCSS.ELA-Literacy.WHST.6-8.2b</u> Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- <u>CCSS.ELA-Literacy.WHST.6-8.2c</u> Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- CCSS.ELA-Literacy.WHST.6-8.2d Use precise language and domain-specific vocabulary to inform about or explain the

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topic.

- CCSS.ELA-Literacy.WHST.6-8.2e Establish and maintain a formal style and objective tone.
- CCSS.ELA-Literacy.WHST.6-8.2f Provide a concluding statement or section that follows from and supports the information or explanation presented.

Production and Distribution of Writing

- CCSS.ELA-Literacy.WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-Literacy.WHST.6-8.5 With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
- CCSS.ELA-Literacy.WHST.6-8.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Research to Build and Present Knowledge

- CCSS.ELA-Literacy.WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- CCSS.ELA-Literacy.WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- CCSS.ELA-Literacy.WHST.6-8.9 Draw evidence from informational texts to support analysis reflection, and research.

Range of Writing

CCSS.ELA-Literacy.WHST.6-8.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Connection: Below are examples of project-based task/learning activities connecting Social Science Skills to the Sports Leadership theme. Teachers can correlate real-world application activities to specific Literacy Standards in developing thematic lessons (see Appendix B – Resources for SLAM Thematic Lesson).

Sample Project-Based Activity: Recreation "Yesterday and Today"

Students view the Entertainment and Recreation Gallery ¹² from the National Library of Congress online and select or get assigned primary sources for further analysis. Students analyze the primary sources to learn more about recreation in the early 20th century, recording their thoughts on the Primary Source Analysis Tool. Students will form groups of two or three, and use the resources to find two photos to illustrate an example of the same types of recreation that they studied. These photos will be reproduced and each group will present the photos and their analysis to the class. The photos may then be posted on the classroom bulletin boards to be viewed by the rest of the class. Following the presentations, the class will discuss similarities and differences in the conclusions reached by each of

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¹² http://www.loc.gov/teachers/classroommaterials/lessons/recreation/gallery.html



the groups about entertainment and recreation during the 1920s and 1930s, beginning with these questions: What similarities in activities from one section of the country to another did you notice as you looked at the pictures? What differences? What differences do you see between rural entertainment and urban entertainment? What differences do you see between your recreational activities and those you studied? Is this a matter of generation or is there a different factor such as rural/urban or region? (see Appendix B for full lesson)

Other activities

- 1. Students conduct oral histories with local people in order to test their conclusion about recreation and entertainment in their community.
- 2. Students use population density maps or settlement maps to hypothesize about a connection between distance and entertainment. Changes in transportation technology could also be brought into this discussion.
 - B. Describe the research base and foundation materials that were used *or will be used* to develop the curriculum.

The School will use research-based programs and state adopted textbooks for all core curriculum subjects, as further described under each respective core curriculum subject area above. The following research based materials/programs will be used in the subjects of reading and mathematics:

- The Sponsor's K-12 Comprehensive Research-Based Reading Plan which has been approved by the FLDOE
- SpringBoard This curriculum is guided by the latest research and written and field tested by teachers, it is a clearly articulated and is proven to be a model of rigorous instruction in English/Language Arts and Mathematics for ALL students. SpringBoard provides an instructional loop that begins with the College Board Standards to ensure all students are prepared for advanced academics, without remediation. Units of instruction within and across all levels provide a vertically articulated curriculum framework that scaffolds the skills and knowledge students need to be successful and concomitantly provides teachers with continuous feedback on student progress. This curriculum includes formative assessments and a continual professional development program for teachers.
- Reading Plus The Reading Plus system fully aligned with the latest reading research. Leading reading researchers (Rasinski, Samuels, Pressley, Allington, Torgesen, Hiebert, and others) suggest that an instructional reading system should provide scaffolded silent reading practice, a highly effective means of guiding students toward reading proficiency. A recent study examined a large-scale implementation of Reading Plus® to validate the effects as well as the feasibility of deployment of Reading Plus® within a wide range of school settings. A total of 16,143 students from grades 4 through 10 in 23 schools in Regions II and III in the Miami-Dade County Public Schools participated in the study. Results indicated that students participating in Reading Plus® for a minimum of 40 or more lessons over approximately six months made significantly greater gains on both the criterion-referenced and norm-referenced reading tests than students who did not participate in the program. Positive results also were demonstrated for various subpopulations often considered at risk for reading difficulties. African-American, Latino-American, special education, and learning disabled students who

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participated in the Reading Plus intervention demonstrated significantly and substantially greater gains in measures of reading achievement than students not participating in the intervention.¹³

- Jamestown Reading Navigator is based on the latest research in adolescent literacy and over 35 years of experience in reaching adolescent readers with the popular Jamestown Education supplemental programs. Jamestown Reading Navigator is a comprehensive research-based program developed specifically to raise reading competencies and test scores of struggling high-school students. Jamestown Reading Navigator incorporates online and print-based student and teacher materials. The online component of Jamestown Reading Navigator improves students' comprehension by utilizing direct, explicit instruction and modeling of good reading practices. Students practice and apply these reading strategies and skills by reading content written specifically for secondary students, viewing interactive multimedia, and writing in response to reading¹⁴
- IXL IXL Math is a Web-based educational software solution to improve and invigorate the learning experience for students, parents, and teachers. IXL Math was developed in 2005 and was researched, discussed, designed and re-designed up until its launch in 2008. According to the authors Robert J. Marzano, Debra J. Pickering, and Jane E. Pollock in their book, *Classroom Instruction that Works: Research-Based Strategies for Increasing Student Achievement,* formative assessments are an ongoing process that are used to determine prior knowledge and are used throughout the lessons to realign best teaching practices. If material is taught as well as assessed in a variety of methods its impact is to be more notable. Marzano states that generative assessments are a formative assessment in which a student can tell you where they are at in their own learning. IXL Math promotes this, and gives even young students the tools to demonstrate where they are in their mathematical learning. ¹⁵

Science materials Research-Based materials will include:

- National Science Teachers Association (NSTA) Florida Association of Science Teachers (FAST)
- American Educational Research Association (AERA) National Association of Research in Science Teaching (NARST)
- USA Test Prep —Technology

Additional Resources and Research used to plan curriculum development based on Common Core Expectations were derived from:

- Florida Department of Education -CPALMS -www.cpalms.org
- The CCSS Standards www.corestandards.org
- Resources/ frameworks for Implementation www.achievethecore.org
- PARCC www.parcconline.org http://www.fldoe.org/parcc/

¹³ http://www.readingplus.com/research/research-briefs

¹⁴ http://www.readingnavigator.com/mkt/assets/executive_summary.pdf

¹⁵ http://allisonyager.files.wordpress.com/2012/01/evaluation-final-project.pdf



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Connection: Resources used for SLAM Thematic Lessons include:

Math - Plus.Math.org

- http://plus.maths.org/content/teacher-package-mathematics-sport
- http://www.mitac.org.au/algebra/content/01_introduction/01_algebrasport/001_algmathssport.htm
- http://prezi.com/Odeyazepamwt/sports-algebra-stats
- https://docs.google.com/file/d/0B5WvJRggBgsGbkVWSTJiQ0pudFE/edit?usp=sharing

ELA - Reading Material and Multimedia – NBC News

- http://cnnradio.cnn.com/2012/10/15/should-youth-football-be-banned/
- http://rockcenter.nbcnews.com/_news/2012/05/09/11604307-concussion-crisis growing-in-girls-soccer? Lite

Science - NBC Learn

- http://www.nbclearn.com/portal/site/learn/science-of-the-summer-olympics
- http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey
- http://www.nbclearn.com/science-of-golf
- http://www.nbclearn.com/nfl
- http://lessonopoly.org/lessonplansearch&searchall=1&byauthor=NBCLearn
- http://search.espn.go.com/results?page=1&searchString=sports+science&dims=6
- C. Describe the school's reading curriculum. Provide evidence that reading is a primary focus of the school and that there is a curriculum and set of strategies for students who are reading at grade level or higher and a separate curriculum and strategy for students reading below grade level. The reading curriculum must be consistent with effective teaching strategies and be grounded in scientifically-based reading research.

The school will assist all students in becoming successful, independent, and comprehensive readers by adopting the **Broward County Public Schools Comprehensive Research-Based Reading Plan (CRRP)**. Broward has already developed a transition plan with professional learning and support for the Common Core State Standards implementation, text complexity, the Comprehension Instructional Sequence (CIS), and teaching standards through course descriptions as the District transitions from the Next Generation Sunshine State Standards and FCAT 2 to the Common Core State Standards and the PARCC Assessments.

Using the CRRP, Reading Instruction will be the main focus of the school in order to promote student achievement through mastery of the Common Core Standards and applicable Literacy standards across the curriculum. The District's professional learning model follows Florida Formula for Effective and Powerful instruction: 3Fs + 1S + Data + PD = Effective and Powerful Instruction

- Frequency and duration of meeting in small groups once daily, twice daily, etc.
- Focus of instruction (the what) vocabulary, phonics, comprehension, etc.
- Format of lesson (the how) determining the lesson structure and the level of scaffolding, modeling, explicitness, etc.
- Size of instructional group 1, 3, 4, 6, or 8 students, etc.

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- Analysis of Data to determine the 3 Fs and 1 S (the why)
- Professional Development that focuses on the collection and analysis of Data, the 3 Fs, and 1 S

The District's Comprehensive Reading Plan supports and provides professional learning aligned with Just Read, Florida's Ten Guiding Principles for Close Reading:

- Make close reading and rereading of texts central to instruction, rather than ancillary.
- Provide scaffolding that does not preempt or replace text.
- Ask text dependent questions from a range of question types.
- Emphasize students supporting answers based upon evidence from the text.
- Provide extensive research and writing opportunities (claims and evidence).
- Offer regular opportunities for students to share ideas, evidence and research.
- Offer systematic instruction in vocabulary.
- Ensure wide reading from complex text that varies in length.
- Provide explicit instruction in applied grammar and conventions.
- Cultivate students' independence.

The school will follow the District's K-12 Comprehensive Research-Based Reading Plan in effect for 2014-15 and thereafter, and commit to the following requisites, at minimum:

- Leadership at the school level is guiding and supporting the reading initiative;
- The analysis of data drives all decision-making;
- Professional development targeted at individual teacher needs as determined by analysis of student performance data;
- Measurable student achievement goals will be established annually
- Appropriate research-based instructional materials and strategies will be used to address specific student needs.

The Reading Curriculum

The school's reading program will offer a multi-tiered system of supports, including data-based problem-solving, utilizing student-centered RtI response to instruction/intervention data to make educational decisions. Other supports to ensure meeting the need of all types of readers, include 1) providing effective core instruction for all students; 2) administering high quality assessments to monitor progress and identify students and systems in need of intervention; 3) instructional use of a wide variety of complex texts to challenge student vocabulary and comprehension learning; and, 4) designing and implementing interventions that are matched to student needs.

Collaborative Problem Solving/Response to Intervention Model: CPS/RtI will be used as a school-wide, multi-level instructional and behavioral system for screening, progress monitoring, databased decision making for instruction and movement within the multi-level system. The District's RtI model will guides the school's Collaborative Problem Solving Teams (CPST) in implementing a tiered approach to instructional delivery that includes fidelity of instruction using a comprehensive core reading program and interventions of increasingly higher intensity, based on the differentiated needs of students. This multi-tiered approach to providing services and interventions to students at increasing

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levels of intensity is based on progress monitoring and data analysis. Supplemental reading resources will differentiate instruction for all students across the continuum of Tiers 1 (initial universal), 2 (strategic intervention), and 3 (intensive intervention).

Student Placement: The decision to participate in Intensive Reading course will be made in accordance with the District's CRRP by student's performance on the prior year's Reading FCAT and monitored throughout the school year using diagnostic assessments such as the District's Interim Assessments, FAIR Progress Monitoring, and teacher recommendations. The K-12 CRRP requires each school to conduct a screening and diagnostic process to identify appropriate placement of Level 1 and Level 2 students in reading classes to be completed prior to the end of the school year. The K-12 CRRP also requires a daily double block for all students who have reading deficiencies in decoding and fluency (Intensive Reading Plus). Some high achieving FCAT Level 2 students as per the CRRP may attend either an Intensive Reading or a homogeneously grouped language arts course, in which the language arts teacher instructs the reading course, while infusing the language arts benchmarks into the course. The criteria are based on FAIR.

Tier 1 (Universal Core Instruction)

- English language arts courses (adopted texts and *SpringBoard* curriculum)

 The District is using *SpringBoard*, the College Board's recommended Pre-AP program that incorporates complex informational and literary texts, for all students in middle school language arts. Reading intervention teachers will teach students to apply the SpringBoard literacy strategies and other evidenced based literacy practices to the reading of complex texts using the gradual release model.
 - Social studies/science and technical subjects Literacy instruction using CCSS

Tier 2 (Strategic Interventions) and Tier 3 (Intensive Interventions)

Both SIRPs and CIRPs can be used together to meet the needs of struggling readers as part of the instructional continuum of Tier 2 (strategic) and Tier 3 (intensive) intervention.

Comprehensive Intervention Reading Programs (CIRP) will address multiple areas of reading, with the aim of accelerating growth in reading to ultimately achieve, at minimum, grade level proficiency. The CIRP includes instructional content based on the six essential components of reading instruction (oral language, phonological awareness, phonics, fluency, vocabulary and comprehension). CIRPs are used to accelerate growth in reading with the goal of returning students to grade level proficiency. Teachers will place students in intervention programs based on data.

Supplemental Intervention Reading Programs (SIRP) provide instruction in one or more areas of reading. The will be uses as part of differentiated instruction and as more intensive interventions to meet student-learning needs in specific areas (phonological awareness, phonics, fluency, vocabulary, and comprehension). They may be used with almost all students in the class in the event that the (CIRP) does not provide enough instruction and practice in a given area for the majority of the students in the class or to provide targeted, intensive interventions for smaller groups of struggling readers. Within these groups students will receive supportive comprehension instruction with

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scaffolding as necessary that focuses on using grade level text to explicitly address text complexity. The ultimate goal is to have students read grade level text independently.

SIRP may include:

- The Wilson Reading System
- Jamestown Timed Readers
- Rewards
- National Geographic/Hampton-Brown Edge program
- Quick Reads

CIRPS may include:

- Scholastic Read XL
- Voyager Journeys

Technology - Reading Plus

Curriculum in career elective at SLAM will emphasize critical reading, writing, thinking, speaking and listening,

- PARCC Content Model Frameworks
- Florida research process model, FINDS, use digital tools and strategies, project based learning, and extended interdisciplinary literacy sequences following the.
- Using complex informational and literary text, students write to sources, research to build and present knowledge, extend literacy skills through speaking and listening activities and the development of academic language.
- Principle Woods Impact (SIRP) also provides students with high interest informational and
 literary texts paired with extension texts focusing on technical and/or vocational literacy skills.
 The texts are available at varying Lexile levels, and through differentiated reader and task
 considerations, they support different levels of text complexity.

Initial Instruction: Classroom instruction in reading will be offered in uninterrupted block of time of at least 90 minutes duration. The initial lesson from the Comprehensive Core Reading Program (CCRP) usually requires 30-40 minutes per day of the required 90-minute uninterrupted reading block. The teacher will then differentiate instruction focusing on individual student needs for the remainder of the reading block. In addition to, or as an extension of the 90-minute reading block, teachers will provide immediate intensive intervention to children as determined by progress monitoring and other forms of assessment.

Intensive Reading Courses offered:

- Intensive Reading Plus (IR+) is intended for students with deficiencies in decoding and fluency in addition to vocabulary and comprehension. All students, with the exception of all ELL students, with deficiencies in decoding and fluency, who scored Level 1 or 2 in reading on the 2014 administration of the FCAT 2.0 will be placed in an Intensive Reading Plus (IR+) class.

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- Intensive Reading (IR) is intended for students with deficiencies in vocabulary and comprehension. All students, with the exception of all ELL students with deficiencies in vocabulary and comprehension, who scored Level 1 or 2 in reading on the 2014 administration of the FCAT 2.0, will be placed in an Intensive Reading (IR) class. This class will focus on effective reading strategies and differentiated instruction that reinforces whole group instruction and provides opportunity for intervention within the classroom context.
- Intensive Reading Enrichment (IR-EN) is Intensive Reading Enrichment (IR-EN) is intended for students whose FCAT scores have regressed from FCAT Level 3 or higher to FCAT Level 2 and students with high FCAT Level 2 scores. All students, with the exception of all ELL students with high FCAT Level 2 scores or who have regressed from FCAT Level 3 or higher to Level 2 on the 2014 administration of the FCAT will be placed in an Intensive Reading Enrichment (IR-EN) class. The class will focus on specific reading strategies targeted to enrich the level of instruction to significantly improve students' vocabulary and comprehension achievement using selected grade level text and novel units.

Since it is anticipated that the FCAT 2.0 will be replaced with another Common Core State Standard Assessment (such as PARCC or other assessment selected by the FL-DOE), the School commits to place students in a remedial (currently identified as intensive) course. These intensive or remedial courses will be implemented to assist the student to gain at least grade level mastery of respective standards and be on track in college and career readiness efforts.

Immediate, Intensive Interventions: Students who achieve a Level 1 or Level 2 on FCAT Reading and who have intervention needs in the areas of decoding and/or fluency will have an extended block of reading intervention, either through a double block of intensive reading or by blocking together a class of "Intensive Reading" with another subject area class. This block of time will be taught by the same teacher, and said teacher will be highly qualified in reading or working toward that status (pursuing the reading endorsement or K-12 reading certification). Classroom infrastructure will have appropriate and adequate CIRP and SIRP materials (detailed below) to address the learners' needs. Furthermore, the reading intervention course will include daily:

- · whole group explicit instruction;
- · small group differentiated instruction;
- · independent reading practice monitored by the teacher;
- · infusion of CCSS Literacy across the curriculum (specifically in subject Science, Social Science and Career and Technology courses.
- focus on text complexity aligned to English language Arts CCSS expectations and matching expected PARCC prototype

Instructional Models: Guided by teacher instructions, reading/literacy teachers will model effective reading strategies and guide students through pre-reading, during reading, and post-reading techniques that will strengthen metacognition and self-monitor their own comprehension.

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Research based Strategies for Reading Instruction - Based on the research, teachers will use systematic, direct and differentiated instruction in their curriculum delivery while implementing the research-based strategies.*

- <u>Systematic instruction</u> will involve a carefully designed sequence plan for instruction. The plan for systematic instruction is carefully thought out, strategic and designed before activities and lessons are developed. Systematic instruction is clearly linked within, as well as across, the six elements of reading instruction (oral language, phonemic awareness, phonics, fluency, vocabulary, and comprehension). For systematic instruction, lessons build on previously taught information, from simple to complex, with clear, concise student objectives that are driven by ongoing assessment. Students are provided appropriate practice opportunities, which directly reflect instruction.
- <u>Direct instruction</u> is an instructional approach that utilizes explicit and structured teaching routines. A teacher using direct instruction models, explains, and guides the students through extended practice of a skill or concept until mastery is achieved. The lessons are fast paced, students are academically engaged, and teachers are enthusiastically delivering instruction. Direct instruction is appropriate instruction for all learners, all six components of reading, and in all settings (whole group, small group, and one-on-one).
- <u>Differentiated Instruction</u> meets the demands of the differing learning abilities in the same class. For optimal instruction, students will be grouped in various ways and in flexible settings to accommodate varying reading levels and learning styles. Teachers will utilize the methods of whole-group instruction, small-group instruction, individual instruction, and independent reading to address the various needs of the students.
- All faculty members must address strategies for reading instruction in their annual Individual Professional Development Plans (IPDP). These strategies must be constantly updated based on the results and analysis of progress monitoring in reading.

*All faculty members must address strategies for reading instruction in their annual Individual Professional Development Plans (IPDP). These strategies must be constantly updated based on the results and analysis of progress monitoring in reading.

Assessments and Progress Monitoring: Diagnostic assessments such as Benchmark Assessments, FAIR, and school-based Benchmark Assessment test will be used for Screening and Progress Monitoring. Outcomes measures will be determined through FAIR (3 times per year), end-of-unit reading assessments (Voyager/Rewards assessments), EOC and other standardized state and district-mandated assessment for 2014 and beyond.

The Literacy Leadership Team: The school will establish a Literacy Leadership Team, with the purpose of creating capacity of reading knowledge within the school building and focusing on areas of literacy concern across the school. The principal selects team members for the Literacy Leadership Team (LLT) based on a cross section of the faculty and administrative team that represents highly qualified professionals who are interested in serving to improve literacy instruction across the curriculum. The team will meet monthly throughout the school year or may choose to meet more

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often. The LLT maintains a connection to the school's CPS/RtI process by using the problem solving approach to ensure that a multi-tiered system of reading support is present and effective. The principal, reading coach, mentor reading teachers, content area teachers, will serve on this team.

In accordance with CRRP, the Literacy Leadership Team will:

- Engage in regular, ongoing, literacy professional learning.
- Support the implementation of the Common Core State Standards for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects.
- Support the work of the school's Collaborative Problem Solving Team/Response to Instruction/Intervention.
- Participate in Professional Learning Communities and Study Groups.
- Use data to analyze the effectiveness of instruction and redesign instruction and resources to meet the student's instructional and intervention needs.
- Monitor, and support the implementation of the Comprehensive Intensive Reading Programs and scientifically based reading instruction and strategies with fidelity.
- Participate in ongoing literacy dialogues with school stakeholders.
- Develop and support initiatives that promote career and college readiness and literacy.
- Support classroom or school-based action research.
- Support or participate in classroom demonstrations and modeling of research-based literacy strategies.
- Support the development of model/demonstration classrooms.
- Mentor and support other teachers.
- Lead and support Professional Learning Communities (PLCs), Study Groups, and Lesson Study.
- Present literacy professional development.

The principal will actively promote school-wide literacy reform by:

- Including representation from all curricular areas on the LLT;
- Selecting team members who are skilled and committed to improving literacy;
- Offering professional growth opportunities for team members;
- Increasing a collaborative environment that fosters sharing and learning;
- Developing a school-wide organizational model that supports literacy instruction in all classes;
- Encouraging the use of data to improve teaching and thus impact student achievement.

Administrative Support - The administrative team and LLT members will conduct classroom visitations, monitor lesson plans and ensure that reading strategies are implemented across the curriculum. Intensive Reading teachers will be certified, Reading endorsed, or working towards said endorsement by completing at least two courses of the six reading endorsement competencies per year. Administrator will identify teachers in need of support and provide assistance through reading coaches, veteran teachers and the LLT members. English/Language Arts Department Chairs and/or Reading Coaches, when applicable, will analyze progress-monitoring data on a quarterly basis. As student data is collected and analyzed, these will be used to identify specific areas in which teachers can benefit from additional professional development opportunities. Assessment data will indicate areas where

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improvement is needed in instructional methods, practices and necessary interventions, thereby allowing for focused professional development (including site-based modeling and coaching).

D. Explain how students who enter the school below grade level will be engaged in and benefit from the curriculum.

The results of the most recent Assessment Test available, teacher-made tests, and screenings through the reading program will be used to determine the level of mastery in reading, writing, mathematics and science for all students. This information, coupled with the results of the prior year standardized tests results and student records, will be used to determine the best educational setting for students (e.g., appropriate course selection, tutoring, referral for special services).

All students will be engaged in, and benefit from, the curriculum including ELL and SWD and/or students who enter the school below grade level. The school will offer a 7 period day to allow all level learners the opportunity to enroll in elective courses despite their needs for remediation or advancement. After school activities, quarterly guest speakers within academy strands, participation in school sponsored events, internship and volunteer opportunities with school partners will provide students with opportunities benefit from the curriculum and school wide programs beyond the bell.

Apart from providing the specific services listed in a student's IEP, EP, and/or ELL plans for ELLs, as applicable, the School's faculty will differentiate instruction as described in Section 4 above, as well as offer tutoring services or other such assistance including but not limited to:

- Progress Monitoring Plan (PMP) this plan requires active participation from the student, the parents and specific teachers in order to ensure continuous student improvement. This initiative allows each student to have ownership and understating of his/her learning style and allows each student to track and monitor his/her achievement. The PMP will be comprised of specific measurable individualized goals for that student, as well the strategies and services to be implemented in order for the student to achieve the specified goals.
- Literacy strategies in the content areas will be facilitated throughout the curriculum to provide students with additional practice in addition to those taught during language arts classes.
- Morning, Saturday, and daily pullout tutoring may be required for those students consistently demonstrating non-mastery of the standards.
- Students consistently demonstrating non-mastery of benchmarks on teacher generated quizzes, chapter tests, projects, investigations, and poor academic progress will be targeted for supplemental and intensive instruction/intervention.

E. Describe proposed curriculum areas to be included other than the core academic areas.



The following elective course offerings will allow students to meet the credit requirements for promotion to senior high school while affording them opportunities to explore sports leadership related career options in middle school. The major concepts and content of the *Career Exploration*

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and Decision Making course will be incorporated into these elective courses below to not only provide students an opportunity to meet this requirement, but also to provide a seamless transition into 9th grade academy tracks offered by SLAM High School (for those students who may chose this program of study in the future).

CTE Electives	Course Number	Suggested Text/ Instructional Materials*
Grade 6 - All Students*		
Business Leadership Skills (.5)	8200120	Cengage Learning - Introduction to Business
Business Keyboarding and Career Planning (.5)	8200130	Glencoe/McGraw-Hill Keyboarding Connections: Projects and applications
Grade 7 - Students select 2 of the following semester courses:		
Exploration of Health Occupations (.5)	8400310	Elsevier Science, Inc Health Careers Today
Exploration of Marketing Occupations (.5)	8800210	Glencoe/McGraw Hill Glencoe Health
Fundementals of AV and Print Technology (.5)	8260300	TBD
Introduction to Business Management and Administration (.5)	8370360	Cengage Learning- Entreprenuership Ideas in Action

*The suggested texts and instructional materials plans, which are the current state and/or district adoptions, may be modified with other state-approved texts once the school's program is fully implemented in order to accommodate CCSS and teacher's professional decision-making in these courses. The school will develop standards-based pacing guides for instruction in the career exploration elective areas. Master scheduling of these course offerings will vary depending on student course selections. Overall students may select two annual elective courses at each grade level. Students scoring at Level 1 or 2 on FCAT Reading/Math 2.0, however, lose the opportunity to select one elective course and will be required to enroll in an intensive course in lieu of one elective course. ELL students are required to take a second ESOL course. The M/J Developmental Language Through ESOL course will count as an elective credit.

Foreign Language

Foreign Langugae	Course Number	Suggested Text/ Instructional Materials*
Grades 6-8		
M/J Spanish, Beginning (Non-Speakers)	0708000	Glencoe/McGraw-Hill ¿Como te va? A, Nivel Verde and B, Nivel Azul
M/J Spanish, Intermediate (Non-Speakers)	0708010	Glencoe/McGraw-Hill ¿Como te va? A, Nivel Verde and B, Nivel Azul
M/J Spanish, Advanced (Non-Speakers)	0708020	Glencoe/McGraw-Hill ¿Como te va? A, Nivel Verde and B, Nivel Azul
Spanish for Spanish Sp Beginning	0709000	Grupo Editorial Norma Sueños y Palabras, Levels 5-12
Spanish for Spanish Sp Intermediate	0709010	Grupo Editorial Norma Sueños y Palabras, Levels 5-12
Spanish for Spanish Sp Advanced	0709020	Grupo Editorial Norma Sueños y Palabras, Levels 5-12
Spanish for Spanish Sp I (High School Credit)	0709300	Grupo Editorial Norma Sueños y Palabras, Levels 5-12
Spanish I (Non Speakers) (High School Credit)	0708340	Grupo Editorial Norma Sueños y Palabras, Levels 5-12

Middle School Spanish for Spanish Speakers - The school will implement the Spanish for Spanish Speakers course if it has a 10% or more Hispanic Population. Hispanic students will be tested for Spanish Language Level using a placement test as determined by the Sponsor. The essential content of this Spanish for Spanish Speakers course will be to reinforce and build grammar, vocabulary, comprehension and critical thinking skills that will be transferred to the English language and better

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FCAT scores. This course at the middle school level will significantly increase students' opportunities to enroll in Spanish Advanced Placement Language and Literature courses in high school.

Physical Education

Physical Education	Course Number	Suggested Text/ Instructional Materials*
Grades 6-8		
M/J Comprehensive PE I	1501100	GLENCOE/McGRAW-HILL FOUNDATIONS OF PERSONAL FITNESS
M/J Comp PE II	1501110	HUMAN KINETICS FITNESS FOR LIFE
M/J Comp PE III	1501120	PERSONAL FITNESS FOR YOU, PERSONAL FITNESS FOR YOU
M/J Dance I	0300000	TBD
M/J Dance II	0300010	TBD
M/J Dance III	0300020	TBD

The School's Physical Education (PE) and Health Education program will center on teaching students to cultivate a healthy and active lifestyles. Students will develop the motor skills necessary to participate successfully in a variety of physical activities, and will learn the benefits of a regular exercise regime. The physical education program will also expand beyond the school grounds, allowing students to experience and appreciate a wide range of physical activities outside of school, with support from SLAM's partners (See Section 13).

The following topics are specifically required by Florida Statutes, the Florida Board of Education, and/or the School district and are embedded in the course content as follows:

- Substance Abuse Education
- Sexually Transmitted Diseases (including HIV/AIDS Education)
- Teen dating violence and abuse prevention
- Bullying Curriculum and Sexting Curriculum
- Internet Safety (Health Education)

Instruction in PE/Dance will consist of a standards-based, balanced, sequential and progressive program in accordance with state course descriptions for these courses. This course also focuses on Health. Students are taught not to take their health for granted, but rather to develop habits of health that contribute to the continued good functioning of the body. The School will be designated a "Drug Free School Zone" and a smoke-free worksite. The health competencies will focus on educating students to develop healthy habits that contribute to the continued good functioning of the body.

In accordance with the "Don Davis Physical Education Act," the equivalent of one class period per day of physical education for one semester of each year is required as per F.S. 1003.455. This requirement shall be waived for a student who meets one of the following criteria:

- The student is enrolled or required to enroll in a remedial course.
- The student's parent indicates in writing to the school that: 1) The parent requests that the student enroll in another course from among those courses offered as options by the school district; 2) The student is participating in physical activities outside the school day, which are equal to or in excess of the mandated requirement; i.e. after school sports, dance classes, physical activity as part of an after school program, et

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In Grade 6, students will have an opportunity to take one semester of Business Leadership Skills and one semester of Business Keyboarding and Career Planning. Through these foundation courses, students will learn and apply such skills including but not limited to proper note-taking and marginal notes, study skills, group work, metacognition skills, speech and presentation skills, using presentation software (PowerPoint, Excel Charts and Graphs, Google Videos, GotoMeeting presentations) cooperative learning, organizational skills, and time management. Projects from core curriculum courses will help reinforce these skills in a practical setting.

Students will be expected to use computer and keyboarding skills to accurately convey responses on the future EOC and state and district assessments. Thus, these courses are intended to prepare students with the skills necessary to manage new and challenging coursework, to meet the demands of new standardized technology-based testing, and to acquire the foundation skills to be eventually successful in the workplace.

In Grade 7, students will select two of four possible exploration courses in Health, Marketing, Media Technology, or Business Management. The goal of these elective courses is to allow students to explore their interests in these careers and to begin to expand their career portfolios. The curriculum will follow the CCR Anchor Standards and ELA and Literacy Standards for Technical Subjects.

In Grade 8, students will focus on one career elective (either Business, Technology and Communication, Journalism or Health Science) for a more in-depth exploration toward a possible career academy path as they progress into the high school program. These courses will follow the state course descriptions for instruction as aligned to the new CCSS.

Incorporating the CCSS in Career Exploration and Technical Courses:

Reading and Writing will be emphasized throughout the curriculum though real-world writing purposes such as:

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REAL-WORLD WRITING PURPOSES			
Purpose	Explanation		
Express and Reflect	The writer expresses or reflects on his or her own life and experiences often looks backward in order to look forward.		
Inform and Explain	The writer states a main point and purpose tries to present the information in a surprising way.		
Evaluate and Judge	The writer focuses on the worth of person, object, idea, or other phenomenon usually specifies the criteria to the object being seen as "good" or "bad."		
Inquire and Explore	The writer wrestles with a question or problem hooks with the problem and lets the reader watch them wrestle with it.		
Analyze and Interpret	The writer seeks to analyze and interpret phenomena that are difficult to understand or explain.		
Take a Stand/Propose a Solution	The writer seeks to persuade audiences to accept a particular position on a controversial issue describes the problem, proposes a solution, and provides justification		

<u>Technology</u> - The School will equip its classrooms with multi-media, high-speed computers and other hardware with high-speed Internet access. In addition to standard courses listed below, students will have access to digital cameras, video and sound equipment, which will enable students to produce professional level products and multimedia presentations for marketing projects in Language Arts and related career courses.

Such integration of technology throughout the curriculum will requires policies to be put in place to promote safe, ethical, and appropriate use of such technology in compliance with legal and professional standards. Therefore, a policy for the acceptable use of the Internet as a tool for learning will be included in the respective handbooks produced and agreed to by students and their parents that clearly dictate network etiquette guidelines for such use.

The school will hire a school technician to monitor the maintenance and property control, maintain computers, modems and DSL connectivity in proper working order and will upgrade equipment when needed in order to ensure efficient communication, operation, and transmission of data.

The Connection: The school will hold an annual School-wide "SLAM Olympics" (conducted in the Spring) where students will compete and participate in selected sports and activities. In preparation for the event, students will work through their career elective courses to form committees as follows:

• Business leadership student committee - Design fundraisers and coordinate event logistics including opening ceremonies and game scheduling

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- Health Science student committee Study "Care and Prevention of Injuries" and will assist athletic trainers during the event
- Journalism/Marketing student committee Work on Advertisement and sponsor promotions for the event – provide media coverage during the event
 - Describe how the effectiveness of the curriculum will be evaluated.

The effectiveness of the curriculum will be measured by the student achievement of the specific Annual Measurable Objectives for the first year of operation as described in Section 5 below. In 2015-16 and beyond, the effectiveness of the curriculum will be evaluated based on achievement of the AMO's in the School Improvement Plan, wherein students will be expected to make annual learning gains toward achieving CCSS and NGSSS, as adopted.

Ongoing monitoring and analysis of school-wide assessment data (as described in Section 5 below) will assist the School in determining staff development needs, curriculum realignments, and the objectives submitted in the School Improvement Plan. Student outcomes on standardized and school-wide assessments, benchmark tests and quizzes, projects, presentations, exhibitions, and portfolios will help assess the effectiveness of the curriculum throughout the school year. Ongoing internal audits of student progress, such as progress reports, report cards, beginning year, mid-year, and end-year assessments will be utilized as tools to evaluate whether the curriculum is effective and meeting the needs of all students.

SLAM will open as accredited middle school under the Mater Academy, Inc. School System, which is accredited by AdvancEd Southern Association of Colleges and Schools Council on Accreditation and School Improvement (SACS/CASI). SLAM will be expected to adhere to the AdvancEd quality standards and implement, with fidelity, the programs and expectations under which all other existing Mater schools were accredited. SLAM will be expected to report on the progress and observance of specific parameters and guidelines set by the accrediting agency. This process provides for reflection and the development of action plans for all school areas with special emphasis on academic standing and school climate concerns of all stakeholders. This process will thereby allow for the school to evaluate the effective of the curriculum and institute measures for continuous improvement throughout the duration of the charter.

Section 5: Student Performance, Assessment and Evaluation

A. State the school's educational goals and objectives for improving student achievement. Indicate how much academic improvement students are expected to show each year, how student progress and performance will be evaluated, and the specific results to be attained.

The School will establish educational goals for improving student achievement through Annual Measurable Objectives (AMO) that aim to continuously increase student proficiency from year to year and are competitive with district/state achievement targets. The AMO's will be realigned annually through the School Improvement Plan, as a vehicle for continuous improvement. The FL-DOE has not yet established a state measure for assessing student mastery on adopted CCSS in 2015. Therefore,

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the school cannot set absolute thresholds at this time. The AMOs for the first year of operation will be realigned once this information is made available. The school commits to implement and address absolute thresholds for all state/district assessments (including applicable EOC) based on actual baseline data, once available.

At minimum, the school has set the following Annual Measurable Objectives:

- 1. Given school-wide instruction for mastery of the CCSS in English Language Arts, the School average will meet and/or exceed the District and/or State average (whichever is higher) of 6-8 grade students who score proficient or above (as established by FL-DOE) on the 2015 administration of the PARCC or other state-approved assessment of ELA to be administered in 2015.
- 2. Given school-wide instruction for mastery of the CCSS in Mathematics, the School average will meet and/or exceed the District and/or State average passing score (whichever is higher) of 6-8 grade students who score proficient or above (as established by FL-DOE) on the 2015 administration of the PARCC or other state-approved assessment of Mathematics to be administered in 2015.
- 3. Given school-wide instruction for mastery of CCCS in Algebra I, at least 90% of 6-8 grade students enrolled in the course will demonstrate proficiency, as evidenced by scoring a 3 or higher on the 2015 End of Course (EOC) exam in Algebra I. *This objective was projected using the current available district achievement data of the 2013 Algebra I EOC for middle students.
- 4. Given school-wide instruction for mastery of CCCS in Geometry, at least 95% of 6-8 grade students enrolled in the course will demonstrate proficiency, as evidenced by a passing score on the 2015 End of Course (EOC) exam in Geometry. *This objective was projected using the current available district achievement data of the 2013 Geometry EOC.
- 5. Given school-wide instruction for mastery of the CCSS Literacy Standards and NGSSS in Science, at least 64 percent of 8th grade students will demonstrate grade level proficiency in Science, as evidenced by earning a score of 3 or higher on the 2015 Florida Comprehensive Assessment Test of Science 2.0. *The school will realign this objective based on any changes to state-assessment adoption for Science for 2015
- 6. Given school-wide instruction for mastery of the CCSS and NGSSS in Writing at least 92% percent of 8th grade students will demonstrate proficiency in Writing as evidenced by earning a score of proficient or higher (as determined by the FLDOE) on the 2015 Florida FCAT Writing. *The school will realign this objective based on any changes to state-assessment adoption for Science for 2015.

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The AMO % targets for Science and Writing (#5 and 6 above) were set using the District's baseline (2010-11) to establish expected performance for 2014-15 as per guidelines for Annual Measurable Objective (AMO) implemented by the FLDOE. These are aimed at reducing the % of non-proficient by 50% over six years (2010-11 to 2016-17).

The AMO for 2014-15, sets a goal to increase the percent of students scoring at Levels 3-5 and reduce the percent of students scoring at levels 1 and 2 by 50% over six years (using 2010-11 district wide data as the baseline year)

2014-2015 Broward Schools AMO Target				
District % Proficient	District % Proficient			
Writing = 92% Science = 64%				

- 7. Given school-wide instruction for mastery of the NGSSS/CCSS in Biology, at least 94% of Eighth graders enrolled in the course will demonstrate proficiency, as evidenced by a passing score on the 2015 End of Course (EOC) exam in Biology 2015 End of Course Biology Exam. *This objective was projected using the current available district achievement data of the 2013 Biology EOC.
- 8. Given school-wide instruction for mastery of the NGSSS/CCSS in Civics, the School will meet and/or exceed the District and/or State average (whichever is higher) of students who achieve a passing score on the 2015 End of Course Civics Exam. *Field test results were not released and the school does not have baseline available.
- 9. Given a school-wide emphasis on increasing learning opportunities for the lowest performing students to ensure adequate progress towards mastery of the NGSSS/CCSS, at least 55% of the lowest quartile of students in grades 6th through 8th will make learning gains in ELA and Math, as established by the FLDOE in 2014-15 or other state and/or district standardized assessments utilized for State of Florida Accountability Program. * The school will realign this objective based on learning gains criteria adopted by the state/district.
- 10. Given school-wide focus on CCR standards and career planning, 80% of SLAM students will have demonstrated career-planning skills as evidenced by having completed a career portfolio by the end of 8th grade in 2016.
- 11. The School will increase the number of students taking academically rigorous courses (i.e. advanced, honors, AP) by 5 % as measured by comparing enrollment in such courses from 2014 to 2015.

All Students are expected to make annual learning gains toward achieving the CCSS and NGSSS as assessed by teacher-made internal pre and post testing in each core course in 2014-15. Due to changes in legislation and state-mandated testing in ELA and Mathematics, the specific thresholds have not yet been determined by the FLDOE for 2015. The school will set an absolute AMO targets for annual learning gains as expected to be established by the FL-DOE in 2014.

Evaluating Student Performance and Progress – SLAM will participate in the statewide assessment program created under s1008.22, Florida Statutes. As per the *Student Success Act*, school districts will be expected to administer student assessments that measure mastery of course content for each course

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offered, beginning the 2014-2015 school year. Accordingly, the school will use such state and district-adopted as well as school-based assessments to measure student progress toward mastery of the *CCSS* and applicable *NGSSS* across all grade levels. The School will implement the Sponsor's testing calendar and measurements, and frequency of assessments therein as amended from time to time in accordance with district and/or statewide assessments. School-based methods of assessing students' mastery of performance outcomes will consider interim progress reports and report cards, facilitator observations, teacher tests and quizzes, attendance rates, teacher-generated exams, midterm and final examinations (EOC's as applicable). As a program focused on exposing to students to careers in sports leadership arena, SLAM will also consider Career Portfolios, Performance –Based Assessments, Authentic Assessments, Exhibitions and Presentations Peer and Self-Assessments when assessing student performance and progress (see examples under *Section 5.E* below)

B. Describe the school's student placement procedures and promotion standards.

SLAM will follow the District's **Student Progression/Promotion Criteria Matrix** to identify the placement and promotion requirements for all students enrolled at the school. This is overview of the policies reflect the most current Student Progression Plan (SPP) available at the time of application submission (2012-2013). The School hereby agrees to adopt the SPP in effect for the 2014-2015 school year and as amended for each year of the charter.

Required Courses for Middle School Students - It is required that all students in the middle school receive instruction in the state and district grade level objectives and competencies approved in mathematics, language arts/ESOL, social science, science, physical education, and career exploration as well as in a range of exploratory/elective areas (including but not limited to music, art, theatre arts, dance, foreign language, and career and technical education).

Subjects	Course Requirements	Additional Information
English	Three middle school annual courses.	For English Language Learners, the required course is M/Language Arts Through ESOL.
Mathematics	Three middle school annual courses.	Can include eligible courses for high school credit.
Science	Three middle school annual courses.	Can include eligible courses for high school credit.
Social Science	Three middle school annual courses. Civics is one of the required courses. It is offered in 7th grade.	Beginning with the 2014-2015 school year, students must earn a passing score on the Civics EOC assessment to pass the Civics course and to be promoted from the middle school to senior high school (The school will abide to any future modification to this mandate as per the FLDOE)
Physical Education	One semester in 6 th , 7 th , and 8 th grade.	 This requirement may be waived under the following conditions: The student is enrolled in a remedial course. The student's parent requests in writing that the student enroll in another course. The student participates in physical activities outside the school day, which are equal to or in

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		 excess of the mandated requirement. Students may elect additional physical education courses.
Electives* including Career and Education Planning	An elective course that incorporates career education and planning and at least 3 additional courses.	 This Career Planning course will culminate in completion of a personalized academic and career plan with an emphasis on technology or the application of technology in career fields. The career and education planning course must inform students of high school graduation requirements, high school assessments and college entrance test requirements Then student must also have completed his/her personalized academic and career plan.

*Electives- Students scoring at Level 1 and Level 2 on the most recent FCAT 2.0 Reading will lose the opportunity to select an elective course and will be required to enroll in an intensive reading course as detailed below. Students scoring at Level 1 and Level 2 on FCAT 2.0 Mathematics may also lose the opportunity to select an elective course. For ELLs at Levels 1 and 2, The M/J Developmental Language Through ESOL course will count as an elective credit and for ELLs. This course is taken in lieu of an intensive reading course.

Middle School Placement – The school will use data (state and district requirements, report cards, testing scores, past performance and comportment) as factors for placement in the appropriate courses to best suit each child. Depending on individual student assessment results, some students may be required to enroll in remediation courses for mathematics and reading, which will take the place of electives.

Intensive Reading - These courses will be in addition to the required M/J Language Arts course in grades 6, 7, and 8. All FCAT Level 1 and 2 students, regardless of whether they are fluent, will be placed in the appropriate reading class as follows:

- Intensive Reading Plus (IR+) is intended for students with deficiencies in decoding and fluency in addition to vocabulary and comprehension. All students, with the exception of all ELL students, with deficiencies in decoding and fluency, who scored Level 1 or 2 in reading on the 2014 administration of the FCAT 2.0 will be placed in an Intensive Reading Plus (IR+) class.
- Intensive Reading (IR) is intended for students with deficiencies in vocabulary and comprehension. All students, with the exception of all ELL students with deficiencies in vocabulary and comprehension, who scored Level 1 or 2 in reading on the 2014 administration of the FCAT 2.0 will be placed in an Intensive Reading (IR) class. This class will focus on effective reading strategies and differentiated instruction that reinforces whole group instruction and provides opportunity for intervention within the classroom context.
- Intensive Reading Enrichment (IR-EN) is Intensive Reading Enrichment (IR-EN) intended for students whose FCAT scores have regressed from FCAT Level 3 or higher to

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FCAT Level 2 and **students with high FCAT Level 2 scores**. All students, with the exception of all ELL students with high FCAT Level 2 scores or who have regressed from FCAT Level 3 or higher to Level 2 on the 2014 administration of the FCAT will be placed in an Intensive Reading Enrichment (IR-EN) class. The class will focus on specific reading strategies targeted to enrich the level of instruction to significantly improve students' vocabulary and comprehension achievement using selected grade level text and novel units.

Intensive Mathematics - For student scoring Level 1 or Level 2 on the 2014 administration FCAT 2.0 Mathematics, the student must receive remediation the following year, either by an M/J Intensive Mathematics course by grade level or remediation which may be integrated into the student's required mathematics course.

Since it is anticipated that the FCAT 2.0 will be replaced for middle grades Reading and Mathematics with another Common Core State Standard Assessment (such as PARCC or other assessment selected by the FL-DOE), the School commits to place students in a remedial (currently identified as intensive) Reading and/or Mathematics course (or other subject area) as will delineated by the FL-DOE and included in future Student Progression Plan, future CRRP and/or or as otherwise mandated by the FL-DOE. These intensive or remedial courses will be implemented to assist the student to gain at least grade level mastery of respective standards and be on track in college and career readiness efforts.

Senior High School Credits in Middle School - Students may enroll in selected senior high school courses to pursue a more challenging program of study. These courses are included when computing grade point averages and rank in class. Up to six credits may be earned, with parental permission, in grades 6, 7, and/or 8, for courses taken, which may be applied toward the total credits needed for graduation, college admission, or for the Florida Bright Futures Scholarship Program requirements. All high school credit courses taken in the middle school will be included in the high school transcript. In a grade below grade 9, and the benefit of retaking a course in which skills have not been mastered. Courses taken will remain a part of a student's middle school record, as well as the student's senior high school record. Credit may be earned in courses such as Algebra 1, Geometry, Physical Science Honors, Biology 1, Computer Programming 1, Foreign Language 1 & above, Spanish for Spanish Speakers 1 & above provided that all applicable End of Course assessment requirements are met.

Middle School Promotion – Promotion from grade to grade will be in accordance with the requirements set forth in the Sponsor's Student Progression Plan.

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End of Grade	Coursed Passed	Status
6	All Courses Passed	Promoted to Grade 7 Regular 7 th grade student
6	4-5 Courses Passed Must pass language arts or mathematics and at least 3 other courses	7 th Grade Student Placed in grade 7 and scheduled to repeat courses not passed as appropriate
6	Less than 4 Courses Passed in Grade 6	Retained 6 th Grade Student
7	12 Cumulative Courses Passed 6 courses passed in grade 6 and 6 courses passed in grade 7	Promoted to Grade 8 Regular 8 th grade student
7	8-12 Cumulative Courses Passed 4 courses passed in grade 6 including language arts, mathematics, science, and social science. 4-5 courses passed in grade 7 including 7 th grade language arts or mathematics, science or social science, and/or a course which incorporates career education planning	8 th Grade Student Placed in grade 8 and scheduled to repeat courses not passed as appropriate
7	7-8 Cumulative Courses Passed	Retained 7 th Grade Student
8	15-18 Cumulative Courses Passed Must pass 3 courses each in language arts, mathematics, science, and social science, including a course that incorporates career and education planning and 3 additional courses.	Promoted to Grade 9
8	14 or Fewer Courses Passed	Retained 8 th Grade Student

Promotion for ELLs and ELLs with disabilities is to be based on the student's performance in the dominant language while the student is in the process of becoming independent in English. Retention of ELLs requires the review and recommendation of the ELL committee. Retention of a student with disabilities who is also ELL (ESE/ESOL) has the same requirements as a non-ESOL student with disability. The IEP Team will review the goals and accommodations to address student needs, as appropriate.

Academic grades will be based on student mastery of the content of the course, as determined by the teacher using all available data. Teachers will consider all available data to determine the degree of student proficiency in meeting the CCSS and NG-SSS standards and mastery of course content. This data will include standardized test results, progress tests, daily assignments, teacher observation, and other objective information. The determination as to the specific grade a student receives will be based on careful consideration of all aspects of each student's performance during a grading period. Academic grades will be issued in accordance with State and Sponsor guidelines, as specified in the Sponsor's Plan (Policy 6000.1).

The Division of Instruction and Intervention Department of College and Career Readiness is currently to recommending changes to the Student Progression Plan (Policy 6000.1). The Policy Review Committee is proposing changes such as replacing District developed midterms with Benchmark Assessment Tests that will not impact student grades, and limiting the range of the "F" grade to 50-59.

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The School will abide any updates/additions/changes to the policy as it relates to the charter school.

- C. If the school will serve high school students, describe the methods used to determine if a student has satisfied the requirements specified in section 1003.428, F.S., and any proposed additional requirements. n/a
- D. Describe how baseline achievement data will be established, collected, and used. Describe the methods used to identify the educational strengths and needs of students and how these baseline rates will be compared to the academic progress of the same students attending the charter school.

Baseline used for initial student placement will be collected by the school upon student registration using reports from previous school records (as applicable) and will include standardized test scores such as (Florida Comprehensive Assessment Test 2.0 or other state-mandated assessment), ¹⁶ End Course Exams, as applicable, or other performance-based criterion examinations, Interim Assessments results, FAIR results, report card grades, attendance records, and behavioral records (including in school and out of school suspensions as well as exemplary behavior). In the case of Special Education, Individual Education Plans (IEP) will be secured and the Individual ELL Student Plans will be obtained for English Language Learners (ELL).

To the extent available for an incoming student, the data will used be used as a baseline in the student's incoming year and to track individual student progress from year to year. Data will be compared to current data at the end of each school year. For example, standardized test results from 2015 will be compared to FCAT results from 2014 to determine educational strengths and needs of students and to compare the student's academic. Ongoing internal audits (Interim Progress Reports and Report Cards, FAIR Ongoing Assessments) of student performance will be used to identify the needs and strengths of students throughout the school year.

The baseline student academic achievement levels for the school will be established using multiple measures of student performance including data from school, district, and state measures (listed in Section 5E below).

The baseline student academic achievement levels for the school will be established using multiple measures of student's academic performance on the school and the Florida Assessment Program, as applicable. Some of the assessments to be utilized will include the following:

- Florida Comprehensive Assessment Test (2014)
- EOC's and other district-adopted exams;
- Other standards-based exams;
- Baseline assessments (school adopted/developed)
- Benchmark Assessment Tests (school adopted/developed);
- FAIR
- Portfolio assessments (whenever applicable).

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¹⁶ It anticipated some FCAT 2.0 assessments may be eliminated beyond the 2014 school year, to be replaced by a Common Core Standardized assessment, e.g. PARCC)



Data from school-adopted baseline assessment to set initial baseline in Reading, Mathematics, Science, United States History, and Civics; FCAT (as applicable) and other standards-based exams, district-developed or district-selected assessments, and FAIR, as applicable, will be used to determine student strengths and weaknesses and inform instruction in these areas.

Each year, baseline data will be established and used to determine annual growth by the students individually and also collectively informing stakeholders to the extent to which educational goals and performance standards have been met by the School. The baseline levels of academic achievement established during the first academic year will be compared to academic achievement levels in prior years. Student performance and achievement results will be compared to the academic progress of the same students from quarter to quarter and from year to year as a means to determine students are continuously improving and making learning gains.

SLAM, as a member of the Mater Academy, Inc. network of school, will have access to a data specialist (employed by Mater Academy, Inc.) to assist the school in collecting, disaggregating and processing individual student performance and achievement data on an on-going and consistent basis (after every quarterly assessment and also throughout the school year). The data specialist provides each of the Mater schools with reports based on data provided by the school, district, and state disaggregated by areas of strength by student, by standard, by teacher, by school and as a network of schools. In this manner, baseline data will be established, collected, and used to identify the educational strengths and needs of students as well as achievement rate (annual growth) from one year to the next.

Baseline data will also be made available to stakeholders and the community at-large, as reported in the *School Improvement Plan* via the needs assessment and also through specific learning objectives, which are written to address student's learning needs. The school will use this data to evaluate the effectiveness of the curriculum by determining the extent to which the School meets the Annual Measurable Objectives (AMO) set for the first year of operation (see *-Section 5A - Student Performance, Assessment and Evaluation*) and with consideration that changes will need to occur as the State solidifies plans for evaluating student mastery of the CCSS via PARCC or whatever other assessment is selected. In subsequent years, the results will be gauged against the AMOs specified in the respective Annual School Improvement Plan and this method of goal setting and data collection will be used as a living and continuous improvement tool.

E. Identify the types and frequency of assessments that the school will use to measure and monitor student performance.

The School will participate in the statewide assessment program created under section 1008.22, F.S. and comply will all applicable requirements under 1003.43, F.S. The School will also participate in all federal, state, and district assessment programs as directed by the Sponsor following all required policies and procedures with regard to administration of tests and standardized practices.

As per the *Student Success Act*, school districts will be expected to administer student assessments that measure mastery of course content for each course offered, beginning the 2014-2015 school year. These assessments may include:

- Statewide assessments;

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- Other standardized assessments including nationally recognized standardized assessments;
- Industry certification examinations; and
- District-developed or district-selected EOC assessments.

SLAM will thereby administer and use state standardized assessment scores and district-adopted assessments in each course offered (as required) to measure mastery of *CCCS/NGSSS* across all grade levels and monitor student performance.

The types and frequency of assessments will include:

School Adopted Standards-based Assessments School Adopted Standards-based Assessments

- School-Based Benchmark Assessments (aligned to pacing guides) will be administered 3 times per year (Fall, Winter, and Spring) in Reading, Mathematics, Science, Algebra, Geometry and United States History to target instruction in these content areas.
- Formative and Summative Assessments in all Courses will include:
 - Weekly teacher-generated quizzes
 - Monthly teacher-generated and textbook-adopted assessments
 - Quarterly Exams
 - Portfolios and presentations
 - Class participation/presentation and PBL rubrics
 - Quarterly projects /investigations
 - Teacher Made Performance-Based Assessments
 - UDL Design Framework*

*Universal Design for Learning supports teachers' efforts to meet the challenge of diversity by providing flexible assessment strategies that help teachers differentiate instruction to meet varied needs, especially for SWD and ELL student populations. It does this by providing options for Instruction (Presenting information and content in different ways) and Assessment (Differentiating the ways that students can express what they know)

In preparation for PARCC and Common Core Assessments, performance tasks elicit a demonstration of the student's mastery of one or more benchmarks standards; they may require students to create a product, demonstrate a process and/or perform an activity; Performance tasks will be evaluated with teacher customized scoring rubrics/exemplars.

SLAM's mission is to expose students to careers in sports leadership arena, therefore Career Portfolios, Performance–Based Learning Task and Assessments, Exhibitions and Presentations, Peer and Self-Assessments will be also considered when assessing student performance and progress.

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The School commits to implement all State mandated and/or Sponsor-required assessments as app The School hereby agrees to adopt and implement the Sponsor's Testing Calendar, and as amended for 2014-15 school year and thereafter. Assessments appropriate to student's grade level and course as projected in the BCPS Assessment Calendar for 2014-15, will be administered at the school.

Current Required State and District Assessments include:

- The Florida Assessments for Instruction in Reading (FAIR) administered 3 times per year for screening, diagnostic and ongoing progress monitoring assessment to measure phonemic awareness, phonics, fluency, vocabulary and comprehension.
- Florida End-of-Course Assessments will be administered in accordance with district schedule (Winter, Spring, and Summer) annually to measure the NGSSS/CCSS for specific courses, as outlined Civics/US History US History, Biology 1, Algebra 1, & Geometry and for applicable credits in these courses.
- FCAT 2.0 –currently administered according to FL-DOE mandates to assess student achievement on selected NG-SSS benchmarks in each academic subject area: Science, Writing, Reading and Mathematics* It is anticipated that the Partnership for Assessment of Readiness for College and Careers (PARCC) assessments or other state-adopted assessment will be given in lieu of FCAT 2.0 beginning in 2014-15 and beyond. The school will abide by the testing adoption in 2014-15 and beyond as determined by the FL-DOE.
- Florida Alternate Assessment (FAA) will be administered as needed on a one-on-one basis by the student's special education teacher to all students meeting the alternate assessment criteria¹⁷
- Comprehensive English Language Learning Assessment (CELLA) Administered in the Spring annually to all current English Language Learners (ELL) and specified former ELLs to measure students' proficiency and gains in English.

The following assessments will be administered on an "as needed" basis:

• IDEA Oral Language Proficiency Test II (IPT-II)- Grades 6-8 - The IDEA Oral Language Proficiency Test Score Levels with Broward County Language Level Charts: ELLs in grades 3-8 who score Fluent English Speaker on the IDEA Oral Language Proficiency Test are administered the Kaufman Test of Educational Achievement II Brief Form (KTEA-II) as part of the entry requirements into the ESOL program. This test generates Reading and Writing scores and can be used to determine reading achievement.

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¹⁷ Participation in statewide testing programs (i.e. EOC, CELLA, FAIR, etc.) is mandatory for all students, including students with disabilities. Generally, all students with disabilities, including ELLs with disabilities whose instructional program incorporates the general education objectives and competencies, should participate in state assessment programs. The decision regarding whether a student will be exempted or tested with or without accommodations is made by the student's IEP team and recorded on the IEP. Students with disabilities who are exempt from these programs will be assessed through the Florida Alternate Assessment as documented on the IEP. Students with disabilities are also required to take applicable EOC tests one time, after which if the IEP committee determines an EOC assessment cannot accurately assessment results may be waived for the purpose of determining the student's grade and credit.



F. Describe how student assessment and performance data will be used to evaluate and inform instruction.

As described above, SLAM will have access to a data specialist to assist the school in collecting, disaggregating and processing individual student performance and achievement data on an on-going and consistent basis (after every quarterly assessment and also throughout the school year). Student assessment and performance data will be used to evaluate and improve school effectiveness by targeting benchmarks indicating which students need additional support to master specific standards and/or grade level skills.

At the beginning of each school year and at least quarterly, the data specialist will work collaboratively with the school to generate meaningful reports on assessment data to identify areas of instructional weaknesses pinpointing thresholds of student progress. State **standardized assessments** will be used to determine mastery of content standards and make decisions regarding school-wide improvement from year to year (see section 5E); FAIR and School-developed Baseline Assessment data will be used for baseline and instructional purpose, program reporting, or as a measure for developing School Improvement Plans; FAIR assessments will be used as screening and progress monitoring tools to differentiate instruction; Interim Assessments and other reports from reading (CIRP and SIRP) and district writing assessments will be used for ongoing progress-monitoring of students. In addition to required and mandated assessments as described in section 5E, teacher-made and text-adopted classroom assessments will further determine mastery of content standards for earning specific class credit requirements.

As a program focused on exposing to students to careers in sports leadership arena, SLAM will also consider Formative assessments (career portfolios, performance-based tasks, exhibitions and presentations, peer and self-assessments, audio/visual presentations, journals, research projects, reviews/case studies, career portfolio's etc.) when assessing student performance and progress. These will also help determine whether students are meeting the expectations set forth by the school's mission and vision.

All Data will be disaggregated and used by teachers to inform instruction on student knowledge and skills relative to CCSS and applicable NGSSS academic standards as follows:

- 1. Data reports on these and all state-mandated assessments (as listed in section 5E above) will be disaggregated by student, by standard, by teacher, and by school will be used to inform decisions about adjustments to the educational program. These reports will be made available to all teachers (and students as applicable) to identify areas needing improvement while informing instruction to enhance curriculum delivery and teacher effectiveness.
- 2. The school leadership team will meet weekly to: Evaluate data and correlate to instructional decisions; Review progress-monitoring data at the grade level and classroom level to identify students and their academic levels; Identify professional development to enhance students' achievement levels; Collaborate, problem solve, share effective practices, evaluate implementation, make decisions, and practice new programs and skills; Facilitate the process of building consensus, increasing infrastructure, and making decisions about implementation.

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- 3. Based on the data analysis, administrators and school faculty collaboratively develop an instructional focus calendars with timelines for addressing targeted strands as denoted in assessed benchmarks. Through the use of the calendars, student assessment data will drive-decisions for continuous improvement of the teaching and learning process.
- 4. Department Chairs will communicate with teachers to determine the areas of students' strengths and weaknesses as demonstrated by class work assignments and assessment results.
- 5. Each teacher will be training and expected use all data available to determine the instructional focus lessons and differentiate instruction accordingly. Struggling students and students referred by teachers will be targeted for Early Bird tutoring, Super Saturday tutoring, and daily pullout tutoring. Students at and above mastery level will be challenged through the use of additional hands-on investigations, projects and research assignments that will reinforce the mastery of benchmarks.

Targeted Interventions - Using real-time data from frequent assessment results, SLAM will provide the necessary individual, classroom and/or school-wide intervention programs which include: requiring students to attend specific targeted tutoring during and afterschool; proving for supplemental intervention programs and support within the respective Reading, Math, Science classrooms through academic coaching, lesson modeling, computerized intervention programs and pull out services (as needed).

The school will use data on an ongoing basis to inform instructional practices allowing for increased Data will serve as a feedback system to guide teachers in lesson planning and individualizing instruction and to provide students with knowledge of their current levels of performance. The school will use data on an ongoing basis to inform instructional practices allowing for increased student-learning outcomes. These actions will enhance instructional interventions by closely monitoring activities and aligning results with effective instructional decision-making.

G. Describe how student assessment and performance information will be shared with students and with parents.

SLAM students will participate in the statewide assessment program under s. 1008.22 and in the state's education performance accountability system under s. 1008.31. The comprehensive assessment program will be used to inform stakeholders (students, parents, and teachers) about where a student is succeeding and what areas need strengthening. The school will thereby provide parents with assessment results on a yearly basis for each year their child participates in the state assessment and EOC examinations (as applicable) and any other district based examinations. The Department of Education reports student assessment data pursuant to s. 1008.34(3)(c) and the school will then report the information to each parent of a student at the charter school, the parent of a child on a waiting list for the charter school, the district, and the governing board of the charter school.

The School will also provide its parents with student performance reports from the Baseline and Interim Assessments results with specific information regarding their child's progress and learning

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gains. This means of communication informs parents whether or not their child is reading at grade level and whether or not their child has gained a year's worth of learning for each year spent at the School.

The establishment of a School Improvement Plan will also ensure school-wide student assessment and performance data can be shared with parents, students and other stakeholders. In addition to the *School Improvement Plan*, the following systems ensure school-wide student assessment and performance data can be shared with parents, students and other stakeholders:

Ongoing communication between the school and the parents will be maintained through systems such as parent access to web-based grade book and progress reports. Specifically, the school will ensure communication with students/parents via the following:

- Progress Reports and Report Cards The School will issue progress reports at the four-week mark and at the end of each marking period.
- Interim reports Not later than 4 weeks into the grading periods, an interim report shall be sent to parents of students who are experiencing difficulty including, but not limited to, the following: failing, a drop of two or more grades, unacceptable behavior and/or excessive absences. Required Parental
- Notification for students in danger of not meeting grade level requirements.

The school will also host parent conferences, open house meetings, parental workshops, and coordinate other appropriate methods of communication with parents/guardians, as necessary.

Section 6: Exceptional Students

- A. Please indicate the level of service that the school will provide to students with disabilities by selecting from the list below.
 - The school will serve students with disabilities whose needs can be met in a regular classroom environment (at least 80% of instruction occurring in a class with non-disabled peers) with the provision of reasonable supplementary supports and services and/or modifications and accommodations.
 - The school will serve students with disabilities whose needs can be met in a regular classroom and resource room combination (between 40%-80% of instruction occurring in a class with non-disabled peers) with the provision of reasonable supplementary supports and services and/or modifications and accommodations.
 - The school will serve students with disabilities whose needs can be met in a separate classroom (less than 40% of instruction occurring in a class with nondisabled peers).

The school will serve students with disabilities whose needs can be met in a regular classroom environment (at least 80% of instruction occurring in a class with non- disabled peers) with the provision of reasonable supplementary supports and services and/or modifications and accommodations. Students with disabilities enrolled in the School will be educated in the least restrictive environment and will be segregated only if the nature and severity of the disability is such that education in regular classes with the use of supplementary aids and services cannot be achieved

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satisfactorily. An inclusion model with ESE support will be used, as appropriate, wherein the ESE Teacher and General Education teacher regularly monitor students' progress on attaining goals stated on the IEP as well as grade-level curriculum goals.

Plan of Services: SLAM will follow the School Board of Broward County's Special Programs and Procedures (SP&P) for Exceptional Students and Collaborative Problem Solving (CPS) and Comprehensive Evaluation in serving students with disabilities (SWD) at SLAM.

Broward County's CPS/RtI Model incorporates a collaborative approach to problem solving using a response to intervention (RtI) system for delivering research-based instruction and intervention. This involves differentiating instruction and providing sequentially more intensive assistance based on student needs through a tiered system of interventions. The CPS/RtI process ensures that students' needs are being addressed prior to any student is identified or evaluated for Exceptional Education Services. Accordingly, Teachers at SLAM will be trained and expected to make significant and meaningful attempts at classroom-based intervention prior to any referral for specialized programs.

Response to Intervention (RtI) – Teachers will use the RtI model to implement research-based interventions, monitoring student progress and evaluating the outcomes of the interventions. This model calls for a 3-tiered system:

- I. The first Tier is the foundation and consists of scientific, research-based core instructional and behavioral methodologies, practices, and supports designed for all students in general education.
- II. The second Tier consists of supplemental instruction and interventions that are provided in addition to and in alignment with effective core instruction and behavioral supports to groups of targeted students who need additional instructional and/or behavioral support.
- III. The third Tier consists of intensive instructional or behavioral interventions provided in addition to and in alignment with effective core instruction, with the goal of increasing an individual student's rate of progress. The Tiers can be distinguished from one another by their intensity, meaning that substantial changes in frequency of intervention, duration of intervention, and/or methods of intervention should be seen as interventions become more intensive.

CPS Process - For students who present a learning and/or behavior problem, the school will use a Collaborative Problem Solving (CPS) Process. CPS is a structured, data-based, team-oriented, model for designing, implementing and evaluating interventions for students who are experiencing academic and/or behavioral problems in the classroom as follows:

- 1. When a student is identified as having an academic and/or behavioral problem in the classroom, the teacher first confers informally with peers and other support personnel in the development of classroom strategies.
- 2. If these strategies do not lead to acceptable student progress, the teacher requests the assistance of the school's CPS team.
- 3. The team works with the teacher to design focused interventions (first at Tier II, then at Tier III, if needed).
- 4. The student's progress is monitored with objective data on all interventions attempted at Tier II and Tier III.

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- 5. If the focused interventions attempted at all Tiers do not produce a satisfactory level of progress, as evidenced by review of the RtI data collected, a comprehensive evaluation may be requested.
- 6. Documentation of the various strategies and interventions employed, as well as all data pertaining to progress monitoring, become part of the referral packet.
- 7. The team keeps parents informed of planned intervention efforts and the student's progress, in response to intervention, throughout the CPS process.

Procedures for Referral for Comprehensive Evaluation (students suspected of having a disability)

Prior to a referral for students suspected of having a disability, school personnel must make one of the following determinations and include appropriate documentation in the student's educational record:

- 1. For students who present speech disorders; severe cognitive, physical, or sensory disorders; and/or severe social/behavioral deficits that require immediate attention in order to prevent harm to the student or others, the implementation of evidence-based interventions (including the parent involvement in the intervention procedures) and the observations of the student would be inappropriate in addressing the immediate needs of the student.
- 2. The activities described in the general education intervention procedures above have been implemented, but have been unsuccessful in addressing the areas of concern for the student. The parents of the child receiving general education interventions requested, prior to the completion of the interventions, that the school conduct an evaluation to determine the child's eligibility for specially designed instruction and related services as a student with a disability. In this case, the activities described in the general education interventions procedures are completed concurrently with the evaluation but prior to the determination of the student's eligibility for specially designed instruction.

When the CPS team concludes that a student has not made sufficient progress in response to focused interventions (Tier 2 and Tier 3) attempted in the regular classroom, and team members suspect a disability, they refer the student for a comprehensive evaluation. When a referral is made, the following occurs:

- 1. The ESE specialist, guidance counselor, or other designee collects a referral packet for students suspected of having a disability. The referral packet includes, but is not limited to: Documented evidence of the intervention activities as outlined above; Parent Information Form (PIF) or Psychosocial Family Assessment; Collaborative Problem Solving and Comprehensive Evaluation: Student Rating Form; Referral for Psychological Evaluation Services; Consent for Evaluation
- 2. A completed referral packet is sent to the appropriate evaluation specialists as coordinated by the school

504 Plan Procedures: A student is entitled to FAPE and may be entitled to Section 504 accommodations if he or she has a physical or mental impairment that substantially limits one or more major life activities. The eligibility/ineligibility is based on a variety of sources. 504 Eligibility sources may include teacher observations, information from parents, and information from medical providers, standardized test scores, grades, or other pertinent information. The school will contact

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the Sponsor to schedule Section 504 eligibility meetings. Parents must receive notice of the Section 504 meeting and be invited to attend. Parents and students should be encouraged to attend the meeting and provide input that would help the committee in making decisions. Section 504 teams that convene for annual or interim meetings should consist of the parents, the student, the school administrator or designee, and school personnel who are familiar with the student, such as the student's teacher or counselor.

Developing Individualized Education Plans: If Student is ESE eligible, an IEP is developed. Students will be guaranteed a free appropriate education and evaluation as well as consequent placement and implementation of an appropriate IEP. The written individualized educational plan for each student will include measurable annual learning goals and behavioral goals that may involve the evaluation of behavior through a Functional Assessment of Behavior (FAB) and the development of a Behavior Intervention Plan (BIP). Additionally, program components, goals, progress reports to parents on goals, diploma options, curriculum whether standard and/or modified, and assessment may also be addressed therein. Supplementary aids and related services will also be identified as well as necessary accommodations and modifications will be clearly delineated in this written plan. The School will ensure that appropriate personnel will be trained in using the Web Based IEP system (Special Education-Electronic Management System) that is currently used by the Sponsor.

Each IEP will include the following:

- A statement of the student's present levels of academic achievement and functional performance, including how the student's disability affects the student's involvement and progress in the general curriculum.
- A statement of measurable annual goals, including academic and functional goals designed to
 meet the student's needs that result from the student's disability to enable the student to be
 involved in and make progress in the general curriculum or for preschool children, as
 appropriate, to participate in appropriate activities and meeting each of the student's other
 educational needs that result from the student's disability.
- A description of benchmarks or short-term objectives for students with disabilities who take an alternate assessment aligned to alternate achievement standards, or any other student with a disability, at the discretion of the IEP team.
- A statement of the special education and related services, and supplementary aids and services, based on peer-reviewed research to the extent practicable, to be provided to the student, or on behalf of the student.
- A statement of the classroom accommodations, modifications, or supports for school personnel that will be provided
- An explanation of the extent, if any, to which the student will not participate with nondisabled students in the regular class or in the activities described above.
- Any individual appropriate accommodations necessary to measure the academic achievement and functional performance of the student on the state or district assessments.
- The projected date for the beginning of the special education, services, accommodations, and modifications described and the anticipated frequency, location, and duration of those services.
- A statement of how the student's progress toward meeting the annual goals will be measured and when periodic reports on the progress the student is making toward meeting the annual

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goals (such as through the use of quarterly or other periodic reports, concurrent with the issuance of report cards) will be provided.

The IEP will be implemented immediately following the meeting and will be made accessible to each of the student's teachers who are responsible for the implementation. Each teacher of the student will be notified of specific responsibilities related to implementing the student's IEP. The school will offer various services to meet the needs of the students with disabilities based on the Individual Educational Plan. These services include specialized gifted courses (as detailed in the curriculum section of this application), acceleration, modifications of content through differentiated curriculum, curriculum compacting, and enrichment. Other services may include social skills development and/or counseling.

<u>Federal and State Reports:</u> Unless otherwise exempted by Chapter 1002, Florida Statutes, the School will complete federal, state and any other reports deemed necessary in accordance with the timelines and specifications of the Sponsor and the State Department of Education.

B. Describe how the school will ensure that students with disabilities will have an equal opportunity of being selected for enrollment in the charter school.

The School will not discriminate on the basis of race, religion, or national or ethnic origin, or exceptionality in the admission of students. Any eligible student who submits a timely application and whose parents accept the conditions of the Parental Involvement Contract shall be considered, unless the number of applications exceeds the capacity of the program, class, grade level, or building. The School will be open to any student residing with the District. The School will have an open admissions procedure, utilizing a "first come, first served" policy as required by statute, unless the number of applicants exceeds capacity. In such case, all applicants shall have an equal chance of being admitted through a random selection process conducted by the School's accounting firm in conformity with Florida's Charter School Legislation. This process doesn't take into account a student's background, ethnicity, race, socio economic status or disability, and therefore allows for every student who applies to have an equal opportunity to enroll in the school.

C. Describe how the school will work with the sponsor to ensure the charter school is the appropriate placement for each student with a disability, based on the student's needs.

Operating under the auspices of the Sponsor as the Local Education Agency (LEA), the School will assume responsibility for programming and delivering related services to exceptional students, as identified in the student's IEP with adherence and fidelity to the Sponsor's policies, and with provisions further detailed in the paragraph that follows. The School does acknowledge a need for a collaborative linkage with the Sponsor, especially with respect to the responsibilities that exist for providing a free appropriate public education to children with disabilities and ensuring that the needs of ESE students are met.

The School hereby agrees to adopt and implement the Sponsor's policies and procedures with respect to serving students with disabilities, including the procedures for identifying students with special needs, developing Individualized Education Plans, and 504 Plans (as applicable), and providing a full range of services. Special Education students will be provided with programs implemented in accordance with federal, state, and local policies (specifically, the Individuals with Disabilities

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Education Act (IDEA); the Americans with Disabilities Act of 1990 (ADA); Section 504 of the Rehabilitation Act of 1993; Sections 1000.05 and 1003.57, Florida Statutes; Chapter 96-186, Laws of Florida; and Chapter 6A-6 of the Florida Administrative Code. Additionally, the School will follow guidelines and procedures in accordance with State Board Rule 6A-6.03019, FAC and BCPS Exceptional Student Education Policies and Procedures (SP&P). The educational program for exceptional students will include and adhere to the principles of the law as follows:

- Free appropriate public education (FAPE)- will be provided to every exceptional student enrolled in the School. That is, Free (no cost to parents); appropriate suited to individual needs of the child; public provided by and paid for the public education system; education-including extracurricular activities.
- Appropriate evaluation evaluations will occur within appropriate timeframes and in accordance with published guidelines. **Individual Education Plans (IEP)** and Educational Plans (EP) for gifted will be developed, and maintained and meetings will be held in accordance with Sponsor's guidelines.
- Parent/Student Participation in Decisions including, but not limited to, giving consent for evaluation and initial placement, helping design the IEP, helping the School understand their child.
 - **Procedural Due Process** a non-discriminatory policy regarding the eligibility, identification, location, placement and evaluation process as well as adherence to procedural guidelines for all of these will consistently be implemented. Notwithstanding, when in question, due process hearings may be initiated by a parent or the district on the proposal or refusal to initiate or change the identification, evaluation, or educational placement of the student or the provision of a free appropriate public education.
- Least Restrictive Environment: Students with disabilities will be educated in the least restrictive environment and will be segregated only if the nature and severity of the disability is such that education in regular classes, with the use of supplementary aids and services, cannot be achieved satisfactorily. Similarly, gifted students will be educated in an environment that promotes acceleration
- D. Describe how the school will utilize the regular school facilities and adapt them to the needs of exceptional students to the maximum extent appropriate, including the use of supplementary aids and services.

The School will make adaptations to school facilities, to the maximum extent appropriate and within provisions of the law, the Americans with Disabilities Act of 1990 (ADA), to ensure students with disabilities enrolled in the School will be educated in the least restrictive environment.

Supplementary supports and services and/or modifications – The School will first consider the least restrictive environment for all students with disabilities and will be segregated only if the nature and severity of the disability is such that education in regular classes with the use of supplementary aids and services cannot be achieved satisfactorily. The supplementary aids and services that will be provided to the students with disabilities will be dependent on the individual needs of each child.

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Those students whose needs can be met in the General Education setting will receive either consultative or collaborative service from the ESE teacher. Depending on the needs of the students, the following collaborative services may be offered by the ESE Teacher: co-teaching or support facilitation. Students in need of a co-teaching model will receive direct services from the ESE teacher and General Education teacher. Teachers will plan, grade and teach together. The ESE Teacher will provide instruction throughout the entire class period. For students in need of collaboration through support facilitation, the ESE teacher and General Education teacher will teach together but the level and frequency of support may vary per student.

SLAM will use UDL model (universal design for learning), assistive technology, accommodations, and/or modifications to provide curriculum support. To maximize accessibility to the curriculum, students will access the State standards/Access Points through appropriate programming, support from special education and regular education teachers, support in the use of assistive technology, and through the use of universal design principals.

Instructional Support - Students may receive instructional support through specially designed instruction and related services as determined through the individual educational plan (IEP) process. All Teachers will be trained in designing and implementing individualized programs to address the learning needs of each student. Teachers will instruct students in the unique skills necessary to access and benefit from the core curriculum. These skills may include, but are not limited to, curriculum and learning strategies, compensatory skills, independent functioning, social/emotional behavior, use of assistive technology, and communication.

Students with disabilities may receive such accommodations in the General Education setting as deemed appropriate on each Individual Educational Plan. A separate room will be provided for the use of supplementary aides and services such as OT, PT, speech/language therapy, counseling or any services by any contracted personnel.

E. Describe how the school's effectiveness in serving exceptional education students will be evaluated.

The goals for determining the School's effectiveness in serving special education students will be aligned directly with annual measurable objectives set for all students and with the individual goals specified in the child's IEP. The School's effectiveness in serving special education students will be evaluated in the ability for the student to demonstrate learning gains consistent with the annual goals specified in the child's IEP.

The School's ability to meet Adequate Yearly Progress (AYP), including AYP for the students with disabilities subgroup, will also serve as an evaluation tool. In addition, feedback from the Sponsor's annual ESE compliance review will also help the School to measure its effectiveness in serving students with disabilities.

F. Explain how exceptional students who enter the school below grade level will be engaged in and benefit from the curriculum.

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The School's thematic program, which allows students to make real-world connections through engaging activities in sports leadership, encourages all students to be more engaged. This allows students, including those in special education, entering below grade level to benefit more from the core curriculum. The school will take steps to ensure that these students, in particular, are successful. For example, the school will determine the level of mastery in reading, writing, mathematics and science for all students using baseline data and interim assessment data. This information, coupled with the results of the prior year standardized tests results and student records, will be used to determine the best educational setting for students (e.g., appropriate course selection, tutoring, referral for special services).

The Common Core State Standards articulate rigorous grade-level expectations in the areas of mathematics and English language arts. Students with disabilities must be supported and challenged to excel within the general curriculum and be prepared for success in their post-school lives, including college and/or careers. In order to accomplish this, the School will commit to instruction that incorporates supports and accommodations, including 18:

- Supports and related services designed to meet the unique needs of these students and to enable their access to the general education curriculum.
- An Individualized Education Program (IEP), which includes annual goals aligned with and chosen to facilitate their attainment of grade-level academic standards.
- Teachers and specialized instructional support personnel who are prepared and qualified to deliver high quality, evidence-based, individualized instruction and support services.
- Teachers maintain a culture of rigor and high expectations in alignment with Common Core State Standards expectations.
- Instructional accommodations changes in materials or procedures-, which do not change the standards but allow students to learn within the framework of the Common Core.
- Assistive technology devices and services to ensure access to the general education curriculum and the Common Core State Standards.
- Instructional supports for learning based on the principles of Universal Design for Learning (UDL), which foster student engagement by presenting information in multiple ways and allowing for diverse avenues of action and expression.

SLAM's mission is to prepare all students for success in school and in their careers beyond school through an innovative and engaging program emphasizing sports leadership career exploration. Thus, the curriculum will implement engaging Project- based task and real-world initiatives (as described in Section 4- Curriculum) that will allow students with disabilities to demonstrate their knowledge and skills using a UDL model, while meeting high standards in mathematics, reading, writing, speaking and listening.

Apart from providing the specific services listed in a student's IEP, EP, and/or ELL plan, as applicable, the School's faculty will differentiate instruction as necessary, as well as offer tutoring services or other such assistance to ensure students remain successful. Student performance will be continuously assessed. Students not making adequate progress towards the CCSS and NGSSS as

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¹⁸ http://www.corestandards.org/assets/application-to-students-with-disabilities.pdf



applicable will be identified and will be given support as follows:

- All students not meeting standards will be placed on a Progress Monitoring Plan Progress Monitoring Plan (PMP) targeting these deficiencies. This plan requires active participation from the student, the parents and specific teachers in order to ensure continuous student improvement. This initiative allows each student to have ownership and understating of his/her learning style and allows each student to track and monitor his/her achievement. The PMP will be comprised of specific measurable individualized goals for that student, as well the strategies and services (tutoring/required additional classes, etc.) to be implemented in order for the student to achieve the specified goal and specific strategies to remediate any learning deficiencies will be implemented.
- Reading strategies in the content areas will be facilitated throughout the curriculum to
 provide students with additional practice in addition to those taught during
 Reading/language arts classes.
- Morning, Saturday, and daily pullout tutoring may be required for those students consistently demonstrating non-mastery of the standards.
- Students consistently demonstrating non-mastery of benchmarks on teacher generated quizzes, chapter tests, projects, investigations, and poor academic progress will be targeted for supplemental and intensive instruction/intervention.

G. Provide the school's projected population of students with disabilities and describe how the projection was made.

The school expects that its student population will also reflect the current demographic profile of students served in the district (described in Section 2A above). Accordingly, the school has based its projections on the average current enrollment of SWD students within the district (12%). The data was derived from the most recent 2013 LEA profile for the county published by the Florida Department of Education Bureau of Exceptional Education and Student Services¹⁹

H. Identify the staffing plan, based on the above projection, for the school's special education program, including the number and qualifications of staff.

The school will have at least two (2) teachers with proper certifications available to serve students with disabilities as projected by an estimated 12% of SWD currently attending the district schools. The school teaching staff will include a certified ESE Teacher with demonstrated experience in providing support and services to children with disabilities. The ESE Teacher will be an employee of the School and will at a minimum possess full certification in special education. The school will increase number of staff based on actual enrollment of SWD and their specific needs.

The ESE Teacher will ensure the implementation of all IEPs and Section 504 Plans. The needs of the population of students with disabilities will dictate the role of the ESE Teachers. The ESE

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¹⁹ http://www.fldoe.org/ese/pdf/2012LEA/Broward.pdf



teachers will provide services within the General Education setting through consultation, collaboration, and/or support facilitation, as well as maintain all ESE records in compliance. If the needs of the SWDs include consultative and collaborative services, the ESE teacher can arrange his/her schedule to meet the needs of the students and maintain compliance of records. For example, the ESE teacher may co-teach a class in Reading/LA and/or math and meet the needs of those students as well consult with the General Education teachers on a weekly or monthly basis to ensure SWD students on consultation are making progress and accessing the curriculum. However, if the need arises to hire an additional ESE teacher(s), that decision will be made based on the needs of the population of students with disabilities.

Consultation provided by the ESE Teacher may include:

- adjustments to the learning environment
- modifications of instructional methods
- adaptation of curricula, and the use of appropriate accommodations to meet the needs of individual students

ESE teachers will be hired to service students with disabilities, in accordance with the level of support needed to implement the related services and specialized instruction detailed on the IEP.

The school will employ teachers who meet all licensure and/or certification requirements that apply to the area in which the individuals are providing services to the special education students. Speech-language, occupational, and physical therapy services will be contracted services that the School may provide for students who qualify for those services. Similarly, all personnel who provide related services (e.g. psycho-social counseling will be provided by a psychologist, social worker or mental professional, etc.) to students will meet all required licensure and/or certification requirements pertaining to their area of related service. Contract Services (in the budget) include professional fees paid to entities such as the Services and Support Provider, Speech Therapist, and other ESE service providers.

I. Describe how the school will serve gifted and talented students.

The School will serve the needs of gifted students in accordance with State Board Rule 6A-6.03019, FAC, Special Instructional Programs for Students Who Are Gifted, and BCPS Exceptional Student Education Policies and Procedures (SP&P) for Gifted Students.

<u>Identification</u>: Gifted students will be identified for special instructional programs for the gifted if the student demonstrates the following:

- 1. a need for a special program*
- 2. a majority of characteristics of gifted students according to a standard scale or checklist and
- 3. superior intellectual development as measured by an intelligence quotient of two (2) standard deviations or more above the mean on an individually administered standardized test of intelligence

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In order to provide a comprehensive profile of the student's abilities and needs, screening activities will include nomination forms from teachers, school staff, students themselves, parents and/or community. The following criteria may be used in identifying students:

- performance on standardized tests
- referrals from teachers for gifted eligibility based on classroom performance, student's portfolio
- recommendation from counselor/teachers regarding student motivational behavior, involvement in activities, etc.
- recommendation from parents about student's academic areas of strength
- Screening Test Kaufman Brief Intelligence Test (K-BIT)

The Kaufman Brief Intelligence Test (K-BIT) or other cognitive screening measure will be administered after proper consent for such an evaluation has been obtained. If the student scores greater than 116 on the screening measure of intellectual functioning, or if the parent requests evaluation, the student will be referred for evaluation. Plan B gifted - If the student scores in the 80th percentile or above in reading or mathematics on a standardized achievement test or scores an average of 80% on at least four (4) of the nomination forms. Then, the student will be referred for screening of intellectual functioning.

<u>Services Delivery Model:</u> <u>Middle School Gifted Courses</u> - Gifted-endorsed teachers may provide challenging and in-depth work in a specific content area to Gifted students within a Gifted course.

<u>Instructional Strategies for Gifted</u> -The School will offer various services to meet the needs of the gifted student based on the Educational Plan. These services may include but are not limited to:

- acceleration: (e.g. enrichment, world immersion activities (i.e. as science and social studies fairs, music and art exhibits, academic competitions, mentoring, career exploration and goal setting integrated into the curriculum);
- differentiation: (e.g. curriculum compacting, modifications of content through differentiated curriculum); and
- ability grouping: (e.g. specialized gifted courses-as detailed below*, Real social skills development and/or counseling).

EP Plan Development: Once a student has been identified as gifted, the gifted coordinator will notify the student's parent, teachers, and school psychologist. The gifted coordinator at the school site will fill out the appropriate forms provided by the school district and notify the parents of the give permission for testing. Upon review of test, at a mutually scheduled EP meeting, the participants will determine the best suitable services required to meet the student's educational needs. The Gifted Eligibility Determination Form will be used to evaluate placement in the gifted program. The Plan B Matrix will include measures of intellectual functioning, academic performance, leadership, motivation, and creativity through the following means.

A multi-disciplinary committee of professionals will be established which will include a parent and may also be comprised of the classroom teacher, the teacher of the Gifted, an LEA representative, the school psychologist, an ESOL designee where appropriate, and other school staff who spend significant time with the student. The eligibility committee at each school will

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be responsible for the review and analysis of evaluation data and the recording of the data on the Gifted Eligibility Matrix (GEM).

<u>Initial Educational Plan (EP) Team Participants</u>: The EP team will include the following participants:

- The student's parents*;
- The student;
- The schools' gifted coordinator;
- At least one teacher of the gifted program;
- One regular education teacher of the student who, to the extent appropriate, is involved in the development and review of a student's EP. Involvement may be the provision of written documentation of a student's strengths and needs;
- School psychologist; and
- Staffing Specialist

*Parents will be considered partners with the schools in developing, reviewing, and revising the educational plan (EP) for their child. The role of parents in developing EPs will include:

- Providing critical information regarding the strengths of their child;
- Expressing their concerns for enhancing the education of their child so that they receive a free appropriate public education
- Participating in discussions about the child's need for specially designed instruction;
- Participating in deciding how the child will be involved and progress in the general curriculum; and
- Participating in the determination of what services the school will provide to the child and in what setting.

The EP team considers the following during development, review, and revision of the EP:

- The strengths of the student and the needs resulting from the student's giftedness
- The results of recent evaluations, including class work and state or district assessments
- In the case of an ELL student the language needs of the student in relation the EP

<u>The Educational Plan (EP)</u> for each student will be individualized, measurable, and observable. The plan will include:

- A statement of the student's present levels of performance which may include, but is not limited to, the student's strengths and interests, the student's needs beyond the general curriculum, results of the student's performance on state and district assessments, and evaluation results;
- A statement of goals, including benchmarks or short-term objectives;
- A statement of the specially designed instruction to be provided to the student;
- A statement of how the student's progress toward the goals will be measured and reported to parents; and
- The projected date for the beginning of services, and the anticipated frequency, location, and duration of those services;

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<u>Implementation:</u> The EP will be implemented immediately following the meeting and will be made accessible to each of the student's teachers who are responsible for the implementation. Each teacher of the student will be notified of specific responsibilities related to implementing the student's EP. Timelines include the following:

- An EP is in effect at the beginning of each school year for each student identified as gifted who is continuing in a special program.
- An EP is developed within 30 calendar days following the determination of eligibility for specially designed instruction in the gifted program and is in effect prior to the provision of these services.
- Meetings are held to develop and revise the EP at least once every three years for students in grades K–8 and at least every four years for students in grades 9–12.

<u>Services and instructional Strategies for Gifted:</u> The school will offer various services to meet the needs of the gifted student based on the Educational Plan. These services may include but are not limited to:

specialized gifted courses (as detailed in the curriculum section of this application),
acceleration,
ability grouping,
modifications of content through differentiated curriculum,
Career exploration and goal setting integrated into the curriculum,
curriculum compacting,
enrichment,
social skills development and/or counseling, and
Real world immersion activities (i.e. as science and social studies fairs, exhibits,
academic competitions, mentoring).

Curriculum will be vertically and horizontally enriching, providing those students who have mastered the grade-level Sunshine State Standards opportunities for acceleration. Curriculum for gifted students should include a wealth of opportunities for extended learning beyond the classroom.

Evaluations: - The EP team shall consider the strengths of the student and needs resulting from the student's giftedness and the results of recent evaluations, including class work and state assessments. In the case of a student with limited English proficiency, the language needs of the student as they relate to the EP, will be considered when reviewing and revising the plan.

Section 7: English Language Learners

A. Describe how the school will comply with state and federal requirements for serving English language learners, including the procedures that will be utilized for identifying such students and providing support services.

The School will adhere to all applicable provisions of Federal law relating to students who are limited

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English proficient, including Title VI of the Civil Rights Act of 1964 and the Equal Educational Opportunities Act of 1974. Additionally, the School will meet the requirements of the Consent Decree entered in Lulac, et al. vs. State Board of Education. The School hereby agrees to adopt and implement the Broward County Public Schools ELL Plan²⁰, as referenced herein, in serving English Language Learners (ELL) as follows:

Identification and Assessment: The School will identify "English Language Learner" (ELL) as:

- An individual who was not born in the United States and whose native language is a language other than English;
- An individual who comes from a home environment where a language other than English is spoken in the home; or
- An individual who is an American Indian or Alaskan native and who comes from an environment
 where a language other than English has had a significant impact on his or her level of English
 language proficiency.

The school will survey ALL parents upon initial entry (registration) using the Home Language Survey (HLS). This is required by the League of United Latin American Citizens (LULAC) et al. v. State Board of Education Consent Decree. The Home Language Survey includes three questions and is given at the time of registration. The questions are as follows:

- 1. Is a language other than English used in the home?
- 2. Did the student have a first language other than English?
- 3. Does the student most frequently speak a language other than English?

If a parent answers "yes" to one or more of the three HLS questions, and/or meets the definition of ELL, they will be advised that the student will need an aural/oral language assessment of English proficiency to determine eligibility and placement in the school's ESOL Program. The parents are informed orally of the need of a language assessment and the student will be assessed for English aural/oral language proficiency:

ESOL Program Placement: A student identified as ELL will be placed in **two** ESOL courses as applicable to the student's grade level and language proficiency: The student is assessed for English aural/oral language proficiency using:

- 1. The Oral Language Proficiency Test II (IPT-II) 2nd Edition
- 2. Fluent English Speakers on the IDEA Oral Language Proficiency Test are administered the Kaufman Test of Educational Achievement II Brief Form (KTEA-II) as part of the entry requirements into the ESOL program. This test generates Reading and Writing scores and can be used to determine reading achievement

The School will use the charts correlating the Oral Language Proficiency Test Score Levels with Broward County Language Level charts:

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²⁰ http://www.broward.k12.fl.us/esol/Eng/ESOL/index.html



- Students with A1 to C1 or A1-B2 language level classifications are entitled to receive ESOL services.
- If the student is classified A1-B2, the school will update the language classification on TERMS
 and the ELLSEP folder. All decisions regarding ELL programmatic assessment and academic
 placement will be documented in the appropriate section of the student's English Language
 Learner Student Educational Plan (ELLSEP) folder. Parents will be notified of placement
 within 20 days in the home language.

ESOL Program - Program instruction will be designed to develop the student's mastery of the four language skills, including listening, speaking, reading, and writing, as rapidly as possible. English Language Learners will receive instruction, which is comprehensible, equal and comparable in amount, scope, sequence and quality to the instruction provided to English proficient students. The School will provide ESOL instruction in English and ESOL instruction in the basic core subject areas in accordance with the District's guidelines.

Students identified as ELL will be placed in **two** ESOL courses as applicable to the grade level and language proficiency:

1. Language Arts content course scheduled by grade level:

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M/J Language Arts 1 Through ESOL -100200002
M/J Language Arts 2 Through ESOL - 100201002
M/J Language Arts 3 Through ESOL- 100202002
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2. Language proficiency course scheduled by English Proficiency Level:

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1002181L1 - M/J Developmental Language Arts Through ESOL (Level 1)
1002181L2 - M/J Developmental Language Arts Through ESOL (Level 2)
1002181L3 - M/J Developmental Language Arts Through ESOL (Level 3)
1002181L4 - M/J Developmental Language Arts Through ESOL (Level 4)
```

If levels need to be combined, the *Developmental Language Arts Through ESOL* placement may be in the best combination of mixed language level courses (ESOL levels 1/2 or 3/4).

The Content-area instructional delivery model will include CCE/ESOL (Curriculum Content in English Using ESOL Strategies)

Administrators will be responsible for monitoring the implementation of strategies by the classroom teacher using classroom walk-through models. Evidence can be observed during classroom visits, through lesson plans, through use of materials and audiovisuals, and through grade book notations. All teachers of ELLs document the ESOL strategies used for each lesson in their lesson plans.

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Some of the ELL Strategies to assist ELLs include but are not limited to Marzano's High Yield Strategies, and as follows:

- **Identifying Similarities and Differences -** Mind mapping, Venn diagrams, T Charts, Cause and Effect Organizers, Word Sorts
- Cooperative Learning Group Projects, Language Experience Approach, Shared Reading and Writing, Book Pass, Dramatizations
- Nonlinguistic Representations Pictures, Manipulatives, Concept Maps, Student Drawings Mnemonic Clues, Visualization, 5 Senses Organizer
- Questions-Cues-Advanced Organizers Activate background knowledge, Frontload key vocabulary, Predicting, inferencing, concluding, Reciprocal teaching and modeling, Think alouds and guided questions, KWL
- Home learning and Practice Lesson opening with review and preview, Metacognition of strengths and weaknesses. Reflective journals, Sharing goals and objectives with parents, Praise efforts to use English, Hold high expectations, Honor individual learning styles, Use authentic assessment.
- **Resources:** Word-to-Word dictionaries in the students' heritage language/English language will be available in the ESOL and Content classrooms throughout the year, as well as, for all district and state assessments.

Developmental Language Arts through ESOL classes the school will use:

Visions/Hampton Brown Inside Fundamentals - ESOL Level 1 Visions/Hampton Brown Inside Level A - ESOL Level 2 Visions/Hampton Brown Inside Level B - ESOL Level 3 Visions/Hampton Brown Inside Level C - ESOL Level 4

The School will commit to provide instruction to ELL students in equal amount, sequence and scope, as to non-ELL students, by ensuring that:

- The same program goals and objectives for ELLs as non ELLs exist (content of basic subject area courses is the same in scope, sequence and quality as the instruction provided to non-ELLs);
- Teacher classroom goals and objectives are for mastery of state standards
- ELL students have access to honors, college preparatory, and advanced placement courses, as appropriate and regardless of language proficiency;
- Instructional delivery, not content, is modified to meet the needs of ELLs; and
- Content area teachers receive appropriate ESOL training, and utilize appropriate ELL strategies when ELLs are enrolled in their classes.

Assessments - All ELLs participate in statewide and district assessments including CELLA (proficiency exams). Accommodations are provided in accordance with State and District mandates and guidelines, which may include:

- English to heritage language dictionary;
- Flexible setting (parent must be notified prior to testing);
- Flexible scheduling;

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• Assistance in the heritage language (as specified in testing manual for each respective section of test to determine level of assistance);

Home Language Assistance Program: If the school has 15 or more ELL students speaking another language (per language group) other than English upon registration, the school will ensure that a linguistically qualified teacher or paraprofessional will be staffed to assist ELL students in understanding content instruction. (LULAC et al vs. School Board of Education Consent Decree). Teachers and paraprofessionals assigned to this program are expected to assist ELL students using their home language in the core subject areas of mathematics, science, and social sciences. Tutoring logs indicating services provided will be kept at the school by the administrator supervising the program.

Bilingual paraprofessionals will assist students through the use of the following:

- working in small groups
- translating information
- interpreting test questions and homework assignments as appropriate
- helping students comprehend textbooks and other written materials

The ELL Plan: All students classified as ELL will have an Individual ELL Student Plan. Such plan is part of the permanent student cumulative record folder upon entry into the ESOL program. The plan will include biographical student information (name, grade, home language) initial assessment and placement data, ESOL program and update information, program participation, amount of instructional time and/or schedule, exit information, post program review, ELL committee information, as well as a Progress Monitoring Plan (PMP) if needed. The plan will be updated on an ongoing basis to include programmatic changes, assessments, level updating, and ELL committee meeting information.

The ELL Plan will:

- Inform the student, parent, and teachers on the student ESOL language level
- Monitor student progression
- Establish meetings between the school, the parents, and the student to discuss academic progress
- Provide methods for evaluation and provisions for monitoring and reporting student progress
- Provide for parental and teacher involvement to ensure that the students are being properly serviced
- Provide for student exit from and reclassification into the program.
- Provide documentation for post program review for students who have exited the ESOL program

The School will designate an ESOL Coordinator to be responsible for developing and updating all Student ELL Plans/WLEP Plans, annually and keeping a record of parental contact and ESOL Program Records Folder.

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The ELL Committee: The main function of the ELL Committee is to resolve any issue that affects the instructional program of an ELL student. It is composed of: an administrator or designee, the ESOL teacher/coordinator, the home language teacher (if any), the classroom/subject area teacher(s), and a guidance counselor, or other educators as appropriate for the situation. The parent(s) will be invited to attend any meeting of the ELL Committee.

The ELL Committee will:

- Review instructional programs or progress.
- Address parental/teacher concerns.
- Review instructional program of former ELL (LF) students during the 2-year postreclassification period with consistent pattern of academic underperformance.
- Handle Reclassification of former ELL.
- Review academic progress for Extension of ESOL services.
- Review all available data to consider exiting a student out of the ESOL program.
- Request evaluations/support from CPS/RtI
- Schedule meetings to review the student's progress and make recommendations after thorough review of all necessary data
- Invite parent(s)/guardian(s) to attend all meetings, discuss and explain all recommendations
- Ensure that the parent(s)/guardian(s) understands the proceedings of the meeting, which may include arranging for an interpreter for parent(s)/guardian(s) whose native language is other than English
- Maintain an ELL Committee log to detail the date, name of child, reason for convening a meeting, and the outcome of the meeting.

Progress Monitoring and Subsequent Exit: The CELLA will be administered each spring to all current ELL students to measure proficiency and gains in reading, writing, listening, and speaking as follows:

Students in grades 3-8 will be eligible to exit from the school's ESOL program once they score proficient on the Listening/Speaking, Reading and Writing sections of the CELLA and score an achievement level of a 3 or equivalent developmental scale score on the Reading portion of the FCAT/or other adopted assessment beyond 2014.

School will follow the Exit Criteria Flowchart for any students who meet the new exit criteria. The School ESOL contact person, in coordination with its teachers, will follow the following procedures to exit students from the ESOL program:

- 1. Identify students who are eligible to exit the ESOL program based on the exit criteria.
- 2. Update the exit information on the ELLSEP folder for exiting students.
- 3. Complete the appropriate section of the ELLSEP folder with the assessment data used to determine English proficiency, date and signature. If the ELL Committee needs to be convened, parents will be invited and all members of the committee will sign as appropriate.

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- 4. Provide the school data processor with required exit data. The required information in entered in the State Database (TERMS).
- 5. Notify the parent(s) that the student is exiting the ESOL program.
- 6. Monitor the student for two years from the exit date in order to ensure success in the mainstreamed classroom.

Post Program Review - The School ESOL coordinator/designee with input from classroom teacher(s), and any other applicable staff will be required for conducting follow-up of former ELLs once they have exited the program. Exited student's academic performance in Language Arts/English will be monitored on an on-going basis and Post Program Review updates will be documented by the Language Arts teacher, via the following timeframe:

- At the end of the first grading period after exiting.
- At the end of the first semester after exiting.
- At the end of the first year after exiting.
- At the end of the second year after exiting.

The school will monitor the student's progress via:

- report cards
- test scores
- classroom performance
- Benchmark Assessments
- Post Program Review Reports (as applicable)
- Standardized tests (as applicable)
- Student Case Management referrals (as applicable)

This information will assist schools in determining if student's progress as well as the school's effectiveness servicing the needs of its ELL population.

ELLSEP plan will reflect the Student's current Language Arts teacher's employee number at time of monitoring. Post Program Review will be the responsibility of the Language Arts teacher, not the ESOL teacher. If student is not performing due to language deficiencies, student is referred to ELL committee. A decline of 1.0 in GPA requires ELL Committee review. If the student's performance is unsatisfactory, the ESOL coordinator or designee will convene an ELL Committee meeting to determine the reason(s) for the student's lack of progress and to recommend appropriate alternative interventions, including, but not limited to discussion over possible re-entry into the ESOL Program.

Parental Involvement: To promote parent and community participation in programs for ELLs, the school will invite parents to participate in district parent organizations. Parents of ELLs who are, or wish to be, in leadership positions will also be invited to attend local conferences and will be provided translation technology for better understanding.

B. Identify the staffing plan for the school's English language learner program, including the number and qualifications of staff.

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The School will ensure that experienced and ESOL certified teachers, as appropriate, will be hired to serve the School's English Language Learner Program, based on students' proficiency levels. The number of teachers will be based on the number of students identified upon student enrollment (results from home language surveys and/or ESOL levels). Additionally, the School is committed to ensuring that all core curriculum personnel instructing ELL students will have the appropriate training (ESOL endorsement/required coursework including ESOL Issues and Strategies -18 or 60 MPP) documentation. The Principal/Staffing Committee will identify each teacher's training status or requirement.

The School will offer on-site staff development opportunities for all staff to acquire ESOL endorsement. The Principal/Staffing Committee will identify each teacher's training status or requirement. The School will work with the Teacher Education Center to provide ESOL in-service training program(s) to assist language arts, basic subjects and other subject area teachers. The School will work with its Sponsor in informing staff of the sessions or web-based courses available to meet the ESOL/META training requirements.

All instructional members will be trained and expected to:

- identify the students in their grade book and record the ESOL level next to each student's name;
- use appropriate lessons and reflect ESOL strategies being used in lesson plans; and
- use appropriate grading guidelines and report card comments.

Additionally, once the School has 15 or more ELLs who speak the same language, the School will employ a bilingual paraprofessional or teacher, as required. Teachers and/or paraprofessionals assigned to this program will be expected to assist ELL students using their home language in the core subject areas and providing instructional assistance in the classroom to ensure the delivery of comprehensible instruction for the ELL students.

Bilingual paraprofessionals will assist students through the use of the following:

- working in small groups,
- translating information,
- interpreting test questions and homework assignments as appropriate, and
- helping students comprehend textbooks and other written materials.

The ESOL program coordinator, who will serve as a staff contact person, will have the responsibility of overseeing/assisting staff in meeting the needs of the School's ELL population throughout the school year.

C. Explain how English Language Learners who enter the school below grade level will be engaged in and benefit from the curriculum.

All students will be engaged in and benefit from the curriculum including English language learners or students who enter the school below grade level. The results of the most recent state/district Assessment Test, teacher-made tests, and CELLA and other screenings through the reading program will be used to determine the level of mastery in reading, writing, mathematics and science for all

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students. This information, coupled with the results of the prior year standardized tests results and student records, will be used to determine the best educational setting for students (e.g., appropriate course selection, tutoring, referral for special services).

Apart from providing the specific services listed in the English Language Learner's WLEP Plan, the School's faculty will differentiate instruction as necessary, as well as offer tutoring services or other such assistance such as what is offered to non-ELL students, to ensure students are successful.

The Common Core State Standards for English language arts articulate rigorous grade-level expectations in the areas of speaking, listening, reading, and writing to prepare all students to be college and career ready, including English language learners. ELL's will benefit from instruction about how to negotiate situations outside of those settings so they are able to participate on equal footing with native speakers in all aspects of social, economic, and civic endeavors.

ELLs, like English-speaking students, require regular access to teaching practices that are most effective for improving student achievement. In order to ensure the ELL are engaged and benefit from CCSS curriculum, the School will train teachers of ELL's to:

- Keep high cognitive demand for Mathematical tasks
- Attend explicitly to concepts; and derive lessons that allow to students to wrestle with important mathematics.
- Ensure that students understand the text of word problems before they attempt to solve them;
- Focus on "mathematical discourse" and "academic language" during instruction of Mathematics

Student performance will be continuously assessed and students not making adequate progress towards mastery of the standards:

- All students not meeting standards will be placed on a Progress Monitoring Plan and specific strategies to remediate any learning deficiencies will be implemented (excluding those ELL students who have been participating in the ESOL program for less than 2 years.) This plan requires active participation from the student, the parents and specific teachers in order to ensure continuous student improvement. This initiative allows each student to have ownership and understating of his/her learning style and allows each student to track and monitor his/her achievement. The PMP will be comprised of specific measurable individualized goals for that student, as well the strategies and services (tutoring/required additional classes) to be implemented in order for the student to achieve the specified goals.
- ESOL/Reading strategies in the content areas will be facilitated throughout the curriculum to provide additional practice in addition to those taught during language arts classes.
- Early bird, Super Saturday, and daily pullout tutoring may be required for those students consistently demonstrating non-mastery of the standards.
- Students consistently demonstrating non-mastery of Benchmarks on teacher generated quizzes, chapter tests, projects, investigations, and poor academic progress will be targeted for supplemental and intensive instruction/intervention.

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Section 8: School Climate and Discipline

A. Describe the school's planned approach to classroom management and student discipline.

The School's philosophy regarding student behavior ensures commitment to the school's mission on a daily basis. The School's mission is to prepare middle school students for high school and careers beyond through an innovative and engaging educational program emphasizing sports leadership career exploration. The educational purposes of the schools are accomplished best in a climate of student behavior that is socially acceptable and conducive to the learning and teaching process. Student behavior that disrupts this process or that infringes upon the rights of other individuals will not be tolerated. Therefore, a safe and orderly school environment is of primary importance to creating an enjoyable learning environment for both students and teachers. Furthermore, when students behave in a respectful, responsible and safe manner, they enjoy a more productive learning experience and develop into responsible citizens.

SLAM students will be students in the Broward County Public School System, and will thereby be required to abide by the district's Code of Student Conduct. Proper and appropriate student conduct will be recognized whereas behaviors categorized as Levels I-IV as per the Districts Code of Student Conduct will be handled according the said consequences in the Code of Student Conduct. Whenever necessary and appropriate a child study may be convened to create a plan of action for addressing a learner's behavioral challenges as a means for intervention and assistance rather than mere punishment for repetitive negative behaviors that may be addressed through assistance and intervention.

The School expects each parent to take an active role in supporting this plan. It is in the student's best interest that parents and staff work together to ensure that students are provided with a safe, engaging learning environment that prepares them to be successful.

B. Describe the school's Code of Conduct, including the school's policies for discipline, suspension, and dismissal.

SLAM will adopt and follow the most recent version of the **Broward County Public Schools Handbook Code of Student Conduct Policy 5.8 and Discipline Matrix**. The School will incorporate the district's policies and expectations for students related to consistent and timely attendance, respect for persons and property, appropriate dress, technology usage, student publications, student activities, student records, and the right to appeal, including grievance procedures. This information will be made available to parents and students upon registration. Parents and student will be required to read, discuss, and accept the policies. The school will also distribute the *Broward County Public Schools Handbook Code of Student Conduct Policy 5.8* and ensure that all parents and students sign and return the Acknowledgement Form to be stored with students' records.

The School will uphold a No Tolerance policy toward school related violent crime. The Board reaffirms its support of the administrative staff and teachers in taking all necessary steps to enforce and implement all Board rules pertaining to the maintenance of appropriate student behavior. Important

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among these rules are those in the areas of conduct, corporal punishment, suspensions, expulsions, and climate for learning. The School maintains a "NO TOLERANCE" policy for weapons in school.

Within every school, the principal and staff have the responsibility and authority for maintaining the orderly educational process. The principal is authorized to take administrative action whenever a student's misconduct away from school has a detrimental effect upon other students or on the orderly educational process. As per the district's Code of Student Conduct, the school will handle discipline according to the matrix provided by the district.

In accordance with *the BCPS Code of Student Conduct and the respective Discipline Matrix*, the most appropriate disciplinary action taken by the school, will be the least extreme measure that can resolve the discipline problem. Teachers and administrators strive to use a variety of informal disciplinary or guidance strategies, prior to, during, and after formal disciplinary action.

When confronted with an act that may require disciplinary action, the student and all other appropriate persons should be given the opportunity to explain the circumstances of the incident. The School will make every effort to inform a parent of disciplinary action prior to the action being taken, if at all possible.

Some of the disciplinary actions that may be utilized (in accordance with the District's Code of Student Conduct) include: Removal from Class; Student Work Assignment; Peer Mediation Other Alternatives (e.g. after-school detention)

Suspension: The Principal of the School may suspend a student from school for up to ten days for persistent disobedience and/or gross misconduct. Principals take this action when they have exhausted informal disciplinary strategies, or when they have at least considered those alternatives and rejected them as inappropriate in a given situation.

<u>In-School Suspension (ISS)</u>: takes away the privilege of attending classes; student remains in school and may get credit for work completed during ISS. A student receiving ISS may not be allowed to participate or attend during the ISS period in after school activities (i.e., sports, clubs, etc.).

Outdoor Suspension may necessary under the following conditions:

- The student's presence in school presents a physical danger to the student or others;
- A "cooling off" period is needed in order to relieve tensions and relieve pressure; and/or
- The student and/or parent refuse an alternative to suspension.

During a suspension the child will be given the opportunity to complete the work that was missed during the suspension. Failure to make up the assigned work missed during a period of suspension will result in the student being given the academic grade of "F" for those assignments. A suspended student completing assigned work missed during the period of suspension will not be subject to the withholding of passing final grades unless the student has, in addition to suspension, attained five or more unexcused absences in a semester course or ten or more unexcused absences in an annual course. In addition to making up assigned work, the student will be held responsible for the material presented

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during his or her absence.

Under no circumstances are teachers required to make special provisions to comply with this procedure. The responsibility for securing assignments missed during the suspension period will be that of the student. Upon completion of the makeup work, within a reasonable amount of time, the student should submit the work to the teacher. The teacher must grade and record the makeup work as it is received. Improved effort and conduct by the student are expected, and the teacher will handle lack of improvement in an appropriate manner (e.g., parent conference, lowered effort and/or conduct grades, or referral to administration).

Dismissal or Recommendation for Expulsion: In accordance with the Code of Student Conduct, the School's Principal may request the School's Governing Board vote to recommend to the Superintendent that a student be expelled, after a hearing where due process has transpired. The principal of the School may request that the School District Superintendent consider this action when the School has exhausted less severe administrative disciplinary action, or when the School has considered those alternatives and rejected them as inappropriate in the given situation. Only the Sponsor can expel a student from a Broward County Public School, and therefore regardless of any recommendations made by the governing board of the School, the decision to expel lies only with the School Board of Broward County.

II. ORGANIZATIONAL PLAN

Section 9: Governance

A. Describe how the school will organize as or be operated by a non-profit organization.

The Sports Leadership and Management Foundation, Inc., a Florida non-profit corporation, is the legal entity that will operate the School in accordance with its *Articles of Incorporation and Bylaws* (See Attached - Appendix C).

All powers of the Corporation shall be exercised by and under the authority of the Governing Board of The Sports Leadership and Management Foundation Inc. and the property, business, and affairs of the Corporation shall be managed under the Governing Board's direction. The Governing Board is the ultimate policy-making body for the school, and will have the responsibility for the affairs and management of the school. The Governing Board will provide continuing oversight of school operations, including a responsibility to effectively and properly manage public funds.

Pursuant to the Articles of Incorporation, Sports Leadership and Management Foundation Inc. is a wholly-owned subsidiary company of Mater Academy Inc., a Florida non-profit corporation. Mater Academy Inc., the parent organization, is the sole member of Sports Leadership and Management Foundation, Inc. As the parent Organization, Mater Academy Inc. retains specified corporate functions as detailed in the Articles of Incorporation which include: issuing new or additional membership interests; any corporate merger, consolidation, dissolution, or liquidation; any amendment

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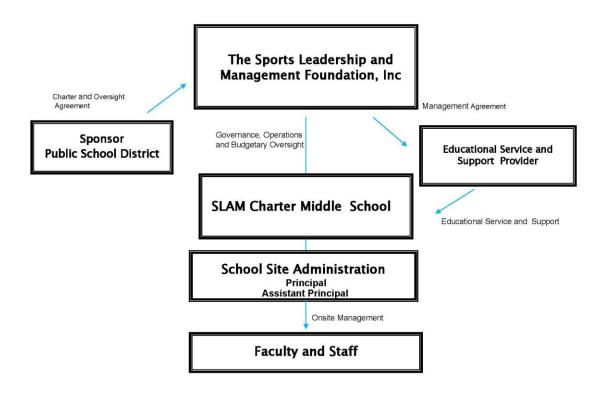


to the Articles of Incorporation or Bylaws; appointment of directors and/or designation of officers; financing; inability to pay debts, insolvency, or corporate bankruptcy.

B. Provide an organizational chart for the school and a narrative description of the chart. Clearly describe the proposed reporting structure to the governing board and the relationship of the board to the school's leader and administration.

The Governing Board will determine the academic direction and oversees the operation of the School. The Governing Board will hire and oversee the school principal. The Principal, as the instructional leader, will be responsible for all aspects of day-to-day administration of the school within the scope of the board's operating policy and in compliance with district, state, and federal guidelines. The School's on site administration (principal and assistant principal and lead staff) will ensure the operations of the school (resources, courses, policies) are in accordance with the mission and vision of the School. The principal, as the instructional leader, will make all school-based decisions, establishing and implementing procedures for the day-to-day operations of the School. The Principal will hire, oversee, and evaluate faculty and staff. The faculty and staff will be responsible for carrying out these procedures in their daily activities and interactions with students, parents and the community. The school's faculty and staff will report directly to the principal, who reports to the Governing Board.

The following is the organizational chart for the School:



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- C. Provide a description of how the governing board will fulfill its responsibilities and obligations, including but not limited to:
 - Adoption of annual budget
 - o Continuing oversight over charter school operations

The Governing Board is the ultimate policy-making body for the school, and will have the responsibility for the affairs and management of the school. The Governing Board will provide continuing oversight of school operations, including a responsibility to effectively and properly manage public funds.

Board Member Duties: The Governing Board will perform the following duties, as well as any and all other duties specified in Florida Statutes regarding Governing Boards of Charter Schools and any other duties specified therein the Applicant's Bylaws:

- Oversee operational policies; Academic accountability, and financial accountability.
- Annually adopt and maintain an operating budget.
- Exercise continuing oversight over charter school operations.
- Report its progress annually to its sponsor, which shall forward the report to the Commissioner of Education at the same time as other annual school accountability reports.
- Ensure that the charter school has retained the services of a certified public accountant for the annual financial audit, pursuant to paragraph (g), who shall submit the report to the governing body.
- Review and approve the audit report, including audit findings and recommendations
- Monitor a financial recovery plan in order to ensure compliance (if applicable).
- Report progress annually to its sponsor, including at least the following components (i.e. Charter School Annual Report):
 - 1. Student achievement performance data
 - 2. Financial status of the School, including revenues and expenditures at a level of detail that allows for analysis of the ability to meet financial obligations and timely repayment of debt.
 - 3. Documentation of the facilities in current use and any planned facilities for use by the charter school for instruction of students, administrative functions, or investment purposes.
 - 4. Descriptive information about the charter school's personnel, including salary and benefit levels of charter school employees, the proportion of instructional personnel who hold professional or temporary certificates, and the proportion of instructional personnel teaching in-field or out-of-field.

President: As further specified in the Bylaws, the President is the chief executive officer of the corporation and has, subject to the control of the Board, general supervision, direction and control of the business and officers of the corporation. The President shall preside at all meetings of the Board. The President has the general management powers and duties usually vested in the office of the President and general manager of a corporation as well as such other powers and duties as may be prescribed by the Board or Bylaws from time to time.

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Vice President: As further specified in the Bylaws, the Vice President(s), in the absence of the President, shall perform all duties of the President and shall have such other powers and perform such other duties as the Board may prescribe from time to time.

Secretary: As further specified in the Bylaws, the Secretary shall be responsible for keeping minutes of all meetings and actions of the Governing Board. The Secretary shall give, or cause to be given, notice of all meetings as required by the Bylaws, and in accordance with applicable law. The Secretary shall keep the seal of the Corporation, and shall have such other powers and perform such other duties as may be prescribed by the Board or by the Bylaws.

Treasurer: As further specified in the Bylaws, the Treasurer shall be responsible for adequate and correct accounting records of all transactions of the Corporation including an accounting for its assets, liabilities, receipts, disbursements, gains and losses. The Treasurer shall ensure all moneys and other valuables are deposited in the name and to the credit of the Corporation with such depositaries as may be designated by the Board. The Treasurer shall ensure, financial statements are prepared on a periodic basis including a statement of financial position, statement of activities, statement of cash flows and such other statements as requested by the President and the Board or those that are required to be in compliance with not-for-profit accounting. The Treasurer shall have such other powers and perform such other duties as may be prescribed by the Board or Bylaws.

D. Describe the proposed policies and procedures by which the governing board will operate, including board powers and duties; board member selection, removal procedures and term limits; code of ethics, conflict of interest, and frequency of meetings. If the Board has not yet developed policies, the applicant shall describe the timeline for development and approval of Board policies.

Charter school governing boards must be guided by a set of by-laws that define how the board will operate. Applicants may include their proposed by-laws.

The policies and procedures by which the board will operate, including specific board member powers are specifically detailed in the attached Bylaws.

A brief overview of those policies and procedures is as follows:

Board Member Duties: The Governing Board will perform the following duties, as well as any and all other duties specified in Florida Statutes regarding Governing Boards of Charter Schools and any other duties specified in the Bylaws:

- Oversee operational policies; Academic accountability, and financial accountability.
- Annually adopt and maintain an operating budget.
- Exercise continuing oversight over charter school operations.
- Report its progress annually to its sponsor, which shall forward the report to the Commissioner of Education at the same time as other annual school accountability reports.
- Ensure that the charter school has retained the services of a certified public accountant for the annual financial audit, pursuant to paragraph (g), who shall submit the report to the governing body
- Review and approve the audit report, including audit findings and recommendations

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- Monitor a financial recovery plan in order to ensure compliance (if applicable).
- Report progress annually to its sponsor, including at least the following components (i.e. Charter School Annual Report):
 - 1. Student achievement performance data
 - 2. Financial status of the School, including revenues and expenditures at a level of detail that allows for analysis of the ability to meet financial obligations and timely repayment of debt.
 - 3. Documentation of the facilities in current use and any planned facilities for use by the charter school for instruction of students, administrative functions, or investment purposes.
 - 4. Descriptive information about the charter school's personnel, including salary and benefit levels of charter school employees, the proportion of instructional personnel who hold professional or temporary certificates, and the proportion of instructional personnel teaching in-field or out-of-field, etc.

Board Member Selection & Removal Procedures & Term Limits: The Applicant's Bylaws clearly specify the selection, removal procedures, and term limits of Board Members, and is summarized as follows:

Selection: Directors shall be elected by the Member at a duly organized meeting of the Board of Directors, and shall serve for a term determined by the Member. Notice of the Member's intentions to elect a Director shall be included in the agenda for that meeting and publicly announced.

Removal Procedures: Any member may be removed with or without cause by the Member. Newly created directorships resulting from an increase in the number of directors compromising the board and all vacancies occurring on the board for any reason, including death, resignation, or removal, shall be filled by the Member. Newly elected members will agree to support the founding organization's vision in order to maintain continuity between the founders and the subsequent board members.

Term Limits: A Director shall be elected for a term as determined by the Member.

Code of Ethics: It is Board policy that employees and board members uphold the highest standards of ethical, professional behavior. To that end, these employees and board members will agree to commit themselves to carrying out the mission of this organization and shall:

- Be mindful of and honor the safety, health and welfare of the public in the performance of professional duties.
- Act in such a manner as to uphold and enhance personal and professional honor, integrity and the dignity of the profession.
- Treat with respect and consideration all persons, regardless of race, religion, gender, sexual orientation, maternity, marital or family status, disability, age or national origin.
- Recognize that the mission at all times is the effective education of children and the development of institutions to foster that mission.
- Engage in carrying out the Board's mission in a professional manner.

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- Collaborate with and support other professionals in carrying out the educational mission.
- Build professional reputations on the merit of services.
- Keep up to date and informed on emerging issues and business of the Board, and to conduct themselves with professional competence, fairness, impartiality, efficiency and effectiveness.
- Uphold and implement policies adopted by the Board of Directors.
- Keep the faculty, parents, students and community informed about issues affecting them.
- Conduct organizational and operational duties with positive leadership exemplified by open communication, creativity, dedication and compassion.
- Exercise whatever discretionary authority they have under the law so as to carry out the mission of the organization.
- Serve with respect, concern, courtesy, and responsiveness in carrying out the organization's mission.
- Demonstrate the highest standards of personal integrity, truthfulness, honesty and fortitude in all activities in order to inspire confidence and trust in such activities.
- Avoid any interest or activity that is in conflict with the conduct of official duties.
- Respect and protect privileged information to which they have access in the course of their official duties.
- Strive for personal and professional excellence and encourage the professional development of others.

Conflict of Interest Policy: As a nonprofit, tax-exempt organization authorized to operate charter schools, the operations of the Applicant can also be viewed as a public trust, which is subject to scrutiny by and accountable to the public. Consequently, a fiduciary duty exists between the Board, officers, management employees, and the public, which carries with it a duty of loyalty and fidelity. The Board, officers, and management employees have the responsibility of administering the affairs of corporation honestly and prudently. Those persons shall exercise the utmost good faith in all transactions involved in their duties, and they shall not improperly use their positions with, or knowledge gained from the organization for their personal benefit.

Nature of Conflicting Interest: A conflicting interest may be defined as an interest, direct or indirect, with any persons or firms mentioned above. Such an interest might arise through:

- Owning stock or holding debt or other proprietary interests in any third party dealing with the Corporation.
- Holding office, serving on the Board, participating in management, or being otherwise employed (or formerly employed) with any third party dealing with the Board.
- Receiving remuneration for services with respect to individual transactions involving the Corporation.
- Using the corporation's time, personnel, equipment, supplies or good will for other than Board approved activities, programs and purposes.
- Receiving personal gifts or loans from dealing or competing third parties. Receipt of any gift is
 disapproved except gifts of a value less than \$150, which could not be refused without
 discourtesy. No personal gift of money should ever be accepted.

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Interpretation of this Statement of Policy: The areas of conflicting interest listed and the relations in those areas, which may give rise to conflict are not exhaustive. Conflicts might arise in other areas or through other relations. Directors, officers and management employees will hopefully recognize such areas and relation by analogy. However, it is the policy of the Board that the existence of any conflict of interest shall be disclosed before any transaction is consummated. It shall be the continuing responsibility of the Board, officers, and management employees to scrutinize their transactions and outside business interests and relationships for potential conflicts and to immediately make such disclosures.

Disclosure Policy and Procedure: Transactions with parties with whom a conflicting interest exists may be undertaken only if all of the following are observed: The conflicting interest is fully disclosed; 2. The person with the conflict of interest is excluded from the discussion and approval of such transaction; 3. Where products, goods or services are being procured or sold, that there exists reliable independent evidence of fair value (which shall be specifically identified in and attached to the minutes), which may include a competitive bid or market survey or comparable valuation or other reliable evidence of market value; and The Board has determined that the transaction is in the best interest of the organization.

Disclosure in the organization should be made to the Board Chair who shall bring the matter to the attention of the Board. Disclosure involving the directors should be made to the Board. The Board shall determine whether a conflict exists and in the case of an existing conflict, whether the contemplated transaction may be authorized as just, fair and reasonable. If the conflict is not deemed to be material and the conflicted party is excluded from the decision making process, then the Board can use its reasonable judgment and make a decision, which it deems to be in the best interest of the entity. The decision of the Board on these matters will rest in its sole discretion, and its concern must be the welfare of the Corporation and the advancement of its purpose.

Meeting schedule selection: A procedure for selection of meeting schedule is clearly written in the Applicant's Bylaws. The Applicant will vote upon and post their meeting schedule for the 2010-2011 school year, and annually thereafter, in accordance with chapter 119 of the Florida Statutes, relating to public records, and public meetings.

- E. Explain how the founding group for the school intends to transition to a governing board. (This question is not applicable if the applicant is an established governing board.) N/A
- F. Describe the plans for board member recruitment and development, including the orientation process for new members and ongoing professional development.

Board members will agree to oversee the operational policies, and ensure academic accountability and financial accountability of the School as well as participate in charter school governance training and successfully undergo a background check by the Sponsor, as specified by law.

Governance Training: The administrators and Governing Board members will be trained in the areas of Non-Profit Board Governance, Florida's Open Government Requirements, the Florida Sunshine Law,

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and the Florida Public Records Law. This training will be provided by The Florida Consortium of Public Charter Schools or another approved vendors. Further, as presented in the Applicant's Bylaws, The Applicant shall develop an orientation and training program for new directors and an annual continuing education program for existing directors.

G. List each of the proposed members of the school's governing board, indicating any exofficio members and vacant seats to be filled. For each proposed member, provide a brief description of the person's background that highlights the contribution he/she intends to make through service as a governing board member and any office of the board that individual holds.

The Sports Leadership and Management Foundation, Inc. is the non-profit organization responsible for the educational, legal and financial obligations of The School. The members of the Board of Directors is comprised of community members who possess the expertise in areas of business, education, finance, law, school management and governance to effectively oversee these obligations. These professionals will be responsible for establishing policies consistent with the School's mission and ensuring that the educational programs and school operations are in compliance with all statutory and regulatory requirements. Below is a brief overview of each member's background that illuminates the contribution he/she intends to make through service as a governing board member:

Rene Ruiz, Esq. – Attorney

Rene Ruiz is an attorney at the law offices of Stearns Weaver Miller Weissler Alhadeff & Sitterson, P.A., and devotes his practice to working with companies on a broad range of labor and employment matters. Rene defends companies in employment litigation, with an emphasis on discrimination, harassment, and the Fair Labor Standards Act. He regularly advises clients regarding compliance with wage and hour laws, Title VII, the Family and Medical Leave Act, and Title III of the Americans with Disabilities Act. Rene also provides management-level individuals with training on litigation avoidance. In addition, Rene regularly negotiates contracts for companies with unionized workforces and advises employers on contract administration.

Mr. Ruiz is admitted to all Florida state courts and the Southern District of Florida. He has extensive experience in federal and state courts, as well as numerous federal and state administrative agencies. He is fluent in Spanish. Mr. Ruiz is included in the 2008 and 2009 editions of Best Lawyers in America. Mr. Ruiz has also been listed as a Legal Elite "Up and Comer" by Florida Trend's since 2006.

Education: University of Miami School of Law (J.D., cum laude, 2001) Florida International University (B.A., magna cum laude, 1998)

Robert Abello, M.D. - Physician

Dr. Robert Abello, originally from Barcelona, Spain, obtained his undergraduate training in Boston, Massachusetts. He subsequently worked in different research projects in the fields of physiology and endocrinology and he became author and co-author of many publications in medical journals. He graduated from the University of Miami School of Medicine and he followed with an emergency medicine residency in New Orleans, Louisiana. During the residency, he was awarded the honor of

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Chief Resident and also given the resident's Teaching Award. Dr. Abello resides in Miami and continues to work as a staff physician in an emergency room in South Florida.

An accomplished athlete with three marathons and multiple triathlons, he has found his passion in integrative medicine, a multidisciplinary approach to the human body. He has received a fellowship in Anti-Aging and Regenerative Medicine as well as been trained by Cenegenics, an Age Management group. He has written articles for local newspapers as well as been featured on T.V. news shows.

Alina Lopez - Charter School Assistant Principal

Alina Lopez has ten years of experience in the field of education and has been an administrator for the past three years. Ms. Lopez earned a Bachelor of Arts in Psychology in 1995 from Florida International University and in 1997, completed her Masters Degree in Elementary Education from Nova Southeastern University. Mrs. Lopez also completed her Certification in Educational Leadership in 2004 from Florida International University.

Prior to coming to Doral, Mrs. Lopez primarily taught 5th grade Math and Science at Mater Academy Charter School. She has also worked as an administrator at the elementary, middle school and high school level. Her contributions as an educator have helped the schools she has taught in and administered achieve excellence year after year.

Mrs. Lopez is dedicated to building a school community where the teachers and staff believe that every individual student is unique and can attain academic success. She will strive to involve teachers, parents and students by using a combination of data-driven instruction and prompting respect and understanding amongst all stakeholders.

Shannine Sadesky, MS. Ed., Administrator

Ms. Sadesky is one of Florida's most experience and accomplished Charter School educators and administrators. She is currently the Principal at Somerset Academy Charter School in Miramar, Florida. She was previously the principal of Somerset's Pembroke Pines Campus, an A+ school for three years in a row.

After earning her bachelor's degree (cum laude) in Elementary Education from American University, Ms. Sadesky continued her graduate studies at Nova Southeastern University where she completed the certification program in Educational Leadership.

Ms. Sadesky has been recognized as a Member of Golden Key National Honor Society, a Broward Education Foundation Science Grant Recipient, and has received an Award from the Annenberg Challenge Grant Project Steering Committee for Outstanding Leadership. Most recently, Ms. Sadesky is credited with writing a competitive grant sponsored by the Walton Family Foundation, which awarded over \$300,000 to Somerset's Miramar Campuses.

C. Christian Crousillat – Entrepreneur

Mr. Crousillat has worked in the construction industry for more than a decade. He obtained a Bachelor of Science in Construction Management from Florida International University. Currently, Mr.

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Crousillat, is Co-Owner of CKA CONSTRUCTION GROUP, LLC, a Commercial and Residential General and Roofing Contractor. Mr. Crousillat manages company operations and construction projects.

Previously, Mr. Crousillat worked for URS Corporation in the capacity of Construction Manager for various private and governmental entities, including the West Palm Beach School Board and the City of Miami Beach Capital Improvements Projects Office. He began his professional career at RUSH Construction, working in the Government sector as a Contractor on projects for National Aeronautics Space Administration (NASA), Cape Canaveral Air Station (CCAS) and Patrick Air Force Base (PAFB).

Mr. Crousillat maintains the following certifications and licenses: Florida Certified General Contractor's License, Florida Certified Roofing Contractor's License, OSHA Certified, Certified AMMA Master Window Installer, Cross Connection Certification, Wind Mitigation Certification, Estimating Building Construction Certification, Home/Building Inspection Certification

Roberto C. Blanch, Esq. - Attorney

Roberto C. Blanch has been an attorney with Siegfried, Rivera, Lerner, De la Torre and Sobel, PA, since 2001, and became a shareholder in 2007. Mr. Blanch concentrates his practice in Community Association Law, handling a broad range of legal issues for the firm's condominium, Cooperative and Homeowner Association clients. Mr. Blanch's experience includes the review and interpretation of community association governing documents; drafting amendments to governing documents; drafting and negotiation service and construction agreements for the firm's community association clients; and the representation of community associations in court and administrative agencies. Mr. Blanch speaks regularly at State-approved board member certification courses and educational seminars and has authored several articles pertaining to various issues affecting community associations. Mr. Blanch is a member of the Dade County Bar Association, the Cuban American Bar Association, Community Association Institute, and Community Association Network. He is admitted to the Florida Bar (Member of Real Property, Probate and Trust Law Section of the Florida Bar) and to the U.S. District Court (Southern District and Northern District of Florida). Mr. Blanch is currently a member of the Saint Thomas University Law School Board of Advisors and serves on the Board of Directors of Mater Academy, Inc., a not-for-profit organization overseeing the operation of fifteen charter schools in Miami-Dade County, Florida. Mr. Blanch also previously served as a member of the Board of Directors for the Spanish American League Against Discrimination. Roberto C. Blanch received his Bachelor of Science in Business Administration from the University of Florida in 1997 and his Juris Doctor from Saint Thomas University in 2000.

H. Outline the methods to be used for resolving disputes between a parent and the school.

The school's governing board will appoint a representative to facilitate parental involvement, provide access to information, assist parents and others with questions and concerns, and resolve disputes. The representative may be a governing board member, charter school employee, or individual contracted to represent the governing board. The representative's contact information will be provided annually in writing to parents and posted prominently on the charter school's website if a website is maintained by the school. The appointed representative and charter school principal or director, or his equivalent, will be physically present at board meetings in accordance with FS 1002.33 (7)(d)(1) and (7)(d)(2).

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Positive relations between the School and its parents and families are a primary concern. For that reason, every effort will be made to handle disputes in the most positive way possible. The following steps have been outlined in order to facilitate resolution of such issues:

- i. Make appointment to clarify issue with student's teacher
- ii. Make appointment to clarify issue with school administration
- iii. Contact the identified person at the Service and Support Organization
- iv. Contact the Governing Board Chair
- v. State concerns at a scheduled Governing Board meeting

Section 10: Management

A. Describe the management structure of the school. Include job descriptions for teachers and each administrative position that identify key roles, responsibilities and accountability.

The management structure for the school's day-to-day operations will be as follows:

The Governing Board will hire and oversee the school principal. The Principal, as the instructional leader, will be responsible for all aspects of day-to-day administration of the school within the scope of the board's operating policy and in compliance with district, state, and federal guidelines for the school's operation. The Principal will hire, oversee, and evaluate faculty and staff. The principal will make all school-based decisions, establishing and implementing procedures for the day-to-day operations of the school including procedures for curriculum and instruction, classroom management, discipline, faculty and staff evaluation, data analysis, testing, support services, parental communication, professional development, discipline, community outreach, oversight of facilities and internal financial controls, etc. The principal will report to the board on the school's operations and finances at minimum at every governing board meeting and will be expected to communicate with the board as often as needed by the School and/or board members in order for school's operational needs to be met.

The administrative staff (to include Assistant Principal, Counselor, ESOL Coordinator and ESE Program Specialist, etc.) will assist the principal in implementing policies and procedures for the daily operations of the school as determined by their specific role in the school. The principal will delegate such duties to the assistant principal and administrative support staff to ensure that daily operations, resources, policies and procedures are being implemented in accordance with the school's mission. Faculty and staff will be responsible for carrying out these procedures in their day-to-day duties, activities, and interactions with students, teachers, and parents of the school.

The duties and key roles for these key personnel are detailed in **Appendix E – Job Descriptions of Key Personnel**.

The Board will contract Academica, an Educational Services and Support Provider, to provide off-site support to the school. The support services to be provided are central office functions including but not limited to: assistance with facilities design and maintenance, staffing recommendations and human resource coordination, curriculum support, research and updating, sponsor relations and reporting,

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program marketing, general accounting services including bookkeeping, payables, asset management, budget preparation, risk management, cash flow analysis, and preparation of financial statements provided to the Governing Board for oversight and approval. The **Sample ESP agreement** in **Appendix D** includes all anticipated professional support services to be provided.

Financial Oversight and Management - The Governing Board has the ultimate responsibility of ensuring that the school's finances are managed properly. As per the duties describe in *Section 9-Governance*, the Board will annually adopt and maintain an operating budget and maintain oversight of all school-based finances. The Governing Board will ensure that the charter school has retained the services of a certified public accountant for the annual financial audit. The ESP, as contracted by the Board, will assist the School with additional preparation and reporting of the school's finances.

The school principal, with support from the ESP, will prepare the estimated budget using anticipated enrollment projections prior to the beginning of each fiscal year. Hiring and procurement decisions will be made at that time. Enrollment will be closely monitored in order to make sure that appropriate master schedules and hiring decisions remain within budgetary constraints. Budget reports will be prepared and presented to the Sponsor and the Board on a monthly basis for oversight. Actual budgets will be prepared and presented to the Board at all quarterly board meetings.

The board has also established financial policies and internal control for the school's operational and internal accounts. These policies and controls are detailed in Section 18, *Financial Management and Oversight*, of this application.

B. Outline the criteria and process that will be used to select the school's leader.

The school principal will be hired by the board, and will be responsible for all aspects of school operations within the scope of operating policy and budgetary approval by the Governing Board. The Board intends to recruit talented individuals who have knowledge of and experience with instructional, educational, and school-site matters. The school will adhere to the anti-discrimination provisions of s. 1000.05, Florida Statutes.

At minimum, the Governing Board will seek an individual who has:

- extensive administrative and teaching experience;
- State of Florida Educational Leadership Certification;
- experience working with school or advisory educational boards;
- strong managerial capabilities;
- knowledge of the needs of student population;
- positive evaluations from previous administrative position(s);
- letters of recommendation:
- excellent communication skills; and
- demonstrated capacity to meet and or exceed the Florida Principal Leadership Standards

Administrator Evaluations- The governing board will conduct formal administrator evaluations annually (mid-year and end-of-year review) using a Comprehensive Assessment Appraisal System in

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accordance with the Florida Principal Leadership Standards. The Standards are set forth in rule as Florida's core expectations for effective school administrators. There are ten Standards grouped into categories, which can be considered domains of effective leadership. The school will use the Sponsor's School Site Managerial Exempt Performance (MEP) Evaluation, which is aligned to the Florida Principal Leadership Standards and approved by the Florida Department of Education. In compliance with the *Student Success Act*, the administrator's evaluation takes into account:

- 1. <u>Performance of Students</u> fifty percent of the school administrator's evaluation will be based upon the performance of the students assigned to the school over a 3-year period.
- 2. <u>Instructional Leadership</u> Leadership standards adopted by State Board of Education, including: performance measures related to effectiveness of classroom teachers, recruitment and retention of effective & highly effective teachers, improvement in the percentage of instructional personnel rated as highly effective & effective, appropriate use of evaluation criteria and other practices that result in student learning growth.
- 3. <u>Professional & Job Responsibilities -</u> Other job responsibilities as adopted by State Board of Education and the Sponsor and may also includes a mechanism to give parents and teachers an opportunity to provide input into the administrator's performance assessment, when appropriate.
- C. Provide a staffing plan for each year of the charter term aligned with the school's projected enrollment as detailed on the cover page of this application.

The detailed staffing plan for each year of the charter in accordance with the projected student population is found in *Appendix A* – *Budget (Staffing Plan)*.

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Staffing Plan

SLAM Middle - Broward

Fringe Benefit Rate	22.00%
FICA	6.20%
Medicare	1.45%
FUTA	\$ 189.00
SUTA	\$ 189.00
Workers Comp	0.88%
401K Contribution	2.00%
Health Insurance per Employee	\$ 4,140.00

\$345 Per month per Employee

		Yr1	Yr2	Yr3	Yr4	Yr5
		High				
Instruction Staff						
Teachers (ESE or ESOL certified teacher)	39,500	17	28	33	35	35
Substitute Teachers	1,100	17	28	33	35	35
Other Teachers (ESE, ESOL, see Budget Narrative)	39,500		1	1	1	2
Paraprofessionals	18,000		1	1	1	1
Supplements	3,500	8	14	16	17	
	101,600	17	30	35	37	38
Pupil Personnel Services						
ESE Teacher	40,000	1.00	1	1	2	2
202 1000101	40,000	1	1	1	2	2
Media Services	.,					
Media Specialist	40,000			1	1	1
'	40,000	-	-	1	1	1
School Administration	,					
Principal	85,000	0.75	1.00	1.00	1.00	1.00
Assistant Principal	65,000		1	1	1	1
Administrative Assistant	24,961	0.50	1	1	1	1
Registrar	22,000	1.00	1.00	1.00	1.00	1.00
Other Clerical	18,000			1	1	1
	214,961	2.25	4	5	5	5
Fiscal Services						
Business Manager	40,000	0.50	1	1	1	1
	40,000	0.50	1	1	1	1
Food Services						
Food Service Workers	14,000	1	2	3	3	3
	14,000	1	2	3	3	3
	-		-		-	-
Operation of Plant						
Custodian	20,801	1	2	2	2	2
Security	20,801			1	1	1
	41,602	1	2	3	3	3
TOTAL EMPLOYEES		23	40	49	52	53
TOTAL EMPLOTEES		23	40	49	52	53

D. Explain the school's plan for recruitment, selection, and development.

The qualifications to be required of the teachers and the potential strategies used to recruit, hire, train, and retain qualified staff.

Recruitment – The School will ensure that faculty members are certified, highly-qualified professional personnel. Accordingly, the School will:

- Recruit teachers through the State-sponsored, Department of Education, Teach in Florida website,
- Coordinate efforts to partner with postsecondary educational institutions to serve as host school for interns whenever possible, and

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 Organize other efforts to attract in-field experts to serve as teachers in the various disciplines that require higher levels of academic content delivery.

Recruitment efforts will also include advertisements in local newspapers and on the school's website, presentations and fliers at local universities, school job fairs, and via word of mouth. Considerable effort will be taken during interviews to hire the most qualified candidates that cumulatively represent the diverse racial/ethnic background of the local community and county that we serve.

Selection Process- The school will look for candidates who demonstrate the following qualifications:

Administration

- Educational background: Master's Degree or higher
- Extensive administrative and teaching experience
- State of Florida Certification in Educational Leadership
- Vast experience in working with school or advisory educational boards
- Strong managerial capabilities
- Knowledge of the needs of the student population served by the School
- Positive evaluations from previous administrative position
- Letters of recommendation
- Excellent communication skills

Faculty/Staff

- Educational background: Bachelor's Degree or higher in field
- State Certification for the required position
- Excellent presentation and interpersonal skills
- Satisfactory recommendation and/or evaluations from previous employer
- Personal characteristics, knowledge, and belief in the school's mission
- An ability and motivation to work as part of a team in a small-school setting with parental involvement
- References/Letters of Recommendation

Hiring Process - The School's Governing Board will appoint a screening committee to recruit, interview and recommend to the board qualified candidates for Administrative positions, as needed. This committee may include current charter school administrators, employees of the organization, current board members and ESP personnel. Based on the recommendations of the committee, the Board conducts final interviews of the most qualified candidates and hires the Principal and any assistance principals (as the need arises).

The Principal, once hired, recruits teachers and may appoint a school-based committee to screen highly - qualified and certified teachers. This committee develops an interview questionnaire for specific positions, conducts initial screening interviews and makes recommendations to the principal. The principal reviews recommendations, conducts final interview, and makes all final hiring decisions within the scope of the budget, as approved by the Governing Board.

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The school will not employ an individual to provide instructional services if the individual's certificate or license as an educator is suspended or revoked by this or any other state. The school agrees to fingerprint all employees as required by Section 1012.32, F.S., all employees agree to background checks, and drug-screening. The School will adhere to the antidiscrimination provisions of s. 1000.05, Florida Statutes. Furthermore, the school will not discriminate based on actual or perceived disability, gender, nationality, race or ethnicity, religion, sexual orientation in the hiring of its employees.

Employee Evaluations – The School will adhere to all requirements of the *Student Success Act* relating to performance pay and evaluations for instructional personnel and school administrators.

The school will use the *Florida Consortium of Public Charter Schools Evaluation System*, which is aligned to the Florida Educator Accomplished Practices (FEAPs) and approved by the Florida Department of Education and Broward County Public Schools on May 17, 2013.

This evaluation system will assist in determining the overall performance level of the instructional employee. In alignment with the Florida Educator Accomplished Practices and in compliance with the Student Success Act, the evaluation system focuses on the following criteria:

- 1. Performance of students At least 50% of the evaluation will be based on student learning growth assessed annually and measured by statewide assessments or, for subjects not measured by statewide assessments, by district assessments in s. 1008.22(8). The school will use the formula adopted by the Sponsor for measuring student learning growth in all courses associated with statewide assessments and for measuring student learning growth for all other grades and subjects. For classroom teachers, as defined in s. 1012.01(2)(a), the student learning growth portion of the evaluation must include growth data for students assigned to the teacher over the course of at least 3 years. If less than 3 years of data are available, the years for which data are available must be used and the percentage of the evaluation based upon student learning growth may be reduced to not less than 40 percent.
- 2. Instructional practice Classroom teachers will be evaluated using Florida Educator Accomplished Practices the system differentiate among four levels: highly effective; effective; needs improvement or, for instructional personnel in the first three years of employment who need improvement, developing; and unsatisfactory;
- 3. Professional and job responsibilities as adopted by the State Board of Education.

All teachers will be formally evaluated at minimum on an annual basis. Newly hired teachers (new to the district and/or new to the profession) will be formally evaluated at least twice in the first year of teaching and will be under a probationary contract. All personnel must be fully informed of the criteria and procedures associated with the evaluation process before the evaluation takes place.

Because every effective teacher must be able to integrate and apply all of the skills involved in the aforementioned areas of professional practice, competent demonstration of each of the twelve Educator Accomplished Practices will be evaluated.

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The CWT (Classroom Walk -Through) Program will be used frequently to provide feedback on objective - setting, grade level appropriateness of lessons, appropriate higher-level thinking strategies and appropriate use of texts and materials. Instructional strategies, classroom management skills, and engagement of learners in the classroom will also be observed and teacher performance will be evaluated as a means to inform instruction and provide for professional growth opportunities.

Non-instructional staff, such as clerical staff, will also be evaluated and receive feedback on their performance via in-house assessment tools and individual conferences with the principal or designee.

Staff Professional Development Plan - In setting high expectations for both students and teachers, the School will be committed to maintaining the level of high quality instructors by implementing a comprehensive professional development plan. The school will support the professional development needs of all professional staff by subsidizing college classes, facilitating the attainment of continuing education credits, and offering trainings.

All staff will participate in school-initiated and other relevant and necessary workshops for professional development. A member of the administrative team will oversee, coordinate, assist and monitor the staff development process. The School will support the needs of all professional staff by facilitating the attainment of continuing education credits, and offering trainings throughout the school year in a variety of forms. Teachers will attend relevant local, state and national conferences and serve as trainer to the remainder of the staff upon return to the School. The PD offered to teachers will align with student achievement data, curriculum, instructional personnel needs, School Improvement plans, and annual school reports.

Annually, the School will offer PD to aide in curriculum delivery, specific to the school's mission and vision including:

- **Opening of Schools** Policies Procedures Training: all personnel will participate in policy and procedures training (conducted by Principal Lead Staff);
- School Mission and Vision Training: all personnel will participate to learn the school's philosophy (Rigor, Relevance and Relationships) and guiding principles of Sports Leadership Program Model (conducted by: Principal Lead Staff);
- **Data-Driven Decision Making:** interactive workshop will teach faculty how to use Specific Performance Indicators to identify student needs and target instruction. Faculty will be trained on types of educational research, corresponding sources of data, and collection instruments to be used for continuous student/school improvement. Teachers will be trained on how to use quantitative and qualitative data to plan and improve classroom instruction (conducted by Principal and Lead Staff);

The School will offer courses such as Reading, Gifted, and English for Speakers of Other Languages (ESOL) endorsement courses, annually, during the summer and/or winter recess, at no cost to teachers, by qualified instructors. Annual professional workshops and conferences, to name a few, will also be made available and/or required, as applicable, for teachers to attend and enhance their teaching skills.

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Monthly in-house workshops will be held by administrators to address student achievement data by content area, and anecdotal information from in the core curriculum areas. Depending on the need, the School may elect to contract for delivery of a targeted PD to share best practices in areas that need to be remedied. Additionally, at least monthly, and as often as biweekly, team leaders will facilitate support and encourage communication during Department Meetings- which will work as Professional Learning Communities wherein team planning and troubleshooting will occur. Select teachers will attend local, state and national conferences and serve as trainer to the remainder of the staff upon return to the School. Appropriate and relevant school wide training will occur on teacher planning days as well as on early release dates. In-house workshops and meetings will be held monthly by administrators and may occur as often as biweekly through team leaders, in order to facilitate support, encourage communication, allow for team planning, and troubleshoot concerns and needs.

All Staff will be offered, at minimum, the following school-site and district-based trainings:

- <u>Curriculum Implementation by Subject/Specialty</u> Teachers will participate in school-wide trainings and individual department trainings throughout the school year related to curriculum implementation. These include but are not limited to: Horizontal and Vertical team planning, CollegeBoard's SpringBoard Training, Implementing Common Core State Standards in English/Language Arts and Mathematics instruction; CCSS Literacy Standards in Science, Social sciences and Content Areas; Preparing ELLs for the Challenges of Common Core; Preparing Students With Disabilities for Common Core. Preparing for PARCC New standards-based testing required for Common Core (As adopted) and The Partnership for Assessment of Readiness for College and Careers (PARCC) Assessments.
- Applying the Connection this workshop will allow teachers to align Common Core and Classroom Instruction to SLAM Career related lessons and activities. Teachers will work cooperatively through PLC and common planning schedules to develop, refine, and present and share curriculum and activities throughout the school year.
- <u>Differentiated Instruction</u> This training teaches teachers and coaches how to differentiate and individualize instruction in order to create effective targeted instructional lessons and tutoring to increase student achievement and maximize instructional time.
- <u>Data-Driven Decision-Making</u> Administrators and staff learn how to analyze, extrapolate and disaggregate school data from a variety of sources and to use this data to create effective school improvement plans and increase student achievement.
- <u>Technology for the Next Generation</u> Staff will participate in hands-on technology workshops to learn how to integrate technology into the classroom. The purpose is to ensure schools are growing with technology to ensure students and teachers are prepared for the expectations of the 21st century and national technology standards.
- <u>Safety and Security</u> Safety and security training will instruct staff on daily safety procedures, and how to prevent and protect the school and students, to handle emergency situations, and to recognize potential threats in accordance with the school safety plan.

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• Individual Professional Development Plan (IPDP) - In addition to school wide professional development opportunities, faculty members will each complete an Individual Professional Development Plan (IPDP) as a means to document and identify areas for personal targeted professional growth, including the identification of strategies for obtaining specified goals, its' compatibility to ensuring the professional development exercise will serve to benefit the student, and a timeframe in which the staff development exercise should occur. All IPDPs will be approved by the Principal, or designee, at such time the principal may elect to recommend additional recommended professional development that should occur within a given timeframe. The principal or member of the administrative staff, together with the teacher, will commit to the IPDP, including the allocation of necessary resources for plan implementation, and observation of new/struggling teachers by veteran/mentor teachers to implement support strategies.

As a Mater Academy, Inc. member school, SLAM will also benefit from the network's in-house trainings for best practices:

- <u>Common Core Standards Literacy Standards</u> -all faculty will receive PD on ELA CCSS and CCR standards in the Content-Areas; and the Importance of Text Complexity
- <u>The Comprehensive Research-Based Reading Plan</u> (includes training on Development of Classroom Libraries; Vocabulary Strategies/Word Walls; 6 Areas of Reading Instruction; Quality Writing Strategies (conducted by Reading Coach); and
- Effective Teaching Strategies for ESE Students (conducted by ESE Teachers),
- Effective Strategies for English Language Learners (conducted by ESOL Coordinator),
- <u>Differentiated Instruction Strategies</u> (conducted by Principal and/or designee), and
- <u>Curriculum Pacing and Alignment</u> (conducted by Administrative Staff and department heads) are four separate PDs that will be offered to all faculty members to provide effective strategies and interventions across the curriculum to address learner's needs.

The professional development plan for administrators will encompass both internal and district-based in-service trainings. Administrators may also participate in professional development conducted through: the National Association of Secondary School principals; the National Association of Elementary School Principals; the Southern Association of Colleges and Schools/AdvancEd; Association for Supervision and Curriculum Development; and state trainings.

At a minimum, administrators will be encouraged to participate in the following professional development trainings and conferences:

- Florida Annual State Charter School Conference administrators will attend state conference on an annual basis.
- Clinical Educator Training –This training provides quality support for developing administrators for the classroom or other educational environments such as the student services area. The Clinical Educator Program is designed to assist experienced educators as they exercise the very critical task of supporting and mentoring developing professionals in a variety of settings. This course helps

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develop skills for coaches and mentors in a formative observation, clinical supervision, feedback skills, and professional development planning for increased instructional effectiveness. The Florida Performance Measurement System's formative and summative processes are incorporated.

- Teacher Evaluation Training for Administrators- Training provided by the Florida Consortium of Public Charter Schools – to conduct teacher formal observation of teachers.
- Classroom Walk-through Training Provides school leaders with strategies and tools to effectively structure classroom visits and follow-up reflection. Reflective thinking about one's practice provides an effective strategy for change and improvement by fostering a process of communication between the instructional leaders and the teacher to increase the focus on student achievement. The process provides a powerful strategy for increasing student achievement; a strategy for classroom visits that focuses on teaching and learning; methodology for analyzing the classroom for feedback purposes, and the use of reflective conversation for providing feedback.
- <u>Budget Training for Administrators</u> This training addresses school budgeting as it pertains to
 both the school's operating budget and internal accounting policies and procedures, *Financial and*Program Cost Accounting and Reporting for Florida Schools (Redbook) requirements, and checks and
 balances to ensure a sound budget.
- Master Scheduling for Administrators Administrators are trained on creating an efficient and
 effective master schedule that meets the national, state and district course requirements, is
 financially sound, and that meets class size requirements.
- <u>Developing the School's Improvement Plan</u> This training assists school administrators to develop a sound and effective school improvement plan to ensure an equitable and high-quality school improvement plan. This process includes data analysis, goal-setting, budget planning, professional development planning and reflective practices.
- <u>Principal Chat Sessions</u> Charter School Administrators meet by level (secondary, elementary) to
 go over pertinent topics and to share best practices. These sessions include curriculum
 development, standards implementation, scheduling, educational changes, innovative programs,
 and more. Experienced administrators share their best practices for using student achievement data
 with newly appointed assistant principals.

Retention of Staff: The School wishes to provide the best benefits and employee services possible. Our experience has shown that when employees deal openly and directly with supervisors, the work environment can be excellent, communications can be clear, and attitudes can be positive. We believe that the School will amply demonstrate their commitment to employees by responding effectively to employee concerns.

A number of the programs (Social Security, workers' compensation, and unemployment insurance) cover all employees in the manner prescribed by law. Additionally, the school will provide a wide range of benefits such as Flexible Benefits Plan; Direct Deposit; Retirement/401(k) Savings Plan; Bereavement Leave; Dental Insurance; Family Medical Leave; Financial Counseling; Health Insurance;

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Holidays; Life Insurance; Long-Term Disability; Sick Leave; Vision Care Insurance to ensure the retaining of qualified and capable staff. These fringe benefits are reflected in the **Budget - Appendix A** herein.

Other programs include:

Educational Assistance/Tuition Reimbursement: The School recognizes that the skills and knowledge of its employees are critical to the success of the institution. The educational assistance program encourages personal development through formal education so that employees can maintain and improve job-related skills or enhance their ability to compete for reasonably attainable jobs within the School.

Employee Assistance Program: The School cares about the health and well-being of its employees and recognizes that a variety of personal problems can disrupt their personal and work lives. Through the Employee Assistance Program (EAP), the school will provide confidential access to professional counseling services for help in confronting such personal problems as alcohol and other substance abuse, marital and family difficulties, financial or legal troubles, and emotional distress

<u>Flexible Spending Account (FSA):</u> A Flexible Spending Account (FSA) program that allows employees to have pre-tax dollars deducted from their salaries to pay for eligible out-of-pocket expenses. The pre-tax contributions made to the FSA can be used to pay for predictable non-reimbursed health care expenses and dependent care expenses during the plan year. Through the FSA program, staff can reduce taxable income without reducing real income, in order to keep more of the money they earn.

<u>Support for Beginning and Struggling Teachers</u>: Observation of new and struggling teachers by veteran teachers and support strategies will be implemented as applicable. A new educator support system format will also be used as a means to offer support to beginning teachers, through the assigning of a willing mentor, who will be assigned for struggling and/or beginning teachers.

Section 11: Education Service Providers

If the school intends to enter into a contract with an Education Service Provider (ESP)²¹:

A. Describe the services to be provided by the ESP.

The ESP's services include assistance with facilities design, staffing recommendations and human resource coordination, curriculum development, research and data updating, sponsor relations and

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²¹ An Education Service Provider (ESP) is an organization that provides comprehensive services to a school. Organized as non-profit or for-profit companies, ESPs generally fall into two categories:

⁻ Educational Management Organizations (EMOs) that provide comprehensive school management services and may provide school designs and/or educational programming as well, and

⁻ Comprehensive School Design Providers that offer a replicable school model or common pedagogical, instructional and governance approach.



reporting, program marketing, and bookkeeping, budgeting, and financial forecasting, provided to the Governing Board for its oversight and approval.

B. Provide a draft of the proposed contract between the school and the ESP including, at a minimum, proposed services, performance evaluation measures, fee structure, renewal and termination provisions, and terms of property ownership (real, intellectual and personal).

A draft of proposed contract between the School and the ESP is included herein as *Appendix D- Sample ESP Agreement*.

C. Unless the ESP is the parent non-profit organization, explain why the ESP was selected, including what due diligence efforts were conducted to inform the selection and how the relationship with the ESP will further the school's mission.

The Board analyzed data regarding several ESP's currently working with charter schools in Florida and concluded that the ESP chosen offered the most competitive price and had a proven track record of success.

The ESP is one of an affiliated group of charter school service and support entities, which compose one of Florida's longest serving and most successful charter school service and support organizations. Currently working with over 100 high performing charter schools, the ESP's mission is to facilitate the vision of the School's governing board by providing the services and support necessary to allow each school to fulfill its mission.

The ESP was selected for the following reasons including, but not limited to:

- The company is staffed by professionals and educators with extensive knowledge of and experience with Florida Charter Schools.
- A principal of the affiliated group, Fernando Zulueta, is a founding Board Member of the Florida Consortium of Charter Schools, and a Board Member of The National Alliance for Public Charter Schools. Mr. Zulueta has received numerous awards for his work with charter schools including the "Cervantes Award" sponsored by Nova Southeastern University for significant efforts to support excellence in the education of Hispanic students.
- The ESP's affiliated group serves the largest number of high-performing schools of any charter school service organization in Florida.
- The ESP's affiliated group was the first charter school service and support entity in Florida to seek SACS accreditation for the schools it serves, and all of the schools it serves are either fully accredited or in the process of obtaining accreditation. Somerset Academy, Inc., one of the charter school networks serviced by the ESP, was the first charter school system in the Nation to receive District Accreditation from SACS/AdvancEd. Mater Academy, Inc., another charter school network serviced by the ESP, was also awarded District Accreditation from SACS/AdvancED in May of 2012.
- Mater Academy Charter High School was presented with a 2011 Inspiration Award from the College Board for being one of the three most inspiring secondary schools in America. These

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- schools are recognized for their outstanding college-preparation programs and partnerships among teachers, parents and community organizations.
- The exemplary academic performance and fiscal soundness achieved for its charter school clients by this service and support organization has resulted in 15-year charter renewals for all schools which have had initial contracts completed
 - D. Explain the ESP's roles and responsibilities for the financial management of the proposed charter school, if applicable, and the internal controls that will be in place to guide this relationship.

The ESP will conduct general accounting services including bookkeeping, purchasing support, payables, asset management, budget preparation, cash flow analysis, and preparation of interim financial statements and assistance with the work of the School's independent certified auditor. All financials are provided to the Governing Board for its oversight and approval.

E. Unless the ESP is the parent non-profit organization, explain how the governing board will ensure that an "arm's length," performance-based relationship exists between the governing board and the ESP.

The Governing Board will conduct periodic and annual evaluations of the performance of the School in the following categories, as to each of which the ESP is required to provide data to the Governing Board: financial performance, including variance to budget; staff turnover data; academic performance, including enrollment; and facilities costs and needs. Failure to perform its obligations under the service/management agreement by the ESP is grounds for termination by the School.

F. Provide a summary of the ESP's history, including its educational philosophy and background and experience of senior management.

Academica is one of the Nation's most experienced and successful charter school service and support organizations. Founded in 1999 on the principle that each charter school is a unique educational environment governed by an independent board of directors that best knows the right path for its school, it is Academica's mission is to facilitate that governing board's vision. Academica has a proven track record of developing growing networks of high performing charter schools.

The company serves more than 100 charter schools in Florida, California, Nevada, Texas, Utah, and Washington D.C. providing educational programs from pre-kindergarten through high school. In Florida, Academica schools have been recognized on a local, state, and national level for their achievements. For example, the Somerset Academy and Mater Academy Schools were recently designated by the Southern Association of Colleges & Schools (SACS) as the first fully accredited charter school systems in the United States. Further, Doral Academy High School and Mater Academy Charter High School were once again listed this year as two of the "Best High Schools in America" by both U.S. News & World Report and Newsweek magazines. On average, Academica's charter schools earned a letter grade of "A" during the 2012-2013 school year from the Florida Department of Education.

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A principal of the affiliated group, Fernando Zulueta, is a founding Board Member of the Florida Consortium of Charter Schools, and a Board Member of The National Alliance for Public Charter Schools. Mr. Zulueta has received numerous awards for his work with charter schools including the "Cervantes Award" sponsored by Nova Southeastern University for significant efforts to support excellence in the education of Hispanic students.

G. Provide a list of other schools with which the ESP has contracts, including contact information and student and financial performance data of such schools.

The following charter schools are serviced by the ESP and its affiliates:

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School	Grade 11-12	Free and Reduced Lunch	Minority Rate	Contact
Somerset Academy, Inc. SOMERSET ACADEMY (SILVER PALMS)	A	82	94	
SOMERSET ACADEMY CHARTER ELEMENTARY SCHOOL (SOUTH HOMESTEAD)	В	73	85	
SOMERSET ACADEMY CHARTER	A	57	94	
SOMERSET ACADEMY-ELEMENTARY, EAGLE CAMPUS	Α	32	94	
SOMERSET ACADEMY-MIDDLE, EAGLE CAMPUS	В	35	94	
SOMERSET ACADEMY ELEMENTARY SCHOOL SOUTH MIAMI CAMPUS	Α	14	85	
SOMERSET ARTS ACADEMY	В	52	65	
SOMERSET ACADEMY AT SILVER PALMS	Α	82	96	
SOMERSET ACADEMY VILLAGE CHARTER MIDDLE SCHOOL	D	84	82	
SOMERSET PREPARATORY ACADEMY CHARTER SCHOOL AT NORTH LAUDERDALE	С	85	96	
SOMERSET VILLAGE ACADEMY	С	83	85	
SOMERSET PREPARATORY ACADEMY CHARTER HIGH AT NORTH LAUDERDALE	F	73	95	
SOMERSET ACADEMY CHARTER HIGH SCHOOL MIRAMAR CAMPUS	Α	54	94	
SOMERSET NEIGHBORHOOD SCHOOL	В	60	95	
SOMERSET PINES ACADEMY	C	64	61	Andreina Figueroa, Board Chair
SOMERSET ACADEMY	Α	35	90	afigueroa@somersetacademyschools
SOMERSET ACADEMY MIDDLE SCHOOL	A	38	86	(786) 586-7001
SOMERSET ACADEMY DAVIE CHARTER	A	40	61	
SOMERSET ACADEMY CHARTER HIGH	A	43	83	
SOMERSET ACADEMY EAST PREPARATORY	В	82	97	
SOMERSET ARTS CONSERVATORY	Α	47	82	
SOMERSET ACADEMY ELEMENTARY (MIRAMAR CAMPUS)	A	62	93	
SOMERSET ACADEMY MIDDLE (MIRAMAR CAMPUS)	A	67	94	
SOMERSET PREPARATORY CHARTER MIDDLE SCHOOL	В	67	96	
SOMERSET ACADEMY CHARTER MIDDLE SCHOOL	A	54	89	
SOMERSET ACADEMY CHARTER MIDDLE SCHOOL (SOUTH HOMESTEAD)	В	72	76	
SOMERSET ACADEMY CHARTER MIDDLE SCHOOL (COUNTRY PALMS)		61	61	
SOMERSET ACADEMY CHARTER MIDDLE SCHOOL SOUTH MIAMI CAMPUS	Α	15 70	82 85	
SOMERSET ACADEMY CHARTER HIGH SCHOOL (SOUTH HOMESTEAD) SOMERSET ACADEMY CHARTER HIGH SCHOOL	Α	82	95	
Mater Academy, Inc.		02	93	
MATER ACADEMY	Α	79	99	
MATER GARDENS ACADEMY	A	51	94	
MATER ACADEMY OF INTERNATIONAL STUDIES	C	90	99	
MATER ACADEMY EAST CHARTER	Α	79	98	
MATER GROVE ACADEMY		64	97	
MATER ACADEMY MIAMI BEACH	Α	68	86	
MATER EAST ACADEMY MIDDLE SCHOOL	С	93	99	Antonio Roca, President
MATER ACADEMY CHARTER MIDDLE	Α	80	98	aroca@rgpa.com
MATER ACADEMY LAKES MIDDLE SCHOOL	Α	76	94	(305) 860-7156
MATER GARDENS ACADEMY MIDDLE SCHOOL	Α	65	93	
MATER ACADEMY MIDDLE SCHOOL OF INTERNATIONAL STUDIES	A	85	99	
MATER PERFORMING ARTS & ENTERTAINMENT ACADEMY	A	74	96	
MATER ACADEMY LAKES HIGH SCHOOL	В	72	95	
MATER ACADEMY HIGH SCHOOL OF INTERNATIONAL STUDIES	Α	83	97	
MATER BRICKELL PREPARATORY ACADEMY HIGH SCHOOL	_	82	100	
MATER ACADEMY EAST CHARTER HIGH SCHOOL MATER ACADEMY CHARTER HIGH	B A	82 79	98 97	
Pinecrest Academy, Inc.			2000	
PINECREST PREPARATORY CHARTER	В	51	83	
PINECREST ACADEMY (SOUTH CAMPUS)	Α	58	95	Judith Marty, Board Chair
PINECREST PREPARATORY ACADEMY	Α	43	96	jmarty@dadeschools.net
PINECREST ACADEMY (NORTH CAMPUS)	A	70	96	(305) 796-7839
PINECREST COVE ACADEMY	Α	58	97	
PINECREST ACADEMY MIDDLE SCHOOL (NORTH CAMPUS)		80	100	
PINECREST ACADEMY CHARTER MIDDLE SCHOOL	A	59	96	
PINECREST PREPARATORY ACADEMY CHARTER HIGH SCHOOL National Ben Gamla Charter School Foundation, Inc	С	52	94	
BEN GAMLA CHARTER SCHOOL NORTH CAMPUS		64	26	
BEN GAMLA CHARTER SCHOOL MIAMI BEACH	Α	29	53	Debra Klein, Board Chair dklein31@verizon.net
BEN GAMLA CHARTER SCHOOL SOUTH BROWARD	С	34	28	(646) 644-3693
BEN GAMLA CHARTER SCHOOL	A	50	32	, ,
		40	90	
DORAL ACADEMY OF TECHNOLOGY				Angela Ramos, Board Chair
DORAL ACADEMY OF TECHNOLOGY	A			angelaramos23@gmail.com
DORAL ACADEMY OF TECHNOLOGY DORAL ACADEMY	Α	37	92	
DORAL ACADEMY OF TECHNOLOGY DORAL ACADEMY DORAL ACADEMY CHARTER MIDDLE SCHOOL	A	37 58	94	(786) 282-2264
DORAL ACADEMY OF TECHNOLOGY DORAL ACADEMY	Α	37		(786) 282-2264
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Form Number: IEPC-M1 Rule Number: 6A-6.0786 May 2012



	Academica Serviced Schools - Florida	'	Financial [Pe Da	
Location	School		·12 Increase Net Assets		Net Ass as of 6-30
	Somerset Academy, Inc.				
0332	SOMERSET ACADEMY (SILVER PALMS)	\$ \$ \$ \$ \$	(125,354)		2,0
0339	SOMERSET ACADEMY CHARTER ELEMENTARY SCHOOL (SOUTH SOMERSET ACADEMY CHARTER	\$	57,281	\$	7
0520 1251	SOMERSET ACADEMY CHARTER SOMERSET ACADEMY-ELEMENTARY, EAGLE CAMPUS	\$ ¢	(21,418) 5,527	\$	7 2
1261	SOMERSET ACADEMY-MIDDLE, EAGLE CAMPUS	\$	27,498	\$ \$	2
2007	SOMERSET ACADEMY ELEMENTARY SCHOOL SOUTH MIAMI CAMPUS	\$	339,378	\$	1,4
2012	SOMERSET ARTS ACADEMY		35,535	\$	4
3033	SOMERSET OAKS ACADEMY	\$ \$	33,822	\$	
4012	SOMERSET PREPARATORY ACADEMY AT SILVER PALMS	\$	425,125	\$	4
5002	SOMERSET ACADEMY VILLAGE CHARTER MIDDLE SCHOOL	\$ \$ \$ \$ \$ \$	203,352	\$	4
5003	SOMERSET PREPARATORY ACADEMY CHARTER SCHOOL AT NORTH	\$	467,384	\$ \$	1,1
5004 5006	SOMERSET VILLAGE ACADEMY SOMERSET PREPARATORY ACADEMY CHARTER HIGH AT NORTH	\$	271,101 174,259	\$	1,1 3
5007	SOMERSET ACADEMY CHARTER HIGH SCHOOL MIRAMAR CAMPUS	4	1,506	\$ \$	3
5008	SOMERSET GABLES ACADEMY	\$ \$	153,409	\$	1
5021	SOMERSET NEIGHBORHOOD SCHOOL	\$	34 064	ф	5
5030	SOMERSET PINES ACADEMY	\$	276,050	\$	7
5141	SOMERSET ACADEMY	\$ \$ \$ \$ \$ \$ \$	276,050 (4,074) 36,937 76,126 31,754 239,830 103,871	\$	2,5
5151	SOMERSET ACADEMY MIDDLE SCHOOL	\$	36,937	\$	1,5
5211	SOMERSET ACADEMY DAVIE CHARTER	\$	76,126	\$	7
5221	SOMERSET ACADEMY CHARTER HIGH	\$	31,754	\$	2,4
5391 5306	SOMERSET ACADEMY EAST PREPARATORY SOMERSET ARTS CONSERVATORY	\$	239,830	\$	1,0
5396 5405	SOMERSET ARTS CONSERVATORY SOMERSET ACADEMY ELEMENTARY (MIRAMAR CAMPUS)	\$	371,115	4	5 3,5
5406	SOMERSET ACADEMY MIDDLE (MIRAMAR CAMPUS)	\$	(48,341)		8
5441	SOMERSET PREPARATORY CHARTER MIDDLE SCHOOL	\$	177,222	\$	2
6004	SOMERSET ACADEMY CHARTER MIDDLE SCHOOL	\$	16,852	\$	5
6013	SOMERSET ACADEMY CHARTER MIDDLE SCHOOL (SOUTH HOMESTEAD)	\$	14,145	\$	3
6043	SOMERSET ACADEMY CHARTER MIDDLE SCHOOL (COUNTRY PALMS)	\$	11,688	\$ \$	1
6053	SOMERSET ACADEMY CHARTER MIDDLE SCHOOL SOUTH MIAMI CAMPUS	\$	1,116		2
7034	SOMERSET ACADEMY CHARTER HIGH SCHOOL (SOUTH HOMESTEAD)	\$	4,998	\$	
7038	SOMERSET ACADEMY HIGH SCHOOL SOUTH CAMPUS	\$	(46,754)	\$	1
7042	SOMERSET ACADEMY CHARTER HIGH SCHOOL	\$	(93,655)	\$	1,2
0100	Mater Academy, Inc. MATER ACADEMY	\$	527,257	\$	9,4
0312	MATER GARDENS ACADEMY	\$	27,519	\$	7
1017	MATER ACADEMY OF INTERNATIONAL STUDIES	\$	202,940		9
3100	MATER ACADEMY EAST CHARTER	\$	258,684	\$	2,4
5045	MATER GROVE ACADEMY	\$	4,088	\$	-,
5046	MATER BRICKELL PREPARATORY ACADEMY	\$	24,495	\$	
5047	MATER ACADEMY MIAMI BEACH	\$	310,973	\$	6
6009	MATER EAST ACADEMY MIDDLE SCHOOL	\$	107,813		9
6012	MATER ACADEMY CHARTER MIDDLE	\$	451,027		7,6
6033	MATER ACADEMY LAKES MIDDLE SCHOOL	\$	303,041		1,4
6042	MATER GARDENS ACADEMY MIDDLE SCHOOL	\$	(122,282)	-	1
6047	MATER ACADEMY MIDDLE SCHOOL OF INTERNATIONAL STUDIES	\$	55,431	\$	2
7014	MATER ACADEMY LAYER LITCH SCHOOL	\$	169,977	\$	2,5
7018	MATER ACADEMY LIGH SCHOOL OF INTERNATIONAL STUDIES	\$	827,604	\$	3,5
7024 7025	MATER ACADEMY HIGH SCHOOL OF INTERNATIONAL STUDIES MATER BRICKELL PREPARATORY ACADEMY HIGH SCHOOL	\$	103,359 8,846	\$ \$	4
7023	MATER ACADEMY EAST CHARTER HIGH SCHOOL	\$ \$	(83,252)		4
7160	MATER ACADEMY CHARTER HIGH	\$	27,563	\$	8,1
	Pinecrest Academy, Inc.			ļ.	
0152	PINECREST PREPARATORY CHARTER HIGH SCHOOL ORLANDO	\$	8,555	\$	_
0155	PINECREST PREPARATORY CHARTER SCHOOL ORLANDO	\$	135,413		2
0342 0600	PINECREST ACADEMY (SOUTH CAMPUS) PINECREST PREPARATORY ACADEMY	\$	(15,091) 194,707		2,0
5048	PINECREST PREPARATORY ACADEMY PINECREST ACADEMY (NORTH CAMPUS)	\$ \$	(17,057)	\$ \$	2,7 2
5046	PINECREST ACADEMY PINECREST COVE ACADEMY	\$	150,724	\$	1
	PINECREST ACADEMY MIDDLE SCHOOL (NORTH CAMPUS)	\$	9,337	₽ \$	1
				4	
6003 6022	PINECREST ACADEMY CHARTER MIDDLE SCHOOL	\$	523,973	\$	2,9

SH	Sports Leadership and Management Middle School (Broward) - Charter School Application						
Academica Serviced Schools - Florida			Financial Performance Data				
Location	School		12 Increase Net Assets		Net Assets as of 6-30-12		
5001	BEN GAMLA CHARTER SCHOOL NORTH CAMPUS	\$	(7,161)	\$	59,272		
5005	BEN GAMLA CHARTER HIGH SCHOOL	\$	40,877	\$	40,877		
5022	BEN GAMLA CHARTER SCHOOL MIAMI BEACH	\$	99,193	\$	103,739		
5025	BEN GAMLA HALLANDALE	\$	1,207	\$	1,207		
5392	BEN GAMLA CHARTER SCHOOL SOUTH BROWARD	\$	(23,401)		314,182		
5410	BEN GAMLA CHARTER SCHOOL	\$	2,620	\$	650,462		
	Doral Academy, Inc.						
3029	DORAL ACADEMY OF TECHNOLOGY	\$	251,714	\$	251,714		
3030	DORAL ACADEMY	\$	313,689	\$	4,641,760		
6030	DORAL ACADEMY CHARTER MIDDLE SCHOOL	\$	346,120	\$	4,109,944		
7009	DORAL PERFORMING ARTS & ENTERTAINMENT ACADEMY	\$	216,054	\$	733,178		
7020	DORAL ACADEMY CHARTER HIGH SCHOOL	\$	(122,894)	\$	4,837,629		
6045	International Studies Charter High School, Inc.		74.500		460.055		
6045 7007	INTERNATIONAL STUDIES CHARTER MIDDLE SCHOOL INTERNATIONAL STUDIES CHARTER HIGH SCHOOL	\$ \$	74,503 23,388	\$ \$	469,855 790,249		
7007		₽	23,300	Þ	790,249		
0133	City of Belle Isle CORNERSTONE ACADEMY CHARTER	+	477,681	¢	1,538,516		
0133	CORNERSTONE ACADEMY CHARTER CORNERSTONE CHARTER ACADEMY HIGH SCHOOL	\$ \$	84,819	\$ \$	212,002		
0110	City of Hialeah	*	01/015	Ψ	212,002		
7262	CITY OF HIALEAH EDUCATION ACADEMY	\$	7,757	\$	568,315		
	Miami Childrens Museum Charter School, Inc.	Ė		Ė	,		
4000	MIAMI CHILDREN'S MUSEUM CHARTER SCHOOL	\$	55,787	\$	1,415,642		
	Theodore R. and Thelma A. Gibson Charter School, Inc.						
2060	THEODORE R. AND THELMA A. GIBSON CHARTER SCHOOL	\$	2,892	\$	70,472		
	Key West Independent Education, Inc.						
0382	KEY WEST COLLEGIATE ACADEMY	\$	4,002	\$	4,002		
	Integrated Science and Asian Culture Academy, Inc.						
2004	INTEGRATED SCIENCE AND ASIAN CULTURE ACADEMY	\$	8,317	\$	115,599		

Section 12: Human Resources and Employment

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A. Explain the school's compensation plan, including whether staff will be publicly or privately employed.

Performance Pay – The School will establish a performance salary schedule for instructional personnel and school administrators hired on or after July 1, 2014. The performance salary schedule will include salary adjustments for performance which become a lasting part of the employee's base salary under s. 121.021(22), F.S., and salary supplements for specified job assignment or duties, which are considered salary under s. 121.021(22), F.S., but only remain in effect while the employee is performing those duties or assignments. The performance salary schedule will:

- Require that any salary adjustments for instructional personnel or school administrators that
 occur be made only for employees with highly effective or effective performance evaluation
 ratings.
- Not reduce the level of funding for the performance salary schedule in greater proportion than other salary schedules, if budget constraints limit the amount of funding that is available.
- Require that recommendations for promotions be based primarily upon the person's effectiveness under s. 1012.34, F.S.; i.e., performance evaluations.

The School will establish a grandfathered salary schedule for any school employees hired before July 1, 2014 (in the case of the administrator or other personnel hired prior to opening). This will be partially

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based upon an employee's performance and includes differentiated pay based upon factors such as additional responsibilities, school demographics, and level of job-performance difficulties. The school has budgeted for Performance Pay. See Appendix A - Budget Detail for performance pay allocation (Under Merit Pay). The amount was derived from the FFEP Teacher Salary Allocation (WFTE share) to be used for merit raises.

Contracts - Instructional personnel will receive either a probationary contract (for instructional personnel new to the profession or the district) or an annual contract (for personnel who have completed a probationary contract or are already under an annual contract). Pursuant to s. 1012.335(1)(c) the Teacher is subject to an initial probationary contract for a period of one (1) school year in the first contract year. During this time, the Teacher may be dismissed with or without cause, or may resign without breach of contract. At the end of the probationary contract, the Governing Board may choose to award or not award the Teacher an annual contract pursuant to §1012.335, Florida Statutes. Teachers will be evaluated in accordance with provisions of § 1012.34, Florida Statutes. An annual contract may only be awarded to those teachers meeting the criteria specified in §1012.335(2)(c), Florida Statutes.

B. Describe the proposed personnel policies and procedures to which staff will be required to adhere, including expectations for participation in the school's professional development program. If personnel policies and procedures have not been developed provide a clear plan, including timeline, for the development and approval by governing board.

The school will adhere to all antidiscrimination provisions of section 1000.05, F.S. The school will not discriminate based on actual or perceived disability, gender, nationality, race or ethnicity, religion, sexual orientation in the hiring of its employees. All faculty and staff members employed by the School will possess the personal characteristics, knowledge base of and belief in the educational and curriculum design as described in this proposal, as well as an ability and motivation to work as part of a team with parental involvement. The School will look for personnel who bring with them a sense of enthusiasm and commitment as well as a strong belief in and understanding of the charter school concept.

Employees are expected to observe high standards of job performance and professional conduct. When performance or conduct does not meet standards, the School may terminate employment, or it may endeavor, if it deems appropriate, to provide the employee a reasonable opportunity to correct the problem. If, however, a corrective opportunity is given and the school determines that the employee has failed to make the correction, he or she will be subject to further discipline, including termination.

Under the No Child Left Behind Act (NCLB) of 2001, all teachers must be "highly qualified" to teach in the school. The definition of a highly qualified teacher includes meeting at least the following three criteria:

- Having a bachelor's degree
- Having State credentials or certificate
- Demonstrated core academic subject matter competence

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Additionally, school employees will be required to adhere to The Code of Ethics of the Education Professional in Florida as defined in State Board of Education Rule 6B – 1.001, FAC.

Contracts - Instructional personnel will receive either a probationary contract (for instructional personnel new to the profession or new to the district) or an annual contract (for personnel who have completed a probationary contract or are already under an annual contract). The contracts will provide just cause reasons, and process, for suspension or dismissal of instructional personnel during the term of an annual contract. At the end of the probationary contract, the Governing Board may choose to award or not award the Teacher an annual contract pursuant to §1012.335, Florida Statutes, with or without cause. Teachers will be evaluated in accordance with provisions of § 1012.34, Florida Statutes.

NOTIFICATION OF UNSATISFACTORY PERFORMANCE—If an employee who holds a professional service contract as provided in s. 1012.33 is not performing his or her duties in a satisfactory manner, the evaluator shall notify the employee in writing of such determination. The notice must describe such unsatisfactory performance. Upon delivery of a notice of unsatisfactory performance, the evaluator must confer with the employee who holds a professional service contract, make recommendations with respect to specific areas of unsatisfactory performance, and provide assistance in helping to correct deficiencies within a prescribed period of time.

The rules set forth below are not exhaustive and are intended to provide employees with illustrations and fair notice of what is expected from them. Obviously, however, such listing cannot identify every situation of unacceptable conduct and performance. Employees should be aware that conduct not specifically listed below, but which adversely affects or is otherwise detrimental to the interests of the school, to students, or to other employees, may also result in disciplinary action.

Probation Period

Pursuant to Florida Statute, Section 1012.335: All instructional personnel will be issued a probationary employment contract for a period of one school year upon initial employment in the school.

Voluntary Termination

The School will consider an employee to have voluntarily terminated or abandoned his or her employment if an employee does any of the following:

- Elects to resign from the school.
- Fails to return from an approved leave of absence on the date specified by the school.
- Fails to return to work without notice to the school for three (3) consecutive days.

Involuntary Termination

The School expressly reserves the right to discharge employees for cause, but without being in violation of the laws of the State of Florida and the United States of America. The School assures thorough, consistent, and even-handed termination procedures. Terminated employees will receive all earned pay to the next regular pay period. An employee may be terminated involuntarily for any reason not prohibited by law, including a leave of absence in excess of 180 days, poor performance, misconduct,

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or other violations of the school's rules of conduct for employees. Involuntary termination, other than for an administrative reason or abandonment of employment, will result in forfeiture of all earned accrued compensation, other than as required to be paid by law.

<u>Iob Performance</u>

Employees may be disciplined/discharged for poor job performance, including but not limited to, the following:

- Below-average work quality or quantity
- Poor attitude or lack of cooperation
- Excess absenteeism, tardiness, or abuse of break or lunch privileges
- Failure to follow instructions or procedures
- Failure to follow established safety/security procedures

Misconduct

Employees may be disciplined or discharged for misconduct, including but not limited to the following:

Insubordination

- Dishonesty;
- Theft;
- Discourtesy (to students, parents, peers, supervisors, etc.);
- Misusing or destroying school property or the property of another;
- Disclosing or using confidential or proprietary information without authorization;
- Falsifying or altering school records, including the application for employment;
- Interfering with the work performance of others;
- Harassing other employees or students;
- Being under the influence of, manufacturing, dispensing, distributing, using, or possessing alcohol or illegal or controlled substances on school property or while conducting school business or supervising students;
- Possessing a firearm or other dangerous weapon on school property or while conducting school business;
- Conduct which raises a threat to the safety and well being of the school, its employees, students, or property, including being charged or convicted of a crime that indicates unfitness for the job; and/or
- Failing to report to the school, within five days, any charge or conviction under any criminal, drug, state or felony arrests.

The school may proceed directly to a written reprimand or to termination for misconduct or performance deficiency, without resort to prior disciplinary steps, when the school deems such action is appropriate. If an employee is recommended for dismissal by the principal of the school, the principal will propose such dismissal at a meeting of the Board of the School. The employee shall have the right to contest the dismissal at the board meeting and present testimony or evidence in connection with the dismissal action.

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Additionally, school employees will be required to adhere to The Code of Ethics of the Education Professional in Florida as defined in State Board of Education Rule 6B – 1.001, FAC.

Professional Development

In setting high expectations for both students and teachers, the School will be committed to maintaining the level of high quality instructors by implementing a comprehensive professional development plan. The school will support the professional development needs of all professional staff by subsidizing college classes, facilitating the attainment of continuing education credits, and offering trainings.

Teacher training will be offered throughout the school year in a variety of forms. Select teachers will attend local, state and national conferences and serve as trainer to the remainder of the staff upon return to the School. Appropriate and relevant school wide training will occur on teacher planning days as well as on early release dates. All staff will participate in school-initiated and other relevant and necessary workshops for professional development, and a member of the administrative team will coordinate, assist and monitor the staff development process. The Educational Service Provider may also prepare staff develop meetings in which the school may elect to participate. In-house workshops and meetings will be held monthly by administrators and may occur as often as biweekly through team leaders, in order to facilitate support, encourage communication, allow for team planning, and troubleshoot concerns and needs.

In addition to school wide professional development opportunities, faculty members will each complete an Individual Professional Development Plan (IPDP) as a means to document and identify areas for personal targeted professional growth, including the identification of strategies for obtaining specified goals, its' compatibility to ensuring the professional development exercise will serve to benefit the student, and a timeframe in which the staff development exercise should occur. All IPDPs will be approved by the Principal, or his/her designee, at such time the principal may elect to recommend additional recommended professional development that should occur within a given timeframe. The principal or member of the administrative staff, together with the teacher, will commit to the IPDP, including the allocation of necessary resources for plan implementation, and observation of new/struggling teachers by veteran/mentor teachers to implement support strategies.

Section 13: Student Recruitment and Enrollment

A. Describe the plan for recruiting students, including strategies for reaching the school's targeted populations and those that might otherwise not have easy access to information on available educational options.

The School plans to prepare promotional materials and announcements in multiple languages (primarily English/Spanish/Creole) to local community organizations to make sure that "harder-to-reach" families (e.g. single-parent families, low socio-economic households, etc.) are aware of the choice program and their eligibility to apply for enrollment. In particular, given the school's focus, an emphasis will be placed on recruiting students who may be at-risk for dropping out.

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SLAM will conduct general information meetings that will be open to the public and announced through public service announcements. The School will post flyers in local public facilities such as the post office, community centers and other locations of public access. The goal is to reach parents by using various means of information delivery. Promotional flyers and/or postcards will be distributed via direct mail and/or directly to community groups and churches to ensure that harder-to-reach families are aware of the school and their eligibility to apply for enrollment. This information will also be posted in local public facilities such as community centers, parks/recreation centers, libraries and other locations of public access as permitted by local regulations.

SLAM will prepare a press release for dissemination to the major print media in the county so that the general public can be made aware of the enrollment period and location.

B. Explain how the school will achieve a racial/ethnic balance reflective of the community it serves or with the racial/ethnic range of other local public schools.

The school will be nonsectarian in its programs, admission policies, employment practices and operations. Students will be enrolled without regard to ethnicity, national origin, gender, or achievement level. Accordingly, the school's marketing and recruitment plan will be designed to reach the entire community and, accordingly, all racial/ethnic groups within it.

Due to the diverse racial and ethnic mix in the district as described in section 2 herein, the school expects to achieve diversity reflective of the community it will serves. By publicizing the availability of the School throughout the district, the racial/ethnic balance of the school should be equivalent to that of public schools currently serving the community.

C. Describe the school's proposed enrollment policies and procedures, including an explanation of the enrollment timeline, criteria and/or any preferences for enrollment, and lottery process.

Admission Policy - In accordance with federal and state anti-discrimination laws and in accordance with the Florida Educational Equity Act, Section 1000.05(2)(a), the School will not discriminate on the basis of race, ethnicity, national origin, gender, disability, or marital status against a student in its school admission process. An open admissions policy will be implemented wherein the School will be open to any student residing in the County. Any eligible student, as described in Fla.Stat.§1002.33(10), who submits an application (prior to the posted deadline) shall be considered, unless the number of applications exceeds the capacity of the program, class, grade level, or building. In such case, all applicants shall have an equal chance of being admitted through a random selection process. If the number of applications falls short of the established capacity, supplemental registration periods may be held for the purpose of reaching student capacity.

Enrollment Preferences - In accordance with Florida's charter school legislation, Fla. Stat. 1002.33(10)(d) the charter school may give enrollment preference to the following student populations:

- Students who are siblings of a student enrolled in the charter school.
- Students who are the children of a member of the governing board of the charter school.

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- Students who are the children of an employee of the charter school.
- Students who are the children of an active duty member of any branch of the United States Armed Forces.

In order to minimize any traffic impact caused by the school and ensure that the school is available to serve the residents of the neighborhood where the school is located, the Governing Board of the charter school may elect to limit the enrollment process to target students residing within a reasonable distance of the school as provided under Fla. Stat. §1002.33 (10)(e).

The School will not discriminate on the basis of race, religion, or national or ethnic origin, or exceptionality in the admission of students. Staff at the School will accommodate the needs of students enrolled at the school to ensure a positive learning experience.

Enrollment Timeline (Approximate Dates):

May 15 th	- Student Registration Begins
May 30th	- Students who have registered will be officially enrolled. If number of applicants exceeds capacity, lottery will be conducted.
June 1st	- Second Registration Period Begins
June 15 th	- Students who have registered will be officially enrolled. If number of applicants exceeds capacity, lottery will be conducted.

D. Explain any student and/or family contracts that will be used as a requisite for initial and continued enrollment in the school. Describe if and how the school will enforce such contracts.

Included in *Appendix F* is a *Sample Parent Contract* the school will use. Through the contract, parents and students agree, as members of the school's family, to abide by all of the school rules and regulations. Through the contract, parents agree, as stakeholders in the school, to abide by all of the school rules and regulations, and specifically, the parent contract stipulates various items that will be utilized in support of the child's education, providing certain means for ensuring their success. For example, parental involvement in the educational process is a major initiative and therefore one of the stipulations of the contract is that parents willingly agree to the required 30 hours of service as an investment in the child's education. The School will provide various options to complete such volunteer obligation, in accordance with State law and detailed below.

The School will enforce parent/guardian contracts as provided by law. The school will work to resolve matters regarding the parent/guardian contract by: 1) setting up a parent/guardian conference (via telephone or in person) to discuss the violation(s) and work with the parent/guardian toward a mutually satisfactory resolution and/or 2) providing opportunities for parents/guardians to fulfill their responsibilities under the contract.

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E. Explain any other efforts to encourage parental and community involvement, if applicable.

Parental and community involvement is a fundamental aspect of the mission and vision of SLAM. The School will encourage parents to be active participants in their children's education through volunteer opportunities at the school. SLAM will reach out to parents and the community through the SLAM website, monthly newsletters, and event calendars which will be updated monthly to disseminate information and maintain open lines of communication.

The school will also use workshops, parent meetings, open houses and email blasts to inform parents of involvement opportunities at the school throughout the school year. These include activities such as chaperoning field trips, assisting with class projects, helping in the library or office, speaking during Career Week, Family Day, etc.

Faculty and staff will also be expected to encourage parental involvement through:

- Parental Service Contracts parents agree to volunteer with their child's teacher and/or be involved in other ways in school activities.
- Quarterly Parent/Teacher Conferences hosted in the evenings at the School where parents can discuss topics that affect their children's educational progress.
- Open houses, Career Fairs, Family Day events held yearly to recruit new students, maintain communication and involvement between the School and the surrounding community.
- School Advisory Council* -This board will consist of school personnel, parents, students, local business, and community members will be able to address and vote on pertinent school matters on a monthly basis.
- PTSA* Parent Teacher Student Association coordinates extra-curricular events involving the community.

*Through the Parent Teacher Student Association (PTSA), School Advisory Council, and other such committees, parent and community members will also be able to partake in the school's decision-making process. The school plans to provide parent workshops on education-related topics, such as decision-making regarding school performance and student assessment needs.

Community Involvement - The existing SLAM middle/high school was featured in local television stations and on NBC's *the Today Show* and in *The Miami Herald*. Since then, the school founders have received numerous expressed commitments to partner with this community-building initiative. Below is an overview of these organizations and their expressed contributions.

The University of Miami Wellness Center/ UM Department of Exercise and Sports Science: infield experts in sports medicine to speak at the school, career advisors, career fairs, guest speakers and internship opportunities. UM has also approved access for SLAM students to conduct interviews with players and athletic staff.

The Miami Marlins: career advisors, shadow day experiences with park executives, fundraising events for the school, access to players, facilities and entertainment/broadcasting staff for students to conduct

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interviews, learn about the A/V equipment and operations.

The Marlins have committed to sending guest speakers (Executive Directors, Directors, Managerial Staff, or players) each nine weeks to speak to students at the school. Marlins' executives will also conduct a career related workshop for students on Thursdays for a 6-week period. Students will be able to attend various workshops to learn about job opportunities in sports. As the program develops further, the Miami Marlins have committed to offering future internship opportunities for students. They have also agreed to partner with SLAM for community service initiatives such as hosting a Senior Prom for seniors.

305 PLP LLC: local production company that will host a TV show premiering soon on a major broadcast network and will have a segment that will ultimately be fully produced by the kids. Students will be able to explore production and interview athletes, student athletes, celebrities, and sports fans. They will provide onsite experts to volunteer for presentations at the school. Working under SLAM staff in partnership with the production team, students will get real world experience in radio, TV/Video production, social media marketing, print journalism and photography.

Pitbull Productions, Inc./Mr. 305, Inc. - Mr. Armando Perez, the global recording artist professionally known as "Mr. Worldwide" and "Pitbull," has partnered with SLAM to participate in the implementation of the educational program and afterschool initiatives at the school. Mr. Perez and his production team will provide access to motivational speakers, celebrities, and sports figures to further engage students in school and career initiatives. Through his production company, Mr. Perez will also provide opportunities for students to attain real-world experience in the areas of broadcasting, video production, and social media marketing. He is also working with the SLAM organization to assist with fund-raising events. The original SLAM school is located in one of the inner city neighborhoods where Mr. Perez grew up. Mr. Perez's involvement with SLAM has been featured on numerous national radio and television shows including National Public Radio, Good Morning America, Today Show, The Katie Couric Show, and the Tonight Show with Jay Leno.

Florida International University: the University's Director of Federal Relations has expressed the University's intent to give SLAM its full support for future programmatic needs.

Pinecrest Physical Therapy – Owned by one of the athletic trainers of the Miami Marlins, this agency will provide athletic trainers for games and opportunities for students to learn about physical therapy though classroom mentors.

Others members of the South Florida community and prominent sports figures nationwide have expressed interest in supporting the school and its future programmatic needs. They include:

- · Jason Jax- Miami Heat/790 The Ticket
- · The Amigo 940 WINZ
- · DJ Irie- Miami Heat
- · Jorge Sedano- 560 WQAM
- · Mike Merchant 560 WQAM
- · Jon Jay St. Louis Cardinals
- · Gio Gonzalez Washington Nationals
- · Olivier Vernon- The Miami Dolphins

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SLAM will foster levels of student engagement through mentoring opportunities, career advisors, athletes as role models through positive relationships with these and other future community partners such as NASCAR, Major League Baseball (MLB), The Miami HEAT, NOVA Southeastern University and St. Thomas University. After school activities, quarterly guest speakers, participation in school sponsored events, internship and volunteer opportunities with school partners and parents will provide students with opportunities to benefit from this innovative programs as well as from varied extracurricular activities.

III. BUSINESS PLAN

Section 14: Facilities

If the site is NOT acquired:

A. Explain the school's facility needs, including desired location, size, and layout of space.

The Board plans to either lease a facility or engage an experienced charter school facilities developer to acquire, design, plan and construct facilities for lease, which are appropriate to the needs of the School.

The school would need a one or multi-story structure built or renovated to meet all requisite codes and life-safety regulations set forth by the applicable governing agency.

Size and Layout of Space: The facility will have an adequate number of classrooms designed to meet or exceed all pertinent classroom design standards set forth by the governing agency. The proposed facility will have an appropriate and will have all the requisite programmatic elements including: classrooms, multi-purpose spaces, library/media-lab, science and labs, restrooms, and administrative offices, cafeteria, administrative offices, gymnasium, and ancillary programs.

B. Provide an estimate of the costs of the anticipated facility needs and describe how such estimates have been derived.

SLAM's Governing Board expects that it will enter into a triple-net, long-term lease for the facilities. The Board and the ESP have undertaken several such leases, and have budgeted for anticipated lease and other facilities costs in the financial data provided in *Appendix A*. The Board has obtained confirmation that the budgeted amounts comport with the current forecast of lease conditions.

Estimate of Costs - These Budget projections in *Appendix A* have been derived from actual historical data from other comparable charter school facilities leased by the board, and from experienced charter school facilities developers, updated based upon widely-reported cost escalations for land and construction costs for the corporation's charter school programs.

Lease of Facilities: The amount assumes an average cost of \$ 900 per student station in the budget. This amount is comparable to that paid by several other charter schools with similar enrollment numbers which have opened recently. It is the intent of this proposed school to try to

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negotiate under similar terms when entering into new leases. The figures are based on statistical expense data compiled from over 100 successfully charter schools currently operating in Florida. The fees included are comparable to the average annual amounts paid by other charter schools with similar enrollment numbers. Lease payments will commence upon the taking of possession of the facilities by the School.

Long-term leasing provides to the School the ability for the School's Governing Board to focus on its core mission (education and educational programming), outsourcing the design, acquisition, permitting, financing, and construction of facilities to experienced entities in those markets, creating long-term guaranteed access to needed physical plant without the associated risks of ownership. The lease documents will provide that so long as the School is meeting its rent and other obligations, even the foreclosure of the property by the developer's lender will not affect the School's continuing rights to possession and use of the facilities under the lease.

Utilities and maintenance cost estimates are shown in the proposed budget and amounts are comparable to the average annual costs paid by other charter schools with similar enrollment numbers. Water and sewer and electricity bills are set at \$1,580 / Classroom. **Operations of Facility/Plant** includes Purchased Service - CAM (Custodial, fire and alarm, pest control), Property Insurance and Utilities.

C. Explain the strategy and schedule that will be employed to secure an adequate facility.

The Governing Board will direct its ESP to bring to the Board a recommendation for a quality educational facility to be leased by the School.

Projected Schedule

Sep- Dec	- Facility Search
Jan – Feb	- Facilities Identification and Negotiations upon charter approval by Sponsoring District
May-July	- Execute Lease/Conduct Maintenance and Repairs
July - Aug	- Final Preparations of Facilities
Aug	- Conduct Final Facilities and Safety Inspections

The ESP has extensive experience in identifying facilities and facilities developers, and has successfully assisted other charter school applicants in securing state-of-the-art charter school campuses. The ESP works with reputable and experienced charter property developers, who have access to a network of financial institutions ready to commit the necessary capital for build-to-lease facilities. The developers have also demonstrated abilities in securing the necessary local governmental approvals for charter school purposes and required financing. They have relationships with award-winning design and engineering firms, as well as contractors with a track record of timely completion of excellent facilities meeting the needs of the School. For example, Mater Academy East Charter School's facility, a 6-

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month construction project, was awarded "Outstanding Educational Design" and featured as the cover of *The American School & University Magazine's* June 2006 issue.

<u>Safety, Permitting, and Inspections</u> - The educational facility will comply with the Florida Building Code pursuant to Section 1013.37, F.S. or with applicable state minimum building codes pursuant to Chapter 553, F.S. and state minimum fire protection codes pursuant to Section 633.025, F.S., as adopted by the County. The facility will meet all local and state requirements for education facilities, including but not limited to, restrooms, fire safety, campus security, air quality control, weather proofing, etc.

The School will participate in the Sponsor's annual site compliance visits for the purpose of reviewing and documenting, as appropriate, compliance with applicable health and safety requirements. Other inspection agencies may include inspections of kitchens and related spaces as well as Department of Labor and Employment to for OSHA compliance. The School will show proof of the annual inspections prior to the first day of operations.

The School will use facilities which comply with the Florida Building Code pursuant to Section 1013.37, Florida Statutes, or with applicable state minimum building codes pursuant to Chapter 553, Florida Statutes, and state minimum fire protection codes pursuant to Section 633.025, Florida Statutes, as adopted by the County (local jurisdiction).

D. Describe the back-up facilities plan.

The School's Governing Board expects to finalize negotiations with a potential landlord prior to charter contract negotiations with the Sponsor. If unsuccessful, negotiation will commence immediately with an experienced developer. The Governing Board will require periodic updates from its ESP concerning the progress that is being made in final identification of a suitable site and developer to acquire, construct and lease the facilities. In the event that issuance of the Certificate of Occupancy is for any reason not expected in a timely fashion, the School's Governing Board intends to direct the ESP to locate short-term alternative facilities options to present to the Board at the earliest possible time. Any such alternate facility shall be suitable for school use, until such time as the school is able to open.

E. Describe the plan and methods the school will employ to comply with Florida's constitutional class size requirements.

The school plans to implement methods, which will ensure that is compliant with Florida's laws relating to class size. For example, the school will ensure that the facilities it occupies are equipped with the number of classrooms needed to accommodate the necessary number of classes. In addition, the school's Board will adopt annual budgets, which include sufficient certified teachers to achieve the student-to-teacher ratios, which are legally applicable.

Section 15: Transportation Service

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A. Describe the school's plan for transportation, including any plans for contracting services. Your plan should discuss, to the greatest extent possible, the issues relevant to the school's transportation plans.²²

The School's plan for transportation, including any plans for contracting services, will be pursuant to Florida's Charter School Legislation and consistent with the requirements subpart I.E. of Chapter 1006 and 1012.45, F.S. The School transportation plan will abide by applicable district, state, and federal rules and regulations. Accordingly, the School will ensure that transportation is not a barrier to equal access within a reasonable distance of the School, as required by section 1002.33, F.S.

The School's plan for providing reasonable and equitable transportation opportunities for all students is as follows:

Parent Transportation Agreements: The School's plans for contracting services, as described in Florida law, §1002.33(20)(c) F.S., provides that the governing body of the charter school may provide transportation through an agreement or contract with a private provider or with parents. The School will enter into agreements with the parents/guardians to provide transportation for their children as stipulated in the school's proposed parental involvement agreements wherein parents receive volunteer hours. The school believes that the time a parent can spend daily transporting the student (his or her child) to the school is a valuable opportunity for the parent and student to strengthen their bond and share information regarding the day's activities and events at the school.

Ensuring Equal Access: The school will ensure that transportation is not a barrier to equal access within a reasonable distance of the School, as provided in the Florida's Charter School Legislation. In the case transportation is needed and the parent advises the School that there is a hardship, and he/she is unable to provide the transportation, the School will provide transportation within a defined reasonable distance. In such cases, the School shall be responsible for transporting all students in a non-discriminatory manner to and from the School who reside within a "reasonable distance" of the School --defined herein as a two to four mile radius of the School-- or who otherwise are entitled to transportation by law.^[1] In these situations, the School may provide transportation by contracting with an independent private transportation provider approved by the Sponsor.

Transportation for ESE Students: The School may contract with a Sponsor-approved private transportation carrier to provide specialized transportation for students with disabilities based on their particular student needs and that, which may be specified in a student's IEP. In such case, the School will provide the Sponsor the name and information of the Sponsor-approved private transportation firm.

Private Providers: - Any private providers contracted by the School will be such providers who have been approved by the Sponsor as per the Sponsor's approved provider list. The School will comply with all applicable requirements of Fla. Stat. 1012.45 and review these rules and statutes at least

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²² The charter school and the sponsor shall cooperate in making arrangements that ensure that transportation is not a barrier to equal access for all students residing within a reasonable distance of the charter school as determined in its charter. (Section 1002.33(20)(c), Florida Statutes)

^[1] The term "reasonable distance" is defined in accordance with Chapters 1000 through 1013, Florida Statutes, as amended from time to time and the standards and guidelines provided by the State Department of Education.



annually for any changes thereto in ensuring compliance with statutes and rules pertaining to the safety of transported students. The School will provide the Sponsor with the names and contact information of any and all contracted private providers in ensuring monitoring of compliance for the safe transporting of students.

Section 16: Food Service

A. Describe the school's plan for food services, including any plans for contracting services or plans to participate in the National School Lunch Program.

SLAM's parent organization, Mater Academy, Inc., is an approved Sponsor of the National School Lunch Program and therefore, SLAM will sponsor the National School Lunch Programs, as required, and will provide free and reduced priced meals for eligible children. SLAM will prepare meals on campus in accordance with standards established by the National School Lunch Program. The school will offer an organized meal service that meets local health, state and federal regulations. Nutritious meals will be provided in accordance with the USDA Dietary Guidelines of meal component and portion size requirements. Food temperatures will be maintained in accordance with USDA guidelines and state standards. All meals will be distributed to students using a point of sale accountability procedure.

Free and Reduced Lunch Program - The School will be an approved site under Mater Academy Inc.'s NSLP Sponsorship and will provide free and reduced priced meals for eligible children. Eligible children are children from households with gross incomes within the free and reduced limits on the Federal Income Guidelines.

Schools have a Verification Plan that is implemented each school year. During the verification period, the confirmations of eligibility for free and reduced priced meal benefits under the National School Lunch Program are completed. Verification includes income documentation or confirmation that the child is included in a currently certified Temporary Assistance to Needy Families (TANF) assistance unit, SNAP, or Food Distribution Program on Indian Reservation (FDPIR). Verification efforts are not required for students who have been directly certified, homeless certified, and migrant certified or designated as a runaway youth. Directly certified students, migrant children, homeless and runaway youth are granted automatic eligibility for free meal benefits.

The School will process all necessary lunch applications; adhere to program operation and record keeping requirements; and use of the Child Nutrition Program (CNP) system. The School will implement the following procedure for processing Free/Reduced Lunch Applications:

- Disseminate lunch applications to all students upon enrollment
- Collect lunch applications and determine applications, according to Florida Income Eligibility
- Guidelines, published in the Federal Register by Food & Nutrition Service, USDA;
- Enter determinations for each child in the district's information system
- Provide students with notice of eligibility;

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- Serve/Charge student lunches in accordance with determined eligibility;
- Submit claims for reimbursement within 30 days of the following month for each approved month of the school year once approved by the NSLP.

Schools have a Standard Sample Size Verification Plan that is implemented between October and November of each school year. At this time the confirmations of eligibility for free and reduced price meal benefits under the National School Lunch Program are completed. Verification includes income documentation or confirmation that the child is included in a currently certified Temporary Assistance to Needy Families (TANF) assistance unit, Food Stamp household or Food Distribution Program on Indian Reservation (FDPIR). Verification efforts are not required for students who have been directly certified, homeless certified, and migrant certified or designated as a runaway youth. Directly certified students, migrant children, homeless and runaway youth are granted automatic eligibility for free meal benefits.

The School will implement the following procedure for processing Free/Reduced Lunch Applications:

- Disseminate lunch applications to all students upon enrollment;
- Collect lunch applications and determine applications, according to Florida Income Eligibility Guidelines, published in the Federal Register by Food & Nutrition Service, USDA;
- Enter determinations for each child into ISIS;
- Provide students with notice of eligibility;
- Serve/Charge student lunches in accordance with determined eligibility; and
- Submit claims for reimbursement within 30 days of the following month for each approved month of the school year (if sponsoring the NSLP).

Lunch Area - The school facility will include a lunchroom that meets state nutritional and sanitation standards. The School agrees to abide by all applicable laws including having two satisfactory health inspections conducted on a yearly basis, by the State Department of Health, County Department, as required, to maintain Permit for Food Service.

Back-up Plan - The school does not have the need to contract for food services. However, in any unforeseen case, if a private vendor had to be contracted by the school for food services, the school would solicit bids from private approved food service vendors. The vendor selected would prepare and serve food (maintaining them at proper temperatures) at the school in accordance with standards established by the Florida Department of Professional and Business Regulations. The private vendor will be required to maintain and supply the school with daily records of all lunches served and current copies of inspection and insurance certificates.

Section 17: Budget

A. Provide an operating budget covering each year of the requested charter term that contains revenue projections, expenses and anticipated fund balances. The budget should be based on the projected student enrollment indicated on the cover page of the application.

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See Appendix A – Operating Budget

B. Provide a start-up budget that contains a balance sheet, revenue projections, including source of revenues, expenses, and anticipated fund balance. The start-up budget must cover any period prior to the beginning of FTE payments in which the school will expend funds on activities necessary for the successful start-up of the school.

The following is the anticipated start-up budget:

04	- D l 4
Start-u	o Budaet

February March April May Line of Credit / Grant ** 25,000	June	Total
TVDDVGC		
EXPENSES:		
Administration Staff 2,500 3,500 3,500 3,5	3,500	16,500
Marketing & Enrollment 2,500 2,0	500	5,000
Computer/Printer 1,500	1,000	2,500
Administrative Expenses 500 200 100 1	00 100	1,000
TOTAL OPERATING EXPENSES 4,500 6,200 3,600 5,6	5,100	25,000
Fund Balance 20,500 14,300 10,700 5,1	-	

Start-Up Budget Revenue- the school will apply for a \$25,000 planning and design grant, as provided by the Charter School Implementation Grant Program. If awarded, the grant will assist the school with the start-up costs, which will be incurred prior to the period when the school will begin to receive operational funding from the sponsor. In the event that the start-up grant is not awarded, the school has identified a non-profit charter school lender that will provide a line of credit to support the opening expenditures (*See Appendix G - Lender Commitment Letter*). If the school opens at 50% enrollment, debt repayment of this line of credit will be interest only for at least 3 years and the school will have the option to pay when funds are available.

Startup Budget Expenses: The startup budget expenses as detailed above by object and function are based on the critical expenses for planning and program design and include: marketing efforts for 3 months prior to school opening; office materials and equipment and office computer; and professional services for staff recruitment and professional development.

C. Provide a detailed narrative description of the revenue and expenditure assumptions on which the operating and start-up budget are based.

The budget narrative should provide sufficient information to fully understand how budgetary figures were determined.

The school's budget forecast was developed using statistical data collected from a decade's worth of operations at more than 100 charter schools successfully operating in Florida and specifically in alignment with the existing SLAM program, which has the same program requisites. Representatives of the charter applicant have also attended state and district-sponsored charter school budget training workshops in prior years. The data and methodology used to prepare the budget forecast is highly

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reliable, and every one of the charter schools that developed budgets using this system completed the past school year with a budget surplus.

The budget contains the following sections to help the reader follow the assumptions presented in the budge:

Budget Summary – this section contains summary information of the overall budget. It is broken up into three different areas:

- Grades Served- Number of students, per student revenue based on the State provided revenue worksheet. In addition, the annual increase in per pupil funding is calculated.
- Revenue and Expenditure Summary- Contained in the expenditure section is information on the size and cost of the facility.
- Teacher Staff Summary Illustrates the average class size, number of teachers, and benefits per teacher.

Budget Detail – The complete five-year budget is presented in this section. For each year of the budget there is a proposed budget enrollment at 100% of projected enrollment, as well as at 75% and at 50% of enrollment:

- The revenues are calculated based on the number of students using the Revenue Worksheet. For subsequent years the State Source funding is calculated using the funding formula in the Budget Summary multiplied by the number of students.
- The expenditures are calculated based on a function of each line item. Each line item has a cost and a basis for the calculation.
- For salaries the total is presented from the Staffing matrix section for each function.

Budget Monthly Years 1-5 – In these sections the annual budget is presented in a monthly format on a cash basis for each of the years of the charter. The ESP has negotiated payment terms with various vendors and the amounts shown follow the payment terms received.

School Design – In this section the number of classrooms and students is presented in four different formats along with the percentage of ESE, ESOL, and students qualifying for free and reduced lunch meals.

Staffing Matrix – This section is broken out into three different areas;

- The first item is the assumptions used for calculating the benefits provided to each staff member.
- The second area is to provide the calculation for the number of staff members for each position.
- Next is the calculation of the pay amount times the number of positions for that function. In addition, benefits costs are calculated at the gross amount times the benefits rate from the first item.

Start-up Budget – The budgeted amounts of revenue and expenditures before the school's first fiscal year of operation are presented in this section.

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All Charter School Calculator – This section is from the Florida Department of Education Revenue worksheet used to calculate the gross State Funding.

Operating Budget Revenue

<u>The FTE Revenue</u> forecast is based upon data provided by the Florida Department of Education and the sponsoring school district at informational meetings held by sponsors for new charter school applicants. The application includes a detailed Revenue Worksheet in *Appendix A*, which explains how revenue figures were derived.

<u>The Transportation Reimbursement</u> revenue was based on the assumptions provided in the budget notes therein.

<u>The Lunch Program income</u> is calculated based on an estimated percentage of F&R lunch from existing schools in the target area, plus an estimation of students paying for their own meals. The revenue and costs associated with the lunch program are detailed in the *Appendix A - Budget Detail* section of the budget.

The Capital Outlay Revenues forecasted include only the amount of revenue that schools with over 250 students would receive from the sponsor's 5% allocation, since the 5% fee is applicable to only the first 250 students. The remainder is returned to the school for capital outlay purposes as defined by statue. No other amount is assumed or forecast. If the School is classified as a "high-performing school", the sponsor's allocation is reduced from 5% to 2% for the first 250 students. The revenues were kept flat for year 1. The average reflects a 1% increase but also reflects a 1% increase in expenses. If the revenue does not increase, the school will decrease expenses (salaries, etc. 1% all) to maintain a balanced budget regardless of fluctuations in FTE revenues.

Operating Budget Expenditures

Expenses have been forecast using the statistical expense data compiled from over 100 successfully charter schools operating in Florida. The data is highly reliable and every one of more than 80 charter schools that developed budgets using this system this past 2013 school year completed the year with a budget surplus.

Instructional Expenses

Salaries: (includes classroom teachers, contract or hourly, and teacher aides). Costs for educational staff and administrators are forecast using the published pay scale in effect in the district where the school is located as a guide. The number of instructional personnel is in accordance with Florida Law for class size as it pertains to charter schools (*See Appendix A - Staffing Plan*).

• School Administration -principal and one assistant principal in (Y2) (The percentage reflected in the budget for the principal refers to the salary, which may be reduced based on the enrollment in Y1; a fulltime **Registrar**; part time administrative assistant (Y1); other clerical personnel on as needed basis.

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- Instructional Staff Teacher Salaries were derived at by using an average salary of \$39,500/teacher for Year 1, with a CPI of 1% for every year thereafter. Teachers include ESOL certified personnel, ESE, Reading/Math Coaches with supplements for additional staff duties budgeted at 3,500/teacher. Paraprofessionals are budgeted at an average salary of \$18,000/year. Substitute teacher costs assume that substitutes will be hired for 10 days/full-time teacher at a rate of \$110/day.
- Pupil Personnel Services includes an ESE Teacher (to serve as program coordinator) in addition to ESE teacher under instructional staff and counselor
- Media Services: A Media Specialist in Y3.
- Fiscal services includes a business manager
- Other staff for school operations includes food service workers, custodial and security personnel.

Employee Benefits are calculated at a rate of approximately 22% (see "Staffing Matrix" section of the budget for exact calculation) of all salaries (excluding contracted services). This includes health insurance costs, 401k contributions, Worker's Compensation, and all mandatory federal and state employment taxes. As noted in the application, for employee insurance and benefits selection, the Governing Board has engaged the services of ADP Totalsource, a professional employer organization that provides human resource services to small and moderate size employers. The use of a professional employer organization allows the staff of the School to enjoy the same level of benefits that are available to employees of large organization such as Fortune 500 companies (including health/dental/vision insurance and Retirement/401k plans).

Staff Development covers Workshops/Trainings workshops and other PD activities (and includes incentive pay for teachers) costs for funds to satisfy FL Statute 1012.34 at approximately 1,000 per teacher. **SB 736 Merit Pay** amount was derived from the FFEP Teacher Salary Allocation (WFTE share) to be used for merit raises.

Instructional Expenses include: expenditures include Classroom Supplies and Equipment, Teacher Supplies, Textbooks and Student Activities and Contracted Professional Services (Therapists & other contracted instructional services for SWD) Supplemental instructional materials (SprinBoard CIRP/SIRP and Technology) as per Reading and Math Interventions (Reading Plus/IXL etc.), Computer Equipment for instruction and Computer Labs. The budgeted amounts assume that the only revenue that the school will receive is FTE, and is therefore consistent with (and exceeds) the amount allocated to instructional materials under the categorical funding formulas used by the State of Florida.

Board Expenses include Professional Legal Services for governing board, Insurance and Travel for Professional Development

Contract Services include professional fees paid to entities such as the Services and Support Provider, Speech Therapist, and other contracted instructional services. As noted in the detailed Revenue Worksheet included in the application, the budget anticipates that 12% of students will be classified as ESE. There is room in the budget to modify the amount paid for ESE services under Miscellaneous and in the Budget Surplus, should the rate of contracted services for ESE/ESOL increase due to the various needs of the students once enrolled.

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The budgeted amounts assume that the main revenue that the school will receive is FTE, and is therefore consistent with (and exceeds) the amount allocated to instructional materials under the categorical funding formulas used by the State of Florida.

Educational Service Provider (ESP) fees are budgeted by services on a per student basis as follows: Instructional Services (Curriculum Planning, Research, Development and Evaluation) \$115.00/student; General Administration management \$225.00/student; and Fiscal Services (Planning, Research, Development and Evaluation) \$110.00/student.

Advertisement and Promotion includes costs related to recruiting students and staff such as printing of brochures, website production, and advertisements in local media outlets (Refer to Section 13-Recruitment and Marketing Plan).

Independent Financial Audit (Fiscal Services) cost was derived using amounts paid by schools of similar size to accounting firms that perform the Independent Audit.

Food Services: Lunch Program expense is based on current figures found in the affiliated charter schools. The School is already approved under the National School Lunch Program and is qualified to receive reimbursements. Since we are uncertain of the precise population (and number of free and reduced lunch meals to be served) we are unable to provide a more precise budgeted structure for food service. However, an estimated amount is provided in the "Budget Detail" section of the budget.

Pupil Transportation Services is calculated at \$225/bus with 15% utilization.

Advertisement and Promotion includes costs related to recruiting students and staff (i.e. printing of brochures, website production, and advertisements in local media outlets)

Independent Financial Audit (Fiscal Services) cost was derived using amounts paid by schools of similar size to accounting firms that perform the Independent Audit.

Operations of Facility/Plant includes Purchased Service - CAM (Custodial, fire and alarm, pest control), Property Insurance and Utilities. Water and sewer and electricity bills are set at \$1,580/classroom. The figures included are based on statistical expense of the existing SLAM program and on data compiled from over 100 successful charter schools currently operating in Florida. The fees included are comparable to the average annual amounts paid by other charter schools with similar enrollment numbers.

Lease of Facilities: The amount assumes an average cost of \$900 per student station in the budget. This amount is comparable to that paid by several other charter schools with similar enrollment numbers which have opened recently. It is the intent of this proposed school to try to negotiate under similar terms when entering into new leases. The school will have a triple net lease, which incorporates improvements.

Maintenance of Plant: Amount listed is comparable to the average annual amounts paid by other charter schools with similar enrollment numbers

Contingency Plan includes a reserve of 5 % of FEFP.

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D. Explain how the governing board will monitor the budget, including a strategy for addressing revenue shortfalls due to lower than expected enrollment.

The Board has the ultimate responsibility to ensure that the School's finances are managed properly. Accordingly, the Board will review and approve a preliminary annual budget prior to the beginning of the fiscal year. The school Principal will prepare a school-site budget, which will include anticipated revenues and expenditures based on student enrollment. As part of its responsibilities, through a contractual agreement with the ESP, the ESP assists the Board and the Principal with the preparation and reporting of the School's finances. The principal receives a monthly Profit and Loss statement from the ESP detailing expenditures in each of the budgeted categories to monitor spending throughout the year. This strategy allows for the principal and board to make adjustments to expenses in anticipation of any possible shortfalls. Each quarter or month, depending on the needs of the School, the Board will review the budget and approve revisions to the budget as necessary.

Professional audit services are allocated and will be used to verify and audit the financial revenues and expenditures of the School to ensure to the board that all funds have been allocated and used in accordance with generally accepted accounting standards, including internal controls, and will accurately represent the financial position of the school as well as the results of their operations and cash flows. In addition, the audit will confirm the operations of the schools and organization were properly conducted in accordance with legal and regulatory requirements.

To ensure that the board has a sound and viable plan to address revenue shortfalls due to lower than expected enrollment:

- Additionally, to ensure that the board has a sound and viable plan to address revenue shortfalls due to lower than expected enrollment, school's budget (attached herein) reflects enrollment projections at 50%, 75% and 100% enrollment in Year 1.
- Most expenses in the budget are based on a "per student" number allocation. This allows the school to make more realistic budget projections and anticipated adjustments, as needed
- The budget includes a contingency reserve of 5% for each year of the charter term.
- The Board will require a report from the principal at least a month prior to school opening with projected and actual enrollments. Based on this report, the board may work with the school principal and the ESP to implement an action plan for additional "student recruitment" if necessary prior to making any staffing position reductions.
- The school has the option of securing a line of credit (if needed) from a non-profit lender in order to cover any unforeseen/startup cost, provided that these are needed and/or the FLDOE-CSP grant is not awarded (See Appendix G Lender Commitment Letter).
- E. Provide monthly cash flow projections for the school's start-up period (i.e. from the date on which the application is approved to the beginning of the first fiscal year of operation) through the first year of operation.

See Appendix A - Budgets including Monthly Projections

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F. Describe the school's fundraising plan, if applicable. Report on the current status of any fundraising efforts, including verification of any fundraising monies reported in the school's start-up or operating budgets.

Fundraising will serve as a catalyst to further service the School's needs. Throughout the school year, the School will conduct fundraising activities to generate capital and to supplement the per pupil allocations. Examples of fundraising activities include Book Fairs, Yearbook Sales, Holiday Store, School Pictures, and School Fair. The School may also apply for grants from national, state, and local foundations, as well as other sources for education grants, including the Charter School Implementation Grants. Specific grant sources will be determined, based on appropriateness and feasibility, by the school administration and Governing Board.

Additionally, the School will also receive a percentage of the sales made from school pictures, uniform sales, and yearbook sales. The School will also encourage sponsorship and donations from local business partners within the local community. This includes financial and material donations that will promote the educational program from the benefit of the community.

Section 18: Financial Management and Oversight

A. Describe who will manage the school's finances and how the school will ensure financial resources are properly managed.

The Governing Board has the ultimate responsibility to ensure that the School's finances are managed properly. The Board will contract with an Education Services Provider (ESP), which will assist the Board and the School Principal with the preparation and reporting of the School's finances. The Board will review and approve a preliminary annual budget prior to the beginning of the fiscal year. The Principal of the School will prepare a school-site budget, which will include anticipated revenues and expenditures based on student enrollment. Each quarter, the Board will review the budget and make revisions, as necessary.

The Principal will manage the day-to-day operations and site-based finances, including expenditures and receivables. The Board will adopt a policy whereby the Principal will need to seek prior approval from the Board for expenditures over a pre-approved amount for expenditures not included in he budget for amounts over \$10,000. The Principal will report at least quarterly to the Governing Board on the progress of the site-based budget and make recommendations and seek approval for large expenses. The Governing Board will oversee the Principal and remain responsible for all financial matters delegated to the Principal. The Governing Board will oversee the Principal and remain responsible for all financial matters delegated to the Principal.

B. Describe the financial controls, including an annual audit and regular board review of financial statements, which will be employed to safeguard finances.

The School has established financial procedures to further safeguard its finances. The Governing Board shall annually adopt and maintain an operating budget, retain the services of a certified public accountant or auditor for the annual independent financial audit and review, and will approve the audit

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report, including audit findings and recommendations. In the event a financial recovery plan is necessary, the Board will monitor it and ensure such plan is appropriately maintained. The Governing Board of the School will also review and monitor the financial statements of the School on at least a quarterly basis during regularly scheduled Board Meetings.

Controls - The Board of Directors is responsible for establishing and maintaining a system of internal controls in order to provide reasonable assurance that the school's assets are safeguarded against loss from unauthorized use or disposition, and that transactions are executed in accordance with the school's authorization and recorded properly in the financial records. Specifically, the Board has established controls in accordance with all applicable federal, state and local laws and in line with accepted industry standards and best practices regarding:

- Revenues, accounts receivable, and cash receipts
- Expenditures, accounts payable, and cash disbursements
- Budgeting and financial reporting
- Risk management
- School inventory & capital assets
- Student records
- Employment records

Standard procedures utilized to ensure sound internal accounting and a system of checks and balances include:

- **General Accounting** utilization of accepted state codification of accounts pursuant to the Financial and Program Cost Accounting and Reporting for Florida Schools in all transactions pertaining to its operations.
- Internal accounting procedures for the School pertaining to receivables and disbursements are as follows: For receivables, all cash payments will be logged, coded by source and deposited in a timely manner. Deposits are reconciled to cash receipt logs. Disbursements will be made only to approved vendors and must be appropriately authorized. Disbursement voucher packages are prepared at the School site and authorized by the School Principal. Disbursement vouchers are submitted to the ESP with appropriate supporting documentation to substantiate the nature, account classification, business purpose and amount. Disbursement vouchers are reviewed and approved by the Principal and the ESP. For internal accounts, all disbursements require two signatures. For operating and lunch accounts, disbursements require two signatures for any check in the amount of \$2,500 or above. Checks in the amount of \$25,000 or above require that one of the signatures be that of the Board Chair. Authorized signatures on checks are limited to the Chair of the Governing Board, the President, the School Principal/designee, or other designee approved by the Governing Board.
- Bank statements will be reconciled on a monthly basis. The School will provide regular financial statements to the Sponsor including a statement of revenues and expenditures and changes in fund balances, prepared in accordance with generally accepted accounting principles. These will be provided on the dates required by the School Board in the charter school contractual agreement between the School and the Sponsor.

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Wire Transfers - copies of all wire transfers (e.g., FTE funds, grants, charter school capital outlay) into the school's banking account(s) along with supporting documentation are maintained and recorded in the general ledger by journal entry.

Internal Revenue Collection - funds collected at the school (i.e., lunch monies, fundraisers, field trips) will be initially collected by the designated school staff member. These funds along with supporting documents are submitted to the Financial Manager whose responsibility is to record and prepare the deposit. All deposits will be prepared in duplicate; the original goes to the financial institution and the copy remains intact in the deposit book. A copy of the financial institution validated receipt along with supporting documentation will be maintained.

Capital Expenditures - purchase orders are required for all capital expenditures and are pre-approved by the Executive Director, Principal, or Designee. Limits are set by the Board of Directors and may change as necessary. These purchase orders are prepared in duplicate with one going to the vendor and the other remaining at the school on file in the Accounting Office. Any purchase order totaling more than the limit, as set by the Board of Directors requires Board action.

Operational Checking Accounts - all expenses related to the operations of the school will be paid from the operating account. Operating and lunch account checks will require two signatures for any check in the amount of \$2,500 or above. Checks in the amount of \$25,000 or above will require that one of the signatures be that of the Board Chair. All operating expenditures are subject to the same approval processes as indicated for capital expenditures. All accounts are reconciled on a monthly basis and presented to the Board of Directors for review.

Authorized Check Signers - authorized signers on school accounts are limited to certain specified individuals as approved by the Board of Directors.

The School will use the standard state codification of accounts as contained in the Financial and Program Cost Accounting and Reporting for Florida Schools, as a means of codifying all transactions pertaining to its operations for both internal and external reporting. Financial reporting will be subject to any directives issued by the State of Florida and the local school district.

C. Describe the method by which accounting records will be maintained.

The School will utilize the standard state codification of accounts as contained in the Financial and Program Cost Accounting and Reporting for Florida Schools, as a means of codifying all transactions pertaining to its operations for both internal and external reporting. Financial reporting will be subject to any directives issued by the State of Florida and Sponsor.

The Board will issue an RFP for the entity and will review proposals (generally every 3 years) to select a CPA firm to conduct annual audits. The School will provide the Sponsor with annual audited financial reports as of June 30 of each year. These reports will include a complete set of financial statements and notes thereto prepared in accordance with generally accepted accounting principles for inclusion into the Board's financial statements annually, formatted by revenue source and expenditures and detailed by function and object, as per the Sponsor's timelines.

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D. Describe how the school will store student and financial records.

The School will maintain both student and financial records in accordance with Chapter 119, Florida Statutes. Retention schedules established by the records and information management program of the Division of Library and Information Services of the Department of State will be followed.

Student Records - The school maintains both active and archival records for current and former students in accordance with federal, state, local laws and with the regulations prescribed by the Florida Department of Education. The school ensures that all student records are kept confidential as required by applicable law.

All permanent records of students leaving the school, whether by graduation or transfer to another sponsoring district school are transferred to the sponsoring district school in which the student is enrolled. All students leaving the school to attend an out-of county school or a private educational institution shall have a copy of their permanent record forwarded to the school in which the student is enrolled. All permanent records remain in the last school in which the student was enrolled.

All student records are kept in locked, fireproof cabinets or in a fireproofed locked records storage vault. Only certain school personnel have access to student records, and computerized student records are backed up regularly and stored in a secure area.

Financial Data Security - financial data will be maintained on a secured system/network. Only the School Director and authorized representatives of the Board of Directors have access to the data. Appropriate file backups and physical records will be maintained locked, fireproof cabinets in secure area.

E. Describe the insurance coverage the school will obtain, including applicable health, workers compensation, general liability, property insurance and directors and officers liability coverage.

The School will maintain insurance coverage limits that either meet or exceed the District minimum insurance limit requirements. The School's insurance shall cover the School (and its subcontractors, to the extent that it is not otherwise insured) for those sources of liability which would be covered by the latest edition of the standard Workers' Compensation Policy, as filed for use in Florida by the National Council on Compensation Insurance, without restrictive endorsements as stated in the Florida Workers' Compensation Act.

Minimum Limits: There shall be no maximum limit on the amount of coverage for liability imposed by the Florida Workers' Compensation Act or any other coverage customarily insured under Part 1 of the standard Worker's Compensation Policy. The minimum amount of coverage for those coverages customarily insured under Part 2 of the standard Worker's Compensation Policy shall be: EL Each Accident: \$500,000; EL Each Disease-Policy Limit: \$500,000; EL Disease-Each Employee: \$500,000

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Insurance limits and deductibles are as follows:

- General Liability Limit \$1,000,000/\$3,000,000 Deductible: \$0
- Educators Legal Liability and Employment Practices Limit: \$1,000,000 Deductible: \$2,500
- · Crime Coverage Limit: \$1,000,000 Deductible: \$5,000
- · Comprehensive Property Coverage Limit: 100% TIV Deductible: Named Windstorm 5% of TIV, \$5,000 All other Perils
- · Workers Compensation Coverage Limit: Each Accident \$2,000,000/Each Disease \$2,000,000/Each Employee \$2,000,000 Deductible: \$0

The insurance carrier has AM Best financial rating of A XII, with over \$1 billion in retained earnings according to AM Best.

For Worker's Compensation: Aon Risk Services, Inc. of FL is licensed in the State of FL and Illinois National Insurance Company is rated "A (Excellent)" by AM Best Company.

Section 19: Action Plan

- A. Present a projected timetable for the school's start-up, including but not limited to the following key activities:
 - i. Identifying and securing facility
 - ii. Recruiting and hiring staff
 - iii. Staff training
 - iv. Governing Board training
 - v. Policy Adoption by Board (if necessary)
 - vi. Lottery, if necessary
 - vii. Student enrollment

(This timetable is a projection and is not meant to be binding on the school or sponsor)

The school's projected timetable for start-up is as follows:

August 2013	- Submission of charter school application proposal
August –	- Application Review and Board Interviews
November	
November –	- School Board consideration of Application
December	- Facility Search
	- Grant Solicitation
December –	- Contract Negotiations with School District
February	- Facilities Identification and Negotiations
December -	- Grant Preparation
January	
February	- Recruitment of Principal
March – May	- Marketing and Student Recruitment

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	- Initial Recruitment of Faculty and Staff
May	- Principal selection and hiring by the Board
May 15 th	- Student Registration Begins
May 30th	- Students who have registered will be officially enrolled. If
	number of applicants exceeds capacity, lottery will be conducted.
June 1st	- Second Registration Period Begins
	- Vendor Contracts Finalized (food service, uniforms, etc.)
June 15 th	- Students who have registered will be officially enrolled. If
	number of applicants exceeds capacity, lottery will be conducted.
May- June	- Curriculum Planning and Purchasing of Materials
	- Technology and School Furniture Purchasing
	- Finalize Staff Recruitment and Hiring
July	- Preparation of Facilities
	- Finalize Faculty and Staff Hiring
	- Policy Adoption by Board as needed (Budget adoption, etc.)
	- Governing Board Training/Fingerprinting as needed
July- Aug	- Conduct Final Facilities and Safety Inspections
	- Staff Training (Summer Institutes)
	- Finalize Registrations and Master Schedule
	- Teacher fingerprinting, drug-testing, and background checks
	completed.
August 2014	- Textbook and Furniture distribution and inventory
	- Final Curriculum Review with lead staff
	- Faculty Orientation Workshops – PD
	- Student/Parent Orientations
	- Classes Commence as per Sponsor Calendar

School-Emergency Management and Recovery Plan - The Governing Board and the School will ensure that all provisions of the Jessica Lunsford Act (1012.465.F.S.) are adhered to at the school in ensuring the safety of all faculty, staff and students on the property. SLAM will implement a security action plan that prepares all staff for unanticipated events including but not limited to: medical, fire, hazardous, weather security, etc. The School will cooperate with the District to provide the safest school possible for the staff and students, and will incorporate all the applicable and appropriate District-approved emergency efforts in order to maintain a safe school environment. Accordingly, the School will adopt the emergency plans for fire, hurricane, tornado, and child safety currently in effect within the District. All staff members will be trained regarding procedures for disaster preparedness plans outlining procedures for emergency situations and natural disasters. Staff will be properly trained to implement the action plan. Procedures and plans will be provided to staff through employee handbooks and parents will receive information regarding emergency procedures via newsletters and parent meetings. Students and staff will be trained in planning for these events through routine drills.

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STATEMENT OF ASSURANCES

This form must be signed by a duly authorized representative of the applicant group and submitted with the application for a charter school.

As the authorized representative of the applicant group, I hereby certify that the information submitted in this application for a charter for **The Sports Leadership and Management Foundation**, Inc., is accurate and true to the best of my knowledge and belief; and further, I certify that, if awarded a charter, the school:

- Will be nonsectarian in its programs, admission policies, employment practices and operations.
- Will enroll any eligible student who submits a timely application, unless the school receives a greater number of applications than there are spaces for students, in which case students will be admitted through a random selection process.
- Will adhere to the antidiscrimination provisions of section 1000.05, F.S.
- Will adhere to all applicable provision of state and federal law relating to the education of students with disabilities, including the Individuals with Disabilities Education Act; section 504 of the Rehabilitation Act of 1974; and Title II of the Americans with Disabilities Act of 1990.
- Will adhere to all applicable provisions of federal law relating to students who are limited English proficient, including Title VI of the Civil Rights Act of 1964 and the Equal Educational Opportunities Act of 1974.
- Will participate in the statewide assessment program created under section 1008.22, F.S.
- Will comply with Florida statutes relating to public records and public meetings, including Chapter 119, Florida Statutes, and section 286.011, F.S., which are applicable to applicants even prior to being granted a charter.
- Will obtain and keep current all necessary permits, licenses and certifications related to fire, health and safety within the building and on school property.
- Will provide for an annual financial audit in accordance with section 218.39, F.S.

The	governing board	l, at its	discretion,	allows	Rene	Ruiz,	Esq.,	Governing	Board	Chair,	to sign	ı as the
	l correspondent f										O	

07/15/13 Date

Rene Ruiz, Esq.

Printed Name
Form Number: IEPC-M1
Rule Number: 6A-6.0786
May 2012



SPORTS LEADERSHIP AND MANAGEMENT (SLAM) MIDDLE SCHOOL (BROWARD)

APPENDICES

Start-up Budget

Otali up Buuget						
· ·	February	March	April	May	June	Total
Line of Credit / Grant **	25,000					
EXPENSES:						
Administration Staff	2,500	3,500	3,500	3,500	3,500	16,500
Marketing & Enrollment		2,500		2,000	500	5,000
Computer/Printer	1,500				1,000	2,500
_						
Administrative Expenses	500	200	100	100	100	1,000
•						
TOTAL OPERATING EXPENSES	4,500	6,200	3,600	5,600	5,100	25,000
		,		,	•	
Fund Balance	20,500	14,300	10,700	5,100	-	

^{**} The School will apply for a \$25,000 planning and design grant, as provided by the Charter School Implementation Grant Program. If awarded, the grant will assist the school with the start-up costs which will be incurred prior to the period when the school will begin to receive operational funding from the sponsor. In the event that the start-up grant is not awarded, the school can either use resources from its network or has identified a non-profit charter school lender that will provide a line of credit to support the opening expenditures.

Year 1 75% Year 1 Low Year 2

Year 3

Year 4

Year 5

SLAM Middle - Broward

Grades	6-8			6-8	6-8	6-8	6-8
Students per grade (average)	125	94	63	200	242	250	250
Total # Students	374	281	187	600	725	750	750
Per Student Revenue *	5,935	5,935	5,935	5,973	6,027	6,087	6,148
				1.0%	1.0%	1.0%	1.0%
REVENUE							
Maximum Gross Revenue (\$)	2,219,613	1,667,677	1,109,807	3,679,515	4,375,797	4,686,730	4,733,597
Enrollment Contingency (\$)	-	ı	•	95,572	6,027	121,733	122,951
Budgeted State Sources of Revenue (\$)	2,219,613	1,667,677	1,109,807	3,583,944	4,369,770	4,564,997	4,610,647
EXPENDITURES Socility Dudget						ı	
Facility Budget	447.602	200 222	242.742	606 200	040.004	006.020	005.706
Maximum Facility Expense	417,692	309,323	212,743	686,208	848,994	886,838	895,706
Minimum Building Size (Sqft)	19,448	14,612	9,724	31,200	37,700	39,000	39,000
Cost per Student	\$ 900.00	\$ 900.00	\$ 900.00	\$ 909.00	\$ 918.09	\$ 927.27	\$ 936.54
Operating and Fixed Costs	81,092	56,423	44,443	140,808	183,379	191,385	193,298
Mortgage Payments/Rent	336,600	252,900	168,300	545,400	665,615	695,453	702,408
Teacher Staffing Budget							
Average Class Size	22	22	22	21	22	21	21
# of Teachers	17	13	9	30	35	37	38
Salary Benefits per Teacher	9,294	9,287	9,294	9,209	9,319	9,422	9,145
			•	•	•		
MAXIMUM FOR OTHER EXPENDITURES	1,428,498	1,002,060	691,359	2,221,852	2,641,183	2,774,321	2,812,225

Year 1

^{*} See All Charter School Calculator for Assumptions for the calculation of per pupil FTE

Classroom Clas																		
Company Comp	SLAM Middle - Broward							YEAR 1				YEAR 2		YEAR 3		YEAR 4	١	EAR 5
Company Comp						Fynerted	,	75% Enrollment	50 %	Fnrollment								
8-8 1-10 1-1	ENROLLMENT	Co	st	Basis		Expected	ť	370 EIN OIMIEN	30 /0	Linoinnene								
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Instruction Instru	other sources - Services					¢ 2.542.127.0	<i>c</i> (. 1 010 7E2 20	ć 1	271 560 00	•	4 200 720 66	¢	E 000 270 E4	¢ E	242 005 04	¢ = ′	202 404 00
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Selbate Selb	Instruction																	
Fringe Benefits Contracted Professional Services (includes Therapists & other contracted instructional services) \$ 45,000 5 5 Student 5 20,196.00 5 10,1078.00 5 10,098.00 5 30,272.00 5 33,226.02 5 43,672.01 5 42,044.00 5 10,098.00 5 10,098.00 5 20,270.00 5 33,220.02 5 43,772.01 5 42,044.00 5 10,098.00 5 10,098.00 5 20,000.00 5 2		See Staffir	ng Plan			\$ 718 200 00	0 9	548 800 00	\$	359 100 00	\$	1 255 733 00	\$	1 482 511 33	\$ 1	584 602 94	\$ 1.5	579 636 89
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Section Sect	<u>u</u>	Ś	450.00	FSF Student										•				
Teachtos supplies		Ś									\$							
Station Stat		\$	35.00	Student					\$	6,545.00	\$	21,210.00	\$	25,885.04		27,045.40	\$	27,315.86
Sa Para Ment Pay	• •	\$							\$	65,450.00	\$		\$		\$	270,454.01	\$ 2	273,158.55
Computer - Equipment for instruction (* lease to include ebooks) \$ 1,600,00 \$ 1,200,000 \$ 1,		\$	75.00	Student		\$ 28,050.00	0 \$	21,075.00	\$	14,025.00	\$	45,450.00	\$	55,467.94	\$	57,954.43	\$	58,533.98
Computer Lab - Including Software	SB 736 Merit Pay					\$ 64,552.00	0 \$	48,500.30	\$	32,276.00	\$	103,500.00	\$	125,064.00	\$	129,387.00	\$	129,387.00
Sub-total Instruction	Computer - Equipment for Instruction (* lease to include ebooks)	\$	1,600.00	Classroom		\$ 27,200.00	0 \$	20,800.00	\$	14,400.00	\$	45,248.00	\$	53,861.28	\$	57,696.86	\$	58,273.82
Pupil Personnel Services	Computer Lab - Including Software	\$ 1	2,000.00	Lab		, , , , , ,		, , , , , , , ,	\$	7,500.00	\$	12,120.00	\$	-	\$	12,363.61	\$	24,974.50
Salaries (Includes counselor, school nurse, health assistant) See Staffing Plan S	Sub-Total Instruction					\$ 1,189,022.00	0 \$	907,915.30	\$	596,811.00	\$	2,031,616.26	\$	2,401,010.13	\$ 2	2,564,616.75	\$ 2,5	576,065.55
Salaries (Includes counselor, school nurse, health assistant) See Staffing Plan S							į											
Fringe Benefits	•	c c							_		_	40,400,00	_	40.004.00	_		_	
Contracted Professional Services (counseling and psychological) S 500.00 ES Estudent S 22,440.00 S 16,860.00 S 11,220.00 S 36,860.00		See Staffir	ng Plan						: '							- ,		,
Sub-Total Pupil Personnel Services S 71,240.00 S 65,660.00 S 35,620.00 S 85,648.00 S 94,155.23 S 146,920.92 S 148,390.13		,	F00 00	CCC Ctdot					1		\$			•				
Media Services See Staffing Plan \$ <th< td=""><td></td><td>Þ</td><td>500.00</td><td>ESE Student</td><td></td><td></td><td></td><td>,</td><td></td><td></td><td>¢</td><td> ,</td><td>Ÿ</td><td></td><td>-</td><td></td><td>Ψ</td><td>-,-</td></th<>		Þ	500.00	ESE Student				,			¢	,	Ÿ		-		Ψ	-,-
Salaries (includes Librarian) See Staffing Plan \$ </td <td>Sub-rotal rupii reisoiniei services</td> <td></td> <td></td> <td></td> <td></td> <td>7 71,240.00</td> <td>,</td> <td>05,000.00</td> <td>7</td> <td>33,020.00</td> <td>7</td> <td>85,048.00</td> <td>7</td> <td>54,155.25</td> <td>7</td> <td>140,320.32</td> <td>γ.</td> <td>140,330.13</td>	Sub-rotal rupii reisoiniei services					7 71,240.00	,	05,000.00	7	33,020.00	7	85,048.00	7	54,155.25	7	140,320.32	γ.	140,330.13
Salaries (includes Librarian) See Staffing Plan \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ 8,976,88 \$ 9,066,65 \$ 9,173,20 \$ 7,500.00 \$ 8,000.00 \$ 8,000.00 \$ 9,000.00 <	Media Services																	
Fringe Benefits		See Staffir	ng Plan			\$ -	9	6 -	\$	-	\$	_	\$	40.804.00	\$	41,212,04	\$	41.624.16
Library Books						\$ -				-	\$	-	\$					
Curriculum Development \$ - \$		\$	7,500.00	School		\$ 7,500.00			\$	3,750.00	\$	7,575.00	\$					7,804.53
Salaries (includes Curriculum Specialist) \$ -	Sub-Total Media Services					\$ 7,500.00	0 \$	5 7,500.00	\$	3,750.00	\$	7,575.00	\$	57,431.63	\$	58,005.95	\$	58,586.01
Salaries (includes Curriculum Specialist) \$ -					T													
Fringe Benefits \$ 115.00 Student \$ 3,010.00 \$ 32,315.00 \$ 21,505.00 \$ 69,690.00 \$ 85,050.84 \$ 88,863.46 \$ 89,752.10 \$ 50.40 \$	·			ĺ											I			
Curriculum Planning, Research, Development and Evaluation \$ 115.00 Student \$ 43,010.00 \$ 32,315.00 \$ 21,505.00 \$ 69,690.00 \$ 85,050.84 \$ 88,863.46 \$ 89,752.10 \$ 50,000 \$ 18,180.00 \$ 22,187.18 \$ 23,181.77 \$ 23,413.59 \$ 10,000 \$ 10,						\$ -	- 1 '			-	\$	-	\$	-		-		-
Student Activities \$ 30.00 Student \$ 11,220.00 \$ 8,430.00 \$ 5,610.00 \$ 18,180.00 \$ 22,187.18 \$ 23,181.77 \$ 23,413.59 Sub-Total Curriculum Development \$ 54,230.00 \$ 40,745.00 \$ 27,115.00 \$ 87,870.00 \$ 107,238.01 \$ 112,045.23 \$ 113,165.69 Staff Development Workshops/Trainings (includes incentive pay for teachers) \$ 1,000.00 Teacher \$ 17,000.00 \$ 13,000.00 \$ 8,500.00 \$ 30,000.00 \$ 30,000.00 \$ 35,000.00 \$ 37,000.00 \$ 38,000.00	S .	1.				\$ -				-	\$	-	Ψ.	-	-		-	-
Sub-Total Curriculum Development \$ 54,230.00 \$ 40,745.00 \$ 27,115.00 \$ 87,870.00 \$ 107,238.01 \$ 112,045.23 \$ 113,165.69 Staff Development \$ 1,000.00 Teacher \$ 17,000.00 \$ 13,000.00 \$ 8,500.00 \$ 30,000.00 \$ 35,000.00 \$ 37,000.00 \$ 38,000.00		\$							1 1		\$							
Staff Development \$ 1,000.00 \$ 13,000.00 \$ 8,500.00 \$ 30,000.00 \$ 35,000.00 \$ 38,000.00		\$	30.00	Student				,		-	\$		\$		-		-	-,
Workshops/Trainings (includes incentive pay for teachers) \$ 1,000.00 Teacher \$ 17,000.00 \$ 13,000.00 \$ 30,000.00 \$ 35,000.00 \$ 37,000.00 \$ 38,000.00	Sub-Total Curriculum Development	1				\$ 54,230.00	υ \$	40,745.00	5	27,115.00	\$	87,870.00	\$	107,238.01	\$	112,045.23	Ş :	113,165.69
Workshops/Trainings (includes incentive pay for teachers) \$ 1,000.00 Teacher \$ 17,000.00 \$ 13,000.00 \$ 30,000.00 \$ 35,000.00 \$ 37,000.00 \$ 38,000.00	Staff Development																	
	<i>"</i>	ς .	1 000 00	Teacher		\$ 17,000,00	n 4	13 000 00	\$	8 500 00	\$	30 000 00	s	35 000 00	\$	37 000 00	\$	38 000 00
2 17,000.00 2 13,000.00 2 30,000.00 2 37,000.00 3 38,000.00		7	1,000.00	reactiet					φ ς	-	Ϋ́		Ś		Ψ		ς ,	
		1			 -	- 17,000.00	- 7	15,000.00	۲	5,500.00	Ť	30,000.00	·	33,000.00	Ť	3.,000.00	r	20,000.00

CLANA Middle Drowned						V54D4					VEAD 2		V54D 3		V545.4		V54D 5
SLAM Middle - Broward						YEAR 1					YEAR 2		YEAR 3		YEAR 4		YEAR 5
				E	xpected	75% Enroll	ment	50 %	% Enrollment								
Instruction Related Technology																	
Salaries (includes Technology Personnel)	See Sta	ffing Plan		\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-
Fringe Benefits				\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-
EduSoft Software and Scanner	\$	1,200.00	School	\$	1,200.00	\$ 1,20	00.00	\$	1,200.00	\$	1,212.00	\$	1,224.12	\$	1,236.36	\$	1,248.72
Hardware Maintenance	\$	400.00	Classroom	\$	6,800.00	\$ 5,20	00.00	\$	3,600.00	\$	11,312.00	\$	13,465.32	\$	14,424.21	\$	14,568.46
Sub-Total Instruction Related Technology				\$	8,000.00	\$ 6,4	00.00	\$	4,800.00	\$	12,524.00	\$	14,689.44	\$	15,660.58	\$	15,817.18
Board																	
Professional Services (Legal)	Ś	2,500.00	School	\$	2,500.00	\$ 2,5	00.00	\$	2,500.00	\$	2,525.00	\$	2,550.25	\$	2,575.75	\$	2,601.51
Insurance (General Liability, D&O, Professional Liability)	Ś	660.00	Classroom	s	11,220.00			\$	5,940.00	\$	18,664.80	\$	22,217.78	\$		\$	24,037.95
Travel	ć	2,000.00	Board Mem	\$	2,000.00		00.00		2,000.00	\$	2,020.00	¢	2,040.20	¢	2,060.60	¢	2,081.21
Sub-Total Board		2,000.00	bourd Wiem	\$	15,720.00		80.00	\$	10,440.00	\$	23,209.80	\$	26,808.23	\$	28,436.31	\$	28,720.67
					•	,			ĺ		,		·		·	•	,
General Administration	1.																
Management Fees	\$	225.00	Student	\$	84,150.00	\$ 63,2	25.00	\$	42,075.00	\$	136,350.00	\$	166,403.81	\$	173,863.29	\$	175,601.93
Administrative Fee																	
Sub-Total General Administration				\$	84,150.00	\$ 63,2.	25.00	\$	42,075.00	\$	136,350.00	\$	166,403.81	\$	173,863.29	\$	175,601.93
School Administration																	
Salaries (includes Principal, Secretary & other Office Personnel)	See Sta	ffing		\$	98,230.48	\$ 98,2	30.48	\$	53,500.00	\$	198,930.57	\$	219,281.68	\$	221,474.49	\$	223,689.24
Fringe Benefits				\$	21,610.71	\$ 21,6	10.71	\$	11,770.00	\$	43,764.73	\$	48,241.97	\$	48,724.39	\$	49,211.63
Equipment Rental / Lease	\$	300.00	Per Month	\$	3,600.00	\$ 3,60	00.00	\$	3,600.00	\$	3,636.00	\$	3,672.36	\$	3,709.08	\$	3,746.17
Travel	\$	400.00	Administrator	\$	500.00	\$ 50	00.00	\$	500.00	\$	505.00	\$	510.05	\$	515.15	\$	520.30
Advertising and Promotion	\$	50.00	Student	\$	18,700.00	\$ 14,0	50.00	\$	9,350.00	\$	30,300.00	\$	36,978.63	\$	38,636.29	\$	39,022.65
License Fees	\$	200.00		\$	200.00	\$ 20	00.00	\$	200.00	\$	202.00	\$	204.02	\$	206.06	\$	208.12
Uniforms	\$	300.00		\$	300.00	\$ 30	00.00	\$	300.00	\$	303.00	\$	306.03	\$	309.09	\$	312.18
Postage	\$	50.00	Classroom	\$	850.00	\$ 6	50.00	\$	450.00	\$	1,414.00	\$	1,683.17	\$	1,803.03	\$	1,821.06
Printing	\$	350.00	Classroom	\$	5,950.00	\$ 4,5	50.00	\$	3,150.00	\$	9,898.00	\$	11,782.16	\$	12,621.19	\$	12,747.40
Office Supplies	\$	30.00	Student	\$	11,220.00	\$ 8,4	30.00	\$	5,610.00	\$	18,000.00	\$	21,750.00	\$	22,500.00	\$	22,500.00
Office Equipment	\$	4,000.00		\$	4,000.00	\$ 4,0	00.00	\$	4,000.00	\$	4,040.00	\$	4,080.40	\$	4,121.20	\$	4,162.42
Computer Equipment	\$	1,000.00	Administrator	\$	1,250.00	\$ 1,2	50.00	\$	1,250.00	\$	1,262.50	\$	1,275.13	\$	1,287.88	\$	1,300.76
Sub-Total School Administration				\$	166,411.19	\$ 157,3	71.19	\$	93,680.00	\$	312,255.79	\$	349,765.57	\$	355,907.85	\$	359,241.93
Facilities Acquisition & Construction																	
Building Lease / Rent (see budget summary for calculation)				\$	336,600.00	\$ 252,9	00.00	\$	168,300.00	\$	545,400.00	\$	665,615.25	\$	695,453.18	\$	702,407.71
Sub-Total Facilities Acquisition & Construction				\$	336,600.00	\$ 252,9	00.00	\$	168,300.00	\$	545,400.00	\$	665,615.25	\$	695,453.18	\$	702,407.71
Fiscal Services																	
Salaries (Business Manager, Accounting & Bookkeeping Personnel)	See Sta	ffing		¢	20,000.00	\$ 20.00	00.00	¢	14,000.00	\$	40,400.00	\$	40,804.00	\$	41,212.04	\$	41,624.16
Fringe Benefits	See Sta	IIIIIg		φ ¢	4,400.00		00.00	•	3,080.00	\$	8,888.00	\$	8,976.88	\$		\$	9,157.32
Fee to County School Board - up to 250 students				¢	74,184.93		84.93			\$	74,665.49	φ \$	75,340.86	\$		Ф \$	76,844.11
Planning, Research, Development and Evaluation	\$	110.00		\$	41,140.00		10.00		20,570.00	\$	66,660.00	\$	81,352.98	\$		\$	85,849.83
Professional Services - Annual Audit	\$	7,500.00		s	7,500.00		00.00		7,500.00	\$	7,575.00	s s	7,650.75	s	7,727.26	\$	7,804.53
Sub-Total Fiscal Services	,	7,300.00		\$	147,224.93			<u>,</u> ψ	100,640.33	\$	198,188.49	\$	214,125.46	\$	219,089.06	\$	221,279.95
Food Services		***		I .	44.000.55			_	44.000	١,	00 000	l _	40.044	۱	40.070.5		40 705
Salaries (Food Service Workers)	See Sta	πing		\$	14,000.00		00.00		14,000.00	\$			42,844.20	\$		\$	43,705.37
Fringe Benefits	_		December 1	\$	3,080.00			\$	3,080.00	\$	6,221.60	\$	9,425.72	\$.,	\$	9,615.18
Food, Materials & Supplies - Vendor provided meals 70% Participation	\$	2.46	Per Meal per day	\$	115,925.04	\$ 87,0	98.76	\$	57,962.52	\$	187,835.76	\$	229,237.89	\$	239,514.07	\$	241,909.21
Equipment Rental / Lease (provided by food vendor)		_	L	l.		_				l .				١.		_	
Inspection fees	\$	75.00	Twice per year	\$	150.00		50.00		150.00	\$	151.50	\$	153.02	\$	154.55	\$	156.09
Sub-Total Food Services				\$	133,155.04	<i>\$</i> 104,3.	28.76	\$	75,192.52	\$	222,488.86	\$	281,660.83	\$	292,461.24	\$	295,385.85

CLAM Middle Propert						VEAD 4				VEAD 2	VEAD 2		VEAR 4	ves-	
SLAM Middle - Broward						YEAR 1				YEAR 2	YEAR 3		YEAR 4	YEAR	. 5
					Expected	75% Enrollm	ent	50 % Enrollment							
Distil Transportation Consists															
Pupil Transportation Services Salaries (Drivers & Transportation workers)	See Sta	ffing		¢	_	\$	_	\$ -	\$	_	\$ -	\$	_	\$	
Fringe Benefits	See Sta	iiiig		¢	-	\$		\$ -	\$		\$ -	\$	-	\$	
Contracted Transportation Services - \$225 per bus 15% utilization	Ś	225.00	15%	s s	40,500.00				\$	81,000.00	\$ 81,000.0		81,000.00	•	000.00
Field Trip Expenses for competitions	7	225.00	1370	T _s	2,500.00		.00		\$	3,500.00	\$ 5,000.0		5,000.00		000.00
Sub-Total Pupil Transportation Services				\$	43,000.00	-		\$ 43,000.00	\$	84,500.00	\$ 86,000.0	_	86,000.00		000.00
Operation of Plant															
Salaries (Custodian, crossing guards, security)	See Sta	ffing		\$	20,800.80	\$ 10,400	.40	\$ 10,400.40	\$	42,017.62	\$ 63,656.6	9 \$	64,293.26	\$ 64,9	936.19
Fringe benefits		Ü		\$	4,576.18	\$ 2,288	.09	\$ 2,288.09	\$	9,243.88	\$ 14,004.4	7 \$	14,144.52	\$ 14,2	285.96
Purchased Service (Custodial, fire and alarm, pest control etc)	\$	75.00	Per Classroom	\$	1,275.00	\$ 975	.00	\$ 675.00	\$	2,121.00	\$ 2,524.7	5 \$	2,704.54	\$ 2,7	731.59
Lawn Maintenance	\$	200.00	Per Classroom	\$	3,400.00	\$ 2,600	.00	\$ 1,800.00	\$	5,656.00	\$ 6,732.6	6 \$	7,212.11	\$ 7,2	284.23
Pest Control	\$	40.00	Per Classroom	\$	680.00	\$ 520	.00	\$ 360.00	\$	1,131.20	\$ 1,346.5	3 \$	1,442.42	\$ 1,4	456.85
Security Services	\$	100.00	Per Month	\$	1,200.00	\$ 1,200	.00	\$ 1,200.00	\$	1,212.00	\$ 1,224.1	2 \$	1,236.36	\$ 1,2	248.72
Property Insurance	\$	1,100.00	Per Classroom	\$	18,700.00				\$	31,108.00	\$ 37,029.6				063.25
Telephone Services	\$	300.00	Per Month	\$	3,600.00		.00		\$	3,636.00	\$ 3,672.3				746.17
Water & Sewer	\$	80.00	Per Classroom	\$	1,360.00	\$ 1,040	0.00	\$ 720.00	\$	2,262.40	\$ 2,693.0	6 \$	2,884.84	\$ 2,9	913.69
Electricity	\$	1,500.00	Per Classroom	\$	25,500.00		_		\$	42,420.00	\$ 50,494.9	_	54,090.80		631.71
Sub-Total Operation of Plant				\$	81,091.98	\$ 56,423	.49	\$ 44,443.49	\$	140,808.09	\$ 183,379.2	2 \$	191,384.52	\$ 193,2	298.36
Maintenance of Plant															
Repairs & Maintenance	\$	1.00	Sq. Ft.	\$	19,448.00	\$ 14,612	2.00	\$ 4,862.00	\$	31,200.00	\$ 37,700.0	0 \$	39,000.00	\$ 39.0	000.00
Supplies				ļ ·	.,			, ,,,,	1	,	, , , , , ,		,		
Sub-Total Maintenance of Plant				\$	19,448.00	\$ 14,612	.00	\$ 4,862.00	\$	31,200.00	\$ 37,700.0	0 \$	39,000.00	\$ 39,0	000.00
Administrative Technology Services															
Systems Operation	\$	750.00	Per Classroom	\$	12,750.00	\$ 9,750	.00	\$ 6,750.00	\$	21,210.00	\$ 25,247.4	8 \$	27,045.40	\$ 27,3	315.86
Systems Planning & Analysis															
Sub-Total Administrative Technology Services				\$	12,750.00	\$ 9,750	0.00	\$ 6,750.00	\$	21,210.00	\$ 25,247.4	8 \$	27,045.40	\$ 27,3	315.86
Redemption of Principal				Ś	25,000.00										
Interest (Interest Only at 6%)				Ś	1,500.00	\$ 1500	0.00	\$ 1,500.00							
Sub-Total Debt Service				\$	26,500.00		0.00		\$	-	\$ -	\$	-	\$	-
Contingency				l .					1.			. [
Operating expense contigency - 5% of FEFP - Considered restricted funds		5%		\$	127,156.90	\$	-	\$ -	\$	210,036.48	\$ 250,413.5	3 \$	267,190.30	\$ 269,6	674.70
Sub-Total Contingency				\$	127,156.90	\$	-	\$ -	\$	210,036.48	\$ 250,413.5	3 \$	267,190.30	\$ 269,6	674.70
Total Expenditures				\$	2,540,200.03	\$ 1,894,405	.66	\$ 1,265,979.33	\$	4,180,880.78	\$ 4,996,643.8	3 \$	5,310,080.57	\$ 5,347,9	951.51
·										•					
Excess of Revenues over Expenditures				\$	2,937.93	\$ 16,347	7.73	\$ 5,589.65	\$	19,848.88	\$ 11,626.7	2 \$	33,725.37	\$ 45,5	542.49

Staffing Plan

SLAM Middle - Broward

 Fringe Benefit Rate
 22.00%

 FICA
 6.20%

 Medicare
 1.45%

 FUTA
 \$ 189.00

 SUTA
 \$ 189.00

 Workers Comp
 0.88%

 401K Contribution
 2.00%

 Health Insurance per Employee
 \$ 4,140.00

\$345 Per month per Employee

			Yr1		Yr2	Yr3	Yr4	Yr5
		High	75%	Low				
Instruction Staff								
Teachers (ESE or ESOL certified teacher)	39,500 1,100	17 17	13	9	28	33	35	35
Substitute Teachers Other Teachers (ESE, ESOL, see Budget Narrative)	39,500	17	13	9	28	33	35 1	35 2
Paraprofessionals	18,000				1	1	1	1
Supplements	3,500	8	6	4	14	16	17	
Сиррістень	101,600	17	13	9	30	35	37	38
	,			-				
Pupil Personnel Services								
ESE Teacher	40,000	1.00	1.00	0.50	1	1	2	2
	40,000	1	1	1	1	1	2	2
Media Services								
Media Specialist	40,000					1	1	1
	40,000	-		-	-	1	1	1
School Administration								
Principal	85,000	0.75	0.75	0.50	1.00	1.00	1.00	1.00
Assistant Principal	65,000				1	1	1	1
Administrative Assistant	24,961	0.50	0.50	0.50	1	1	1	1
Registrar Other Clerical	22,000 18.000	1.00	1.00	0.50	1.00	1.00	1.00	1.00
Other Clerical	214,961	2.25	2.25	1	4	5	5	5
Fiscal Services	214,801	2.20	2.23		4	3	3	5
	40.000	0.50	0.50	0.05				1
Business Manager	40,000 40,000	0.50 0.50	0.50 0.50	0.35 0.35	1	1	1	1
Food Comises	40,000	0.50	0.50	0.35		1		1
Food Services	11.000							
Food Service Workers	14,000	1	1	1	2	3	3	3
-	14,000	1	1	1_	2	3	3	3
0 11 68 1	-	-		-	-	-	-	-
Operation of Plant								
Custodian	20,801	1	0.50	0.50	2	2	2	2
Security	20,801					1	1	1
	41,602	1	1	1	2	3	3	3
TOTAL EMPLOYEES		23	18	12	40	49	52	53
TOTAL EMPLOYEES		23	18	12	40	49	52	53
Salary Inflation	1.0%							
outary innation	1.070							
Instruction Staff								
Homeroom Teachers		671,500	513,500	335,750	1,117,060	1,329,700	1,424,391	1,438,635
Substitute Teachers		18,700	14,300	9,350	31,108	37,030	39,667	40,063
Other Teachers (ESE, ESOL, Reading/Math Coaches)		-	-	-	39,895	40,294	40,697	82,208
Paraprofessionals		_	_	_	18,180	18,362	18,545	18,731
Supplements		28,000	21,000	14,000	49,490	57,126	61,303	
P		718,200	548,800	359,100	1,255,733	1,482,511	1,584,603	1,579,637
Benefits:		158,004	120,736	79,002	276,261	326,152	348,613	347,520
Pupil Personnel Services		40.000	40.000	20,000	40.400	40.004	00.404	02.040
ESE Teacher		40,000 40,000	40,000 40,000	20,000	40,400 40,400	40,804 40,804	82,424 82,424	83,248 83,248
Benefits:		8,800	8,800	4,400	8,888	8,977	02,424	
Media Services		0,000	0,000	7,700			18 133	18 315
Media Specialist					0,000	0,311	18,133	18,315
		-	-	-	-			
		-	-	-	-	40,804	41,212	41,624
Benefits:		-	-	-				41,624 41,624
		-	-	-	-	40,804 40,804	41,212 41,212	41,624 41,624
Benefits: School Administration Principal		-	-	- - - 42,500	-	40,804 40,804	41,212 41,212	41,624 41,624
School Administration Principal Assistant Principal		63,750	63,750	42,500	- - - 85,850 65,650	40,804 40,804 8,977 86,709 66,307	41,212 41,212 9,067 87,576 66,970	41,624 41,624 9,157 88,451 67,639
School Administration Principal Assistant Principal Administrative Assistant		63,750 - 12,480	63,750 - 12,480	42,500	85,850 65,650 25,211	40,804 40,804 8,977 86,709 66,307 25,463	41,212 41,212 9,067 87,576 66,970 25,717	41,624 41,624 9,157 88,451 67,639 25,974
School Administration Principal Assistant Principal Administrative Assistant Registrar		63,750	63,750	42,500	- - - 85,850 65,650	40,804 40,804 8,977 86,709 66,307 25,463 22,442	41,212 41,212 9,067 87,576 66,970 25,717 22,667	41,624 41,624 9,157 88,451 67,639 25,974 22,893
School Administration Principal Assistant Principal Administrative Assistant		63,750 - 12,480 22,000	63,750 - 12,480 22,000	42,500 - - 11,000	85,850 65,650 25,211 22,220	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,545	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731
School Administration Principal Assistant Principal Administrative Assistant Registrar Other		63,750 - 12,480 22,000 - 98,230	63,750 - 12,480 22,000 - 98,230	42,500 - - 11,000 - 53,500	85,850 65,650 25,211 22,220	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362 219,282	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,545 221,474	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689
School Administration Principal Assistant Principal Administrative Assistant Registar Other Benefits:		63,750 - 12,480 22,000	63,750 - 12,480 22,000	42,500 - - 11,000	85,850 65,650 25,211 22,220	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,545	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689
School Administration Principal Assistant Principal Administrative Assistant Registrar Other Benefits: Fiscal Services		- - 63,750 - 12,480 22,000 - 98,230 21,611	63,750 - 12,480 22,000 - 98,230 21,611	42,500 - - 11,000 - 53,500 11,770	85,850 65,650 25,211 22,220 - 198,931 43,765	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362 219,282 48,242	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,545 221,474 48,724	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212
School Administration Principal Assistant Principal Administrative Assistant Registar Other Benefits:		63,750 - 12,480 22,000 - 98,230 21,611 20,000	63,750 - 12,480 22,000 - 98,230 21,611 20,000	42,500 - - 11,000 - 53,500 11,770 14,000	85,850 65,650 25,211 22,220 - 198,931 43,765	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362 219,282 48,242 40,804	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,545 221,474 48,724	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212 41,624
School Administration Principal Assistant Principal Administrative Assistant Registrar Other Benefits: Fiscal Services Business Manager		- - - - 12,480 22,000 - - 98,230 21,611 20,000 20,000	63,750 - 12,480 22,000 - 98,230 21,611 20,000 20,000	42,500 - - 11,000 - 53,500 11,770 14,000 14,000	85,850 65,650 25,211 22,220 - 198,931 43,765 40,400 40,400	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362 219,282 48,242 40,804 40,804	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,545 221,474 48,724 41,212 41,212	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212 41,624 41,624
School Administration Principal Assistant Principal Administrative Assistant Registrar Other Benefits: Fiscal Services Business Manager Benefits:		63,750 - 12,480 22,000 - 98,230 21,611 20,000	63,750 - 12,480 22,000 - 98,230 21,611 20,000	42,500 - - 11,000 - 53,500 11,770 14,000	85,850 65,650 25,211 22,220 - 198,931 43,765	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362 219,282 48,242 40,804	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,545 221,474 48,724	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212 41,624
School Administration Principal Assistant Principal Administrative Assistant Registrar Other Benefits: Fiscal Services Business Manager Benefits: Food Services Benefits:		- - - - - - - - - - - - - - - - - - -		42,500 - - 11,000 - 53,500 11,770 14,000 14,000 3,080	85,850 65,650 25,211 22,220 - 198,931 43,765 40,400 40,400 8,888	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362 219,282 48,242 40,804 40,804 8,977	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,545 221,474 48,724 41,212 41,212 9,067	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212 41,624 9,157
School Administration Principal Assistant Principal Administrative Assistant Registrar Other Benefits: Fiscal Services Business Manager Benefits:				42,500 - 11,000 - 53,500 11,770 14,000 14,000 3,080	85,850 65,680 25,211 22,220 198,931 43,765 40,400 8,888 28,280	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362 219,282 48,242 40,804 4,804 8,977	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,645 221,474 48,724 41,212 9,067	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212 41,624 41,624 9,157
School Administration Principal Assistant Principal Administrative Assistant Registrar Other Benefits: Fiscal Services Business Manager Benefits: Food Service Workers		- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -	42,500 - 11,000 - 53,500 11,770 14,000 14,000 3,080 14,000 14,000	85,850 65,650 25,211 22,220 198,931 43,765 40,400 8,888 28,280 28,280	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362 219,282 48,242 40,804 40,804 8,977	41,212 9,067 87,576 66,970 25,717 22,667 18,545 221,474 48,724 41,212 9,067 43,273 43,273	41,624 41,624 9,157 88,451 67,639 25,974 22,983 18,731 223,689 49,212 41,624 41,624 9,157 43,705
School Administration Principal Assistant Principal Administrative Assistant Registrar Other Benefits: Fiscal Services Business Manager Benefits: Food Services Food Service Workers Benefits:				42,500 - 11,000 - 53,500 11,770 14,000 14,000 3,080	85,850 65,680 25,211 22,220 198,931 43,765 40,400 8,888 28,280	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362 219,282 48,242 40,804 40,804 4,894 42,844	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,645 221,474 48,724 41,212 9,067	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212 41,624 41,624 9,157
School Administration Principal Assistant Principal Administrative Assistant Registar Other Benefits: Fiscal Services Business Manager Benefits: Food Service Workers Benefits: Benefits: Food Principal Benefits: Food Service Workers		63,750 12,480 22,000 98,230 21,611 20,000 4,400 14,000 14,000 3,080	63,750 12,480 22,000 98,230 21,811 20,000 4,400 14,000 3,080	42,500 - - 11,000 - 53,500 11,770 14,000 3,080 14,000 14,000 3,080	85,850 65,650 25,211 22,220 198,931 43,765 40,400 40,400 8,888 28,280 6,222	40,804 40,804 8,977 86,709 66,307 25,463 72,442 18,362 219,282 48,242 40,804 40,804 40,804 42,844 42,844 9,426	41,212 41,212 9,067 87,576 66,970 25,717 72,2667 18,545 221,474 48,724 41,212 9,067 43,273 9,520	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212 41,624 41,624 9,157 43,705 43,705 9,615
School Administration Principal Assistant Principal Administrative Assistant Registrar Other Benefits: Fiscal Services Business Manager Benefits: Food Service Workers Benefits: Coperation of Plant Custodian		- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -	42,500 - 11,000 - 53,500 11,770 14,000 14,000 3,080 14,000 14,000	85,850 65,650 25,211 22,220 198,931 43,765 40,400 8,888 28,280 28,280	40,804 40,804 8,977 86,709 66,307 25,463 22,442 219,282 48,242 40,804 40,804 8,977 42,844 9,426 42,844 9,426	41,212 41,212 9,067 87,576 66,970 25,717 22,667 121,444 48,724 41,212 41,212 41,212 9,067 43,273 9,520	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212 41,624 41,624 4,1624 9,157 43,705 9,615
School Administration Principal Assistant Principal Administrative Assistant Registrar Other Benefits: Fiscal Services Business Manager Benefits: Food Services Food Service Workers Benefits: Deration of Plant		63,750 12,480 22,000 98,230 21,611 20,000 4,400 14,000 14,000 3,080	63,750 12,480 22,000 98,230 21,611 20,000 4,400 14,000 14,000 3,080	42,500 11,000 53,500 11,770 14,000 14,000 3,080 14,000 14,000 14,000 10,400	85,850 65,650 25,211 22,220 198,931 43,765 40,400 40,400 8,888 28,280 6,222 42,018	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362 219,282 48,242 40,804 40,804 40,804 42,844 42,844 42,844 42,844 42,438 42,438	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,545 221,474 48,724 41,212 9,067 43,273 43,273 42,273 42,862 42,862 21,431	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212 41,624 41,624 9,157 43,705 9,615 9,615
School Administration Principal Assistant Principal Administrative Assistant Registrar Other Benefits: Fiscal Services Business Manager Benefits: Food Service Workers Benefits: Operation of Plant Custodian Security		63,750 12,480 22,000 98,230 21,611 20,000 4,400 14,000 14,000 3,080 20,801	63,750 12,480 22,000 98,230 21,611 20,000 4,400 14,000 14,000 10,400 10,400	42,500 	85,850 65,650 25,211 22,220 198,931 43,765 40,400 40,400 8,888 8,888 28,280 6,222 42,018	40,804 40,804 8,977 86,709 68,307 25,463 22,442 18,362 219,282 40,804 40,804 40,804 8,977	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,545 221,474 48,724 41,212 9,067 9,520 43,273 9,520 42,862 21,431 64,293	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212 41,624 41,624 9,157 9,615 43,705 9,615
School Administration Principal Assistant Principal Administrative Assistant Registrar Other Benefits: Fiscal Services Business Manager Benefits: Food Service Workers Benefits: Custodian		63,750 12,480 22,000 98,230 21,611 20,000 4,400 14,000 14,000 3,080	63,750 12,480 22,000 98,230 21,611 20,000 4,400 14,000 14,000 3,080	42,500 11,000 53,500 11,770 14,000 14,000 3,080 14,000 14,000 14,000 10,400	85,850 65,650 25,211 22,220 198,931 43,765 40,400 40,400 8,888 28,280 6,222 42,018	40,804 40,804 8,977 86,709 66,307 25,463 22,442 18,362 219,282 48,242 40,804 40,804 40,804 42,844 42,844 42,844 42,844 42,438 42,438	41,212 41,212 9,067 87,576 66,970 25,717 22,667 18,545 221,474 48,724 41,212 9,067 43,273 43,273 42,273 42,862 42,862 21,431	41,624 41,624 9,157 88,451 67,639 25,974 22,893 18,731 223,689 49,212 41,624 41,624 4,1624 9,157 43,705 9,615

YEAR 1

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
REVENUES													
REVENUES													
State Sources with expected enrollment	184,968	184,968	184,968	184,968	184,968	184,968	184,968	184,968	184,968	184,968	184,968	184,968	\$ 2,219,613.00
Federal Sources - NSLP funds 60% of students	10 1,500	10 1,500	11,633	11,633	11,633	11,633	11,633	11,633	11,633	11,633	11,633		\$ 116,328.96
Local Sources - Lunch program paid students			2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020		\$ 20,196.00
Capital Outlay (SACS Accredited through Mater - Capital Outlay available year 1,)			2,020	20,778	20,778	20,778	20,778	20,778	20,778	20,778	20,778		\$ 187,000.00
Other Sources - Services				-,	-,	-,	.,	,	,	.,	.,	,	\$ -
`	184,968	184,968	198,620	219,398	219,398	219,398	219,398	219,398	219,398	219,398	219,398	219,398	\$ 2,543,137.96
EXPENDITURES													
Instruction													
Salaries (includes classroom teachers, contract or hourly, and teacher aides)		32,645	68,555	68,555	68,555	68,555	68,555	68,555	68,555	68,555	68,555	,	\$ 718,200.00
Fringe Benefits		7,182	15,082	15,082	15,082	15,082	15,082	15,082	15,082	15,082	15,082	15,082	\$ 158,004.00
Contracted Professional Services (includes Therapists & other contracted instructional services)				2,244	2,244	2,244	2,244	2,244	2,244	2,244	2,244	2,244	\$ 20,196.00
Classroom Supplies & Equipment		5,554	5,554	5,722									\$ 16,830.00
Teacher Supplies		4,320	4,320	4,451									\$ 13,090.00
Textbooks and/or ebooks/Student Activities		43,197	43,197	44,506									\$ 130,900.00
Supplemetal instructional materials (CIRP/SIRP and Technology)		9,257	9,257	9,537									\$ 28,050.00
SB 736 Merit Pay												64,552	
Computer - Equipment for Instruction (* lease to include ebooks)		8,976	8,976	9,248									\$ 27,200.00
Computer Lab - Including Software		3,960	3,960	4,080									\$ 12,000.00
Sub-Total Instruction	-	115,091	158,901	163,425	85,882	85,882	85,882	85,882	85,882	85,882	85,882	150,434	\$ 1,189,022.00
Pupil Personnel Services													
Salaries (includes counselor, school nurse, health assistant)			4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	\$ 40,000.00
Fringe Benefits			4,000 880	880	4,000 880	4,000 880	4,000 880	880	880	4,000 880	880	4,000 880	\$ 8,800.00
Contracted Professional Services (counseling and psychological)			2,244	2.244	2.244	2.244	2.244	2,244	2,244	2.244	2.244	2,244	\$ 22,440.00
Sub-Total Pupil Personnel Services	_		7,124	7,124	7,124	7,124	7,124	7,124	7,124	7,124	7,124	7,124	
Sub-rotal rapin crommerservices			7,124	7,12-7	7,124	7,124	7,12-4	7,124	,,12.4	7,12-4	7,12-4	7,124	φ 71)2 10:00
Media Services													
Salaries (includes Librarian)		_	_	_	_	_	_	_	_	_	_	_	s -
Fringe Benefits		-	-	-	-	-	-	-	-	-	-	-	\$ -
Library Books		3,750	3,750										\$ 7,500.00
Audio Visual Materials		-	-										\$ -
Sub-Total Media Services	-	3,750	3,750	-	-	-	-	-	-	-	-	-	\$ 7,500.00
Curriculum Development													
Salaries (includes Curriculum Specialist)		-	-	-	-	-	-	-	-	-	-	-	\$ -
Fringe Benefits									-				\$ -
Curriculum Planning, Research, Development and Evaluation	3,584	3,584	3,584	3,584	3,584	3,584	3,584	3,584	3,584	3,584	3,584	3,584	\$ 43,010.00
Development Supplies			- 5,610										\$ -
Student Activities Sub-Total Curriculum Development	3,584	5,610 9,194	9,194	3.584	3,584	3.584	3.584	3,584	3,584	3.584	3,584	3,584	\$ 11,220.00 \$ 54,230.00
3ab-10tal Carricalam Development	3,384	3,134	3,134	3,384	3,364	3,364	3,364	3,384	3,384	3,364	3,384	3,364	\$ 34,230.00
Staff Development													
Workshops/Trainings (includes incentive pay for teachers)		8,500	.						8,500				\$ 17,000.00
Travel		-							-				\$ -
Professional Services		-	.						-				\$ -
Sub-Total Staff Development	-	8,500	-	-	-	-	-	-	8,500	-	-	-	\$ 17,000.00
Instruction Related Technology													
Salaries (includes Technology Personnel)		-	-	-	-	-	-	-	-	-	-	-	\$ -
Fringe Benefits		-	-	-	-	-	-	-	-	-	-	-	\$ -
EduSoft Software and Scanner		600	600										\$ 1,200.00
Hardware Maintenance				756	756	756	756	756	756	756	756	756	\$ 6,800.00
Computer Learning Labs		-	-										\$ -
Sub-Total Instruction Related Technology	-	600	600	756	756	756	756	756	756	756	756	756	\$ 8,000.00
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SLAM Middle - Broward													YEAR 1
Board		1	1							1			-
Professional Services (Legal)						625	625	625	625				\$ 2,500.00
Insurance (General Liability, D&O, Professional Liability)	2,805			2,805			2,805	525		2,805			\$ 11.220.00
Travel	2,000			,			,			,			\$ 2,000.00
Sub-Total Board	4,805	-	-	2,805	-	625	3,430	625	625	2,805	-	-	\$ 15,720.00
General Administration													Ĭ
Management Fees												84,150	\$ 84,150.00
Administrative Fee	-	-	-	-	-	-	-	-	-	-	-	-	\$ -
Sub-Total General Administration	-	-	-	-	-	-	-	-	-	-	-	84,150	\$ 84,150.00
School Administration													Ĭ
Salaries (includes Principal, Secretary & other Office Personnel)	8,186	8,186	8,186	8,186	8,186	8,186	8,186	8,186	8,186	8,186	8,186	8,186	\$ 98,230.48
Fringe Benefits	1,801	1,801	1,801	1,801	1,801	1,801	1,801	1,801	1,801	1,801	1,801	1,801	
Equipment Rental / Lease	300	300	300	300	300	300	300	300	300	300	300	300	
Travel	300	300	300	500	300	300	500	500	330	330	300	330	\$ 500.00
Advertising and Promotion	6,233	6,233		555					6,233				\$ 18,700.00
License Fees	200	-,3							2,233				\$ 200.00
Uniforms	300												\$ 300.00
Postage			85	85	85	85	85	85	85	85	85	85	
Printing	2,975	270	270	270	270	270	270	270	270	270	270	270	\$ 5,950.00
Office Supplies	2,805	765	765	765	765	765	765	765	765	765	765	765	\$ 11,220.00
Office Equipment	4,000												\$ 4,000.00
Computer Equipment	1,250												\$ 1,250.00
Sub-Total School Administration	28,050	17,556	11,407	11,907	11,407	11,407	11,407	11,407	17,641	11,407	11,407	11,407	\$ 166,411.19
Facilities Acquisition & Construction													1
Building Lease / Rent (see budget summary for calculation)		30,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600	\$ 336,600.00
Remodeling & Renovations	_	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	\$ 330,000.00
Purchase of Buildings & Fixed Equipment													\$ -
Land	_												s -
Sub-Total Facilities Acquisition & Construction	-	30,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600	\$ 336,600.00
Fiscal Services													Ì
Salaries (Business Manager, Accounting & Bookkeeping Personnel)	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667	\$ 20,000.00
Fringe Benefits	367	367	367	367	367	367	367	367	367	367	367		
Fee to County School Board - up to 250 students	6,182	6,182	6,182	6,182	6,182	6,182	6,182	6,182	6,182	6,182	6,182	6,182	
Planning, Research, Development and Evaluation	3,428	3,428	3,428	3,428	3,428	3,428	3,428	3,428	3,428	3,428	3,428	3,428	
Professional Services - Annual Audit Sub-Total Fiscal Services	625	625 12,269	625 12,269	625	625	625	625	625	625	625	625 12,269	625	
Sub-Total Fiscal Services	12,269	12,269	12,269	12,269	12,269	12,269	12,269	12,269	12,269	12,269	12,269	12,269	\$ 147,224.93
Food Services													1
Salaries (Food Service Workers)			1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	\$ 14,000.00
Fringe Benefits			308	308	308	308	308	308	308	308	308	308	
Food			-	-	-	-	-	-	-	-	-	-	\$ -
Food, Materials & Supplies - Vendor provided meals 70% Participation			11,593	11,593	11,593	11,593	11,593	11,593	11,593	11,593	11,593	11,593	\$ 115,925.04
Equipment Rental / Lease (provided by food vendor)			-	-	-	-	-	-	-	-	-	-	\$ -
Inspection fees			15	15	15	15	15	15	15	15	15	15	
Sub-Total Food Services	-	-	13,316	13,316	13,316	13,316	13,316	13,316	13,316	13,316	13,316	13,316	\$ 133,155.04
Pupil Transportation Services													1
Salaries (Drivers & Transportation workers)			_	_	_	_	_	-	_	_	-	_	s -
Fringe Benefits			-	-	-	-	-	-	-	-	-	-	\$ -
Contracted Transportation Services - \$225 per bus 15% utilization			4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	\$ 40,500.00
Field Trip Expenses for competitions			250	250	250	250	250	250	250	250	250	250	\$ 2,500.00
Buses			-	-	-	-	-	-	-	-	-	-	\$ -
Repairs & Maintenance			-	-	-	-	-	-	-	-	-	-	\$ -
Fuel			-	-	-	-	-	-	-	-	-	-	\$ -
Sub-Total Pupil Transportation Services	-		4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	\$ 43,000.00
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SLAM Middle - Broward													YEAR 1
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Operation of Plant													
Salaries (Custodian, crossing guards, security)	1,733	1,733	1,733	1,733	1,733	1,733	1,733	1,733	1,733	1,733	1,733	1,733	\$ 20,800.80
Fringe benefits	381	381	381	381	381	381	381	381	381	381	381	381	\$ 4,576.18
Purchased Service (Custodial, fire and alarm, pest control etc)	106	106	106	106	106	106	106	106	106	106	106	106	\$ 1,275.00
Lawn Maintenance	283	283	283	283	283	283	283	283	283	283	283	283	\$ 3,400.00
Pest Control	57	57	57	57	57	57	57	57	57	57	57	57	\$ 680.00
Security Services	100	100	100	100	100	100	100	100	100	100	100	100	\$ 1,200.00
Property Insurance	1,558	1,558	1,558	1,558	1,558	1,558	1,558	1,558	1,558	1,558	1,558	1,558	\$ 18,700.00
Telephone Services	300	300	300	300	300	300	300	300	300	300	300	300	\$ 3,600.00
Water & Sewer	113	113	113	113	113	113	113	113	113	113	113	113	\$ 1,360.00
Electricity	2,125	2,125	2,125	2,125	2,125	2,125	2,125	2,125	2,125	2,125	2,125	2,125	
Custodial Supplies & Equipment	-	-,	-	-	-	-	-	-	-	-	-,	-	\$ -
Sub-Total Operation of Plant	6,758	6,758	6,758	6,758	6,758	6,758	6,758	6,758	6,758	6,758	6,758	6,758	\$ 81,091.98
	1,,,,,	,,,,,	.,	,,,,,,	.,,	7.00	.,	,,,,,,	.,	.,	.,	.,,	, , , , , , ,
Maintenance of Plant													
Repairs & Maintenance		1,768	1,768	1,768	1,768	1,768	1,768	1,768	1,768	1,768	1,768	1,768	\$ 19,448.00
Supplies		,	_	_	-	-	-	_	_	_	_	,	s -
Sub-Total Maintenance of Plant		1,768	1,768	1,768	1,768	1,768	1,768	1,768	1,768	1,768	1,768	1,768	\$ 19,448.00
	1	2,100	2,100	2,	2,100	2,100	2,100	2,	2,	2,: 22	2,100	3,110	7 20,110.00
Administrative Technology Services													
Internal Technology Support	_	_	-	_	_	_	-	_	-	-	_	_	\$ -
Technology Personnel	_	_	-	_	_	_	-	_	-	-	_	_	\$ -
Systems Operation	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	\$ 12,750.00
Systems Planning & Analysis	· -	_	-	-	· -		-	-	-	-	_	-	\$ -
Sub-Total Administrative Technology Services	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	\$ 12,750.00
After Care Programs													
After Care Salary			-	-	-	-	-	-	-	-	-	-	\$ -
Fringe Benefits			-	-	-	-	-	-	-	-	-	-	\$ -
Sub-Total After Care Programs			-	-	-	-	-	-	-	-	-	-	\$ -
Debt Service													
Redemption of Principal												25,000	\$ 25,000.00
Interest (Interest Only at 6%)		136	136	136	136	136	136	136	136	136	136	136	\$ 1,500.00
Sub-Total Debt Service		136	136	136	136	136	136	136	136	136	136	25,136	\$ 26,500.00
	1								Ī				
Contingency	1								Ī				
Operating expense contigency - 5% of FEFP - Considered restricted funds												127,157	\$ 127,156.90
Sub-Total Contingency	-	1							_			127,157	\$ 127,156.90
Sub-rotal Contingency		<u> </u>	<u> </u>	·	-	·	·	·	<u> </u>	<u> </u>	-	127,137	7 127,130.30
Total Expenditures	\$ 56,528.17	\$ 207,283.55	\$ 261,184.92	\$ 259,810.17	\$ 178,961.37	\$ 179,586.37	\$ 182,391.37	\$ 179,586.37	\$ 194,319.71	\$ 181,766.37	\$ 178,961.37	\$ 479,820.27	\$ 2,540,200.03
Excess of Revenues over Expenditures	\$ 128,439.58	\$ (22,315.80)	\$ (62,564.67)	\$ (40,412.15)	\$ 40,436.65	\$ 39,811.65	\$ 37,006.65	\$ 39,811.65	\$ 25,078.32	\$ 37,631.65	\$ 40,436.65	\$ (260,422.25)	\$ 2,937.93
Fund Balance	\$ 128,439.58	\$ 106,123.78	\$ 43,559.11	\$ 3,146.96	\$ 43,583.61	\$ 83,395.26	\$ 120,401.91	\$ 160,213.56	\$ 185,291.88	\$ 222,923.53	\$ 263,360.18	\$ 2,937.93	

YEAR 2

													100 % Enrollment
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
REVENUES													
REVENUES													
State Sources with expected enrollment	306,626	306,626	306,626	306,626	306,626	306,626	306,626	306,626	306,626	306,626	306,626	306,626	\$ 3,679,515.42
Federal Sources - NSLP funds 60% of students	,	,	18,849	18,849	18,849	18,849	18,849	18,849	18,849	18,849	18,849	18,849	\$ 188,490.24
Local Sources - Lunch program paid students			3,272	3,272	3,272	3,272	3,272	3,272	3,272	3,272	3,272		\$ 32,724.00
Capital Outlay (SACS Accredited through Mater - Capital Outlay available year 1,)			-,	33,333	33,333	33,333	33,333	33,333	33,333	33,333	33,333	33,333	\$ 300,000.00
Previous Years Balance Carry Forward	2,938			33,333	33,333	33,333	33,333	33,333	33,333	33,333	33,333	33,333	\$ 2,937.93
\	309,564	306,626	328,748	362,081	362,081	362,081	362,081	362,081	362,081	362,081	362,081	362,081	\$ 4,203,667.59
EXPENDITURES			0_0,1.0				002,002		,	002,002		002,002	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
ENTEROTIONES													
Instruction													
Salaries (includes classroom teachers, contract or hourly, and teacher aides)		57,079	119,865	119,865	119,865	119,865	119,865	119,865	119,865	119,865	119,865	119,865	\$ 1,255,733.00
Fringe Benefits		12,557	26,370	26,370	26,370	26,370	26,370	26,370	26,370	26,370	26,370	26,370	\$ 276,261.26
Contracted Professional Services (includes Therapists & other contracted instructional services		12,557	20,570	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636		\$ 32,724.00
Classroom Supplies & Equipment		8,999	8,999	9,272	3,030	3,030	3,030	3,030	3,030	3,030	3,030	3,030	\$ 27,270.00
Teacher Supplies		6,999	6,999	7,211									\$ 21,210.00
Textbooks and/or ebooks/Student Activities		69,993	69,993	72,114									\$ 212,100.00
Supplemetal instructional materials (CIRP/SIRP and Technology)		14,999	14,999	15,453									\$ 45,450.00
· · · · · · · · · · · · · · · · · · ·		14,555	14,333	13,433								103,500	
SB 736 Merit Pay		44.022	44.022	45.204								103,500	,,
Computer - Equipment for Instruction (* lease to include ebooks)		14,932	14,932	15,384									\$ 45,248.00
Computer Lab - Including Software		4,000	4,000	4,121									\$ 12,120.00
Sub-Total Instruction		189,557	266,157	273,427	149,872	149,872	149,872	149,872	149,872	149,872	149,872	253,372	\$ 2,031,616.26
Pupil Personnel Services													
Salaries (includes counselor, school nurse, health assistant)			4,040	4,040	4,040	4,040	4,040	4,040	4,040	4,040	4,040	4,040	\$ 40,400.00
Fringe Benefits			889	889	889	889	889	889	889	889	889	889	\$ 8,888.00
			3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3.636	3,636	\$ 36,360.00
Contracted Professional Services (counseling and psychological) Sub-Total Pupil Personnel Services	-	-	3,636 8.565	3,636 8.565	3,636 8,565	3,636 8.565	3,636 8,565	3,636 8.565	8,565	3,636 8,565	3,535 8,565	3,636 8.565	\$ 35,350.00
Sub-10tal Pupil Personnel Services	-	-	8,565	8,565	8,565	8,565	8,565	8,565	8,565	8,565	8,565	8,565	\$ 85,048.00
Media Services													
Salaries (includes Librarian)		-	-	-	-	-	-	-	-	-	-	-	-
Fringe Benefits				-	-	-	-	-	-	-	-	-	\$ -
Library Books		3,788	3,788										\$ 7,575.00
Audio Visual Materials													\$ 7.575.00
Sub-Total Media Services	-	3,788	3,788	-	-	-	-	-	-	-	-	-	\$ 7,575.00
Curriculum Development													
Salaries (includes Curriculum Specialist)		_	_	_	_	_	_	_	_	_	_	_	s -
Fringe Benefits													\$ -
Curriculum Planning, Research, Development and Evaluation	5,808	5,808	5,808	5,808	5,808	5,808	5,808	5,808	5,808	5,808	5,808	5,808	\$ 69,690.00
Development Supplies	3,808	5,808	5,808	3,808	3,808	3,808	3,808	3,808	3,808	3,808	3,808	3,808	© 03,030.00
Student Activities		9.090	9,090										\$ 18,180.00
Sub-Total Curriculum Development	5,808	14,898	14,898	5,808	5,808	5,808	5,808	5,808	5,808	5,808	5,808	5,808	\$ 87,870.00
Sub-rotal curriculum Development	3,000	14,838	14,858	3,000	3,000	3,000	3,800	3,000	3,000	3,000	3,808	3,800	\$ 07,070.00
Staff Development													
Workshops/Trainings (includes incentive pay for teachers)		15,000							15,000				\$ 30,000.00
Travel		-							15,000				\$ -
Professional Services													\$ -
Sub-Total Staff Development	-	15,000	-	_	-	-	_	-	15,000	-	_	-	\$ 30,000.00
	1	15,000							13,000				, 55,555.00
Instruction Related Technology													
Salaries (includes Technology Personnel)		_	_	_	_	_	_	_	_	_	_	_	s -
Fringe Benefits		_	_		_		_	_	_	-	_	_	\$ -
EduSoft Software and Scanner		606	606	-	_	-	_	_	Ī	-	Ī -		\$ 1,212.00
		000	000	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	\$ 1,212.00
				1,43/	1,23/	1,20/	1,25/	1,257	1,257	1,257	1,257	1,23/	١١,٥١٤.٥١ پ
Hardware Maintenance				, and the second									e
Computer Learning Labs Sub-Total Instruction Related Technology		- 606	- 606	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	1,257	\$ - \$ 12,524.00

SLAM Middle - Broward													YI	EAR 2
													100 %	Enrollment
Board Professional Services (Legal)	2,525												\$	2,525.00
Insurance (General Liability, D&O, Professional Liability)	2,525 4,666			4,666			4,666			4,666			\$	18,664.80
Travel	2,020			1,000			.,000			1,000			\$	2,020.00
Sub-Total Board	9,211	-	-	4,666		-	4,666	-		4,666	-		\$	23,209.80
General Administration														
Management Fees	11,363	11,363	11,363	11,363	11,363	11,363	11,363	11,363	11,363	11,363	11,363	11,363	\$	136,350.00
Administrative Fee	-	-	-	-	-	-	-	-	-	-	-	-	\$	-
Sub-Total General Administration	11,363	11,363	11,363	11,363	11,363	11,363	11,363	11,363	11,363	11,363	11,363	11,363	\$	136,350.00
School Administration														
Salaries (includes Principal, Secretary & other Office Personnel)	16,578	16,578	16,578	16,578	16,578	16,578	16,578	16,578	16,578	16,578	16,578	16,578	\$	198,930.57
Fringe Benefits	3,647	3,647	3,647	3,647	3,647	3,647	3,647	3,647	3,647	3,647	3,647	3,647	\$	43,764.73
Equipment Rental / Lease	303	303	303	303	303	303	303	303	303	303	303	303	\$	3,636.00
Travel				505									\$	505.00
Advertising and Promotion License Fees	10,100 202	10,100	10,100										\$ \$	30,300.00 202.00
Uniforms	303												\$	303.00
Postage	303		141	141	141	141	141	141	141	141	141	141	\$	1,414.00
Printing	4,949	450	450	450	450	450	450	450	450	450	450	450	\$	9,898.00
Office Supplies	4,500	1,227	1,227	1,227	1,227	1,227	1,227	1,227	1,227	1,227	1,227	1,227	\$	18,000.00
Office Equipment	4,040												\$	4,040.00
Computer Equipment Sub-Total School Administration	1,263 45.884	32.305	32,446	22.851	22,346	22,346	22,346	22,346	22,346	22,346	22,346	22,346	\$	1,262.50 312,255.79
Sub-Total School Auministration	43,684	32,303	32,440	22,831	22,340	22,340	22,340	22,340	22,340	22,340	22,340	22,340	Þ	312,233.73
Facilities Acquisition & Construction														l
Building Lease / Rent (see budget summary for calculation)		49,582	49,582	49,582	49,582	49,582	49,582	49,582	49,582	49,582	49,582	49,582	\$	545,400.00
Remodeling & Renovations	-												\$	-
Purchase of Buildings & Fixed Equipment Land	-												\$	-
Sub-Total Facilities Acquisition & Construction	-	49,582	49.582	49.582	49,582	49.582	49,582	49.582	49.582	49,582	49,582	49,582	Ś	545,400.00
		,	,	,	,	,	,	13,000	,	.0,002	,	,	7	
Fiscal Services														
Salaries (Business Manager, Accounting & Bookkeeping Personnel)	3,367	3,367	3,367	3,367	3,367	3,367	3,367	3,367	3,367	3,367	3,367	3,367	\$	40,400.00
Fringe Benefits Fee to County School Board - up to 250 students	741 6,222	741 6,222	741 6,222	741 6,222	741 6,222	741 6,222	741 6,222	741 6,222	741 6,222	741 6,222	741 6,222	741 6,222	\$ \$	8,888.00 74,665.49
Planning, Research, Development and Evaluation	5,555	5,555	5,555	5,555	5,555	5,555	5,555	5,555	5,555	5,555	5,555	5,555	\$	66,660.00
Professional Services - Annual Audit	631	631	631	631	631	631	631	631	631	631	631	631	\$	7,575.00
Sub-Total Fiscal Services	16,516	16,516	16,516	16,516	16,516	16,516	16,516	16,516	16,516	16,516	16,516	16,516	\$	198,188.49
Good Comittee														
Food Services Salaries (Food Service Workers)			2,828	2,828	2,828	2,828	2,828	2,828	2,828	2,828	2,828	2,828	s	28,280.00
Fringe Benefits			622	622	622	622	622	622	622	622	622	622	\$	6,221.60
Food			-		-	-	-	- 1	-	-	-	-	\$	
Food, Materials & Supplies - Vendor provided meals 70% Participation			18,784	18,784	18,784	18,784	18,784	18,784	18,784	18,784	18,784	18,784	\$	187,835.76
Equipment Rental / Lease (provided by food vendor)			-	-	-				-		-		\$	-
Inspection fees Sub-Total Food Services	+ -	_	15 22,249	\$ \$	151.50 222,488.86									
Sub Fold Fold Fold School			22,243	22,243	22,243	22,243	22,243	22,243	22,243	22,243	22,243	22,243	, , , , , , , , , , , , , , , , , , ,	222,100.00
Pupil Transportation Services														ļ
Salaries (Drivers & Transportation workers)			-	-	-	-	-	-	-	-	-	-	\$	-
Fringe Benefits Contracted Transportation Services - \$225 per bus 15% utilization			- 8,100	\$ \$	- 81,000.00									
Field Trip Expenses for competitions			350	350	350	350	350	350	350	350	350	350	\$	3,500.00
Buses			-	-	-	-	-	-	-	-	-	-	\$	-,200.00
Repairs & Maintenance			-	-	-	-	-	-	-	-	-	-	\$	-
Fuel			-	-	-	-	-	-	-	-	-	-	\$	-
Sub-Total Pupil Transportation Services	+	-	8,450	8,450	8,450	8,450	8,450	8,450	8,450	8,450	8,450	8,450	\$	84,500.00

After Care Salary
Fringe Benefits

Sub-Total After Care Programs

Debt Service
Redemption of Principal

SLAM Middle - Broward YEAR 2 100 % Enrollment Operation of Plant 3,501 42,017.62 Salaries (Custodian, crossing guards, security) 3,501 3,501 3,501 3,501 3,501 3,501 3,501 3,501 3,501 3,501 3,501 Fringe benefits 770 770 770 770 770 770 770 770 770 770 770 770 9,243.88 Purchased Service (Custodial, fire and alarm, pest control etc) 177 177 177 177 177 177 177 177 177 177 177 177 2,121.00 471 471 471 471 471 471 471 471 471 471 471 471 \$ 5,656.00 Lawn Maintenance Pest Control 94 94 94 94 94 94 94 94 94 94 94 \$ 1,131.20 Security Services 101 101 101 101 101 101 101 101 101 101 101 101 1,212.00 Property Insurance 2,592 2,592 2,592 2,592 2,592 2,592 2,592 2,592 2,592 2,592 2,592 2,592 31,108.00 Telephone Services 303 303 303 303 303 303 303 303 303 303 303 303 \$ 3,636.00 189 189 189 189 189 189 189 189 189 189 189 189 2,262.40 Water & Sewer 3,535 3,535 3,535 3,535 3,535 3,535 3,535 3,535 3,535 3,535 3,535 42,420.00 Electricity 3,535 Custodial Supplies & Equipment 11,734 11,734 11,734 11,734 11,734 11,734 11,734 11,734 11,734 11,734 11,734 140,808.09 Sub-Total Operation of Plant 11,734 Maintenance of Plant Repairs & Maintenance 2,836 2,836 2,836 2,836 2,836 2,836 2,836 2,836 2,836 2,836 2,836 31,200.00 Supplies 2,836 2,836 2,836 2,836 31,200.00 Sub-Total Maintenance of Plant 2,836 2,836 2,836 2,836 2,836 2,836 2,836 Administrative Technology Services Internal Technology Support Technology Personnel 1,768 1,768 1,768 1,768 1,768 1,768 1,768 1,768 1,768 1,768 1,768 1,768 21,210.00 Systems Operation Systems Planning & Analysis Sub-Total Administrative Technology Services 1,768 1,768 1,768 1,768 1,768 1,768 1,768 1,768 1,768 1,768 1,768 1,768 21,210.00 After Care Programs

Interest (Interest Only at 6%)		-	-	-	-	-	-	-	-	-	-	-	\$ -
Sub-Total Debt Service		-	-	-	-	-	-	-	-	-	-	-	\$ -
Contingency Operating expense contigency - 5% of FEFP - Considered restricted funds												210,036	\$ 210,036.48
Sub-Total Contingency		-	-	-	-	-	-	-	-	-	-	210,036	\$ 210,036.48
Total Expenditures	\$ 102,282.52	\$ 349,951.13	\$ 450,955.93	\$ 441,070.50	\$ 312,343.98	\$ 312,343.98	\$ 317,010.18	\$ 312,343.98	\$ 327,343.98	\$ 317,010.18	\$ 312,343.98	\$ 625,880.46	\$ 4,180,880.78
Excess of Revenues over Expenditures	\$ 207,281.70	\$ (43,324.84)	\$ (122,208.22)	\$ (78,989.46)	\$ 49,737.06	\$ 49,737.06	\$ 45,070.86	\$ 49,737.06	\$ 34,737.06	\$ 45,070.86	\$ 49,737.06	\$ (263,799.42)	\$ 22,786.81
,													
Fund Balance	\$ 207 281 70	\$ 163,956,85	\$ 41 748 63	\$ (37,240,82)	\$ 12 496 24	\$ 62 233 31	\$ 107 304 17	\$ 157 041 24	\$ 191 778 30	\$ 236,849,17	\$ 286 586 23	\$ 22 786 81	

YEAR 3

													100 % Enrollment
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
251/511/52													
REVENUES													
State Sources with expected enrollment	364,650	364,650	364,650	364,650	364,650	364,650	364,650	364,650	364,650	364,650	364,650	364,650	\$ 4,375,797.00
Federal Sources - NSLP funds 60% of students	304,030	304,030	23,004	23,004	23,004	23,004	23,004	23,004	23,004	23,004	23,004	23,004	\$ 230,036.63
Local Sources - Lunch program paid students			3,994	3,994	3,994	3,994	3,994	3,994	3,994	3,994	3,994	3,994	\$ 39,936.92
Capital Outlay (SACS Accredited through Mater - Capital Outlay available year 1,)			3,33 .	40,278	40,278	40,278	40,278	40,278	40,278	40,278	40,278	40,278	\$ 362,500.00
Previous Years Balance Carry Forward	22,787			,	,	,	,	,	,	,	,	,	\$ 22,786.81
•	387,437	364,650	391,647	431,925	431,925	431,925	431,925	431,925	431,925	431,925	431,925	431,925	\$ 5,031,057.35
EXPENDITURES													
Instruction													
Salaries (includes classroom teachers, contract or hourly, and teacher aides)		67,387	141,512	141,512	141,512	141,512	141,512	141,512	141,512	141,512	141,512	141,512	\$ 1,482,511.33
Fringe Benefits		14,825	31,133	31,133	31,133	31,133	31,133	31,133	31,133	31,133	31,133	31,133	\$ 326,152.49
Contracted Professional Services (includes Therapists & other contracted instructional services)				4,437	4,437	4,437	4,437	4,437	4,437	4,437	4,437	4,437	\$ 39,936.92
Classroom Supplies & Equipment		10,983	10,983	11,315									\$ 33,280.76
Teacher Supplies		8,542	8,542	8,801									\$ 25,885.04
Textbooks and/or ebooks/Student Activities		85,421	85,421	88,009									\$ 258,850.38
Supplemetal instructional materials (CIRP/SIRP and Technology)		18,304	18,304	18,859									\$ 55,467.94
SB 736 Merit Pay												125,064	\$ 125,064.00
Computer - Equipment for Instruction (* lease to include ebooks)		17,774	17,774	18,313									\$ 53,861.28
Computer Lab - Including Software		-	-	-									\$ -
Sub-Total Instruction	-	223,236	313,669	322,380	177,083	177,083	177,083	177,083	177,083	177,083	177,083	302,147	\$ 2,401,010.13
Pupil Personnel Services													
Salaries (includes counselor, school nurse, health assistant)			4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	\$ 40,804.00
Fringe Benefits			898	898	898	898	898	898	898	898	898	898	\$ 8,976.88
Contracted Professional Services (counseling and psychological)			4,437	4,437	4,437	4,437	4,437	4,437	4,437	4,437	4,437	4,437	\$ 44,374.35
Sub-Total Pupil Personnel Services	-	-	9,416	9,416	9,416	9,416	9,416	9,416	9,416	9,416	9,416	9,416	\$ 94,155.23
Media Services													
Salaries (includes Librarian)		1,855	3,895	3,895	3,895	3,895	3,895	3,895	3,895	3,895	3,895	3,895	\$ 40,804.00
Fringe Benefits		408	857	857	857	857	857	857	857	857	3,893 857	857	\$ 8,976.88
Library Books		3,825	3,825	857	657	837	837	837	837	837	837	837	\$ 7,650.75
Audio Visual Materials		3,823	3,823										\$ 7,030.73
Sub-Total Media Services	-	6,088	8,577	4,752	4,752	4,752	4,752	4,752	4,752	4,752	4,752	4,752	\$ 57,431.63
Curriculum Development													
Salaries (includes Curriculum Specialist)		-	-	-	-	-	-	-	-	-	-	-	\$ -
Fringe Benefits		-	-	-	-	-	-	-	-	-	-	-	\$ -
Curriculum Planning, Research, Development and Evaluation	7,088	7,088	7,088	7,088	7,088	7,088	7,088	7,088	7,088	7,088	7,088	7,088	\$ 85,050.84
Development Supplies		-	-										\$ -
Student Activities		11,094	11,094										\$ 22,187.18
Sub-Total Curriculum Development	7,088	18,181	18,181	7,088	7,088	7,088	7,088	7,088	7,088	7,088	7,088	7,088	\$ 107,238.01
Comt Development													
Staff Development		47.500							47.500				¢ 05,000,00
Workshops/Trainings (includes incentive pay for teachers)		17,500							17,500				\$ 35,000.00
Travel		-							-				5 -
Professional Services	-	17.500							47.500				\$ 35,000.00
Sub-Total Staff Development	1	17,500	-	-	-	-	-	-	17,500	-	-	-	\$ 35,000.00
Instruction Related Technology													
Salaries (includes Technology Personnel)		_	_	_	_	_	_	_	_	_	_	_	s -
Fringe Benefits						-					-		\$ - \$
EduSoft Software and Scanner		612	612	-	_	-	-	-	_	_	_	=	\$ 1,224.12
Hardware Maintenance		012	012	1,496	1,496	1,496	1,496	1,496	1,496	1,496	1,496	1,496	\$ 1,224.12 \$ 13,465.32
Computer Learning Labs		_	_	1,430	1,490	1,430	1,450	1,450	1,430	1,430	1,430	1,430	\$ 10,400.02
Sub-Total Instruction Related Technology	-	612	612	1,496	1.496	1,496	1,496	1,496	1.496	1,496	1,496	1,496	\$ 14,689.44
		012	012	1,430	1,430	1,430	1,430	1,430	1,430	1,430	1,430	1,430	- 17,000,44

SLAM Middle - Broward													YEAR 3
													100 % Enrollme
Board													
Professional Services (Legal)	2,550 5,554			5,554			5,554			5,554			\$ 2,550. \$ 22,217.
Insurance (General Liability, D&O, Professional Liability) Travel	2,040			5,554			5,554			5,554			\$ 22,217
Sub-Total Board	10,145		_	5,554	-		5,554	_	_	5,554			\$ 26,808.
Sub-10tal Board	10,143	_	_	3,334	_		3,334		_	3,334	_	_	20,000.
General Administration													
Management Fees	13,867	13,867	13,867	13,867	13,867	13,867	13,867	13,867	13,867	13,867	13,867	13,867	\$ 166,403
Administrative Fee		-	-	-	-	-	-	-	-	-	-	-	\$ -
Sub-Total General Administration	13,867	13,867	13,867	13,867	13,867	13,867	13,867	13,867	13,867	13,867	13,867	13,867	\$ 166,403.
School Administration	40.070	40.070	40.070	40.070	40.070	40.070	40.070	40.070	40.070	40.070	40.070	40.070	
Salaries (includes Principal, Secretary & other Office Personnel)	18,273	18,273	18,273	18,273	18,273	18,273	18,273	18,273	18,273	18,273	18,273		\$ 219,281
Fringe Benefits	4,020 306	4,020 306	4,020 306	4,020 306	4,020 306	4,020 306	4,020 306	4,020 306	4,020 306	4,020 306	4,020 306	4,020 306	
Equipment Rental / Lease Travel	306	306	300	510	300	300	300	300	306	300	300	306	\$ 5,672
Advertising and Promotion	12,326	12,326	12,326	310									\$ 36,978
License Fees	204	12,520	12,320										\$ 204.
Uniforms	306												\$ 306.
Postage			168	168	168	168	168	168	168	168	168	168	\$ 1,683.
Printing	5,891	536	536	536	536	536	536	536	536	536	536	536	\$ 11,782.
Office Supplies	5,438	1,483	1,483	1,483	1,483	1,483	1,483	1,483	1,483	1,483	1,483	1,483	\$ 21,750.
Office Equipment	4,080												\$ 4,080
Computer Equipment	1,275												\$ 1,275.
Sub-Total School Administration	52,120	36,944	37,113	25,297	24,786	24,786	24,786	24,786	24,786	24,786	24,786	24,786	\$ 349,765.
Facilities Acquisition & Construction		50.540	50.540	50 540	50 540	50.540	50.540	50.540	50 540	50.540	50.540	50.540	
Building Lease / Rent (see budget summary for calculation)		60,510	60,510	60,510	60,510	60,510	60,510	60,510	60,510	60,510	60,510	60,510	\$ 665,615. \$
Remodeling & Renovations Purchase of Buildings & Fixed Equipment	· _												\$ -
Land													\$
Sub-Total Facilities Acquisition & Construction	_	60,510	60,510	60,510	60,510	60,510	60,510	60,510	60,510	60,510	60,510	60,510	\$ 665,615.
		20,020	55,525	53,525	55,525	50,522	20,020	55,525	50,520	30,020	20,022		, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Fiscal Services													
Salaries (Business Manager, Accounting & Bookkeeping Personnel)	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	\$ 40,804
Fringe Benefits	748	748	748	748	748	748	748	748	748	748	748	748	\$ 8,976
Fee to County School Board - up to 250 students	6,278	6,278	6,278	6,278	6,278	6,278	6,278	6,278	6,278	6,278	6,278	6,278	
Planning, Research, Development and Evaluation	6,779	6,779	6,779	6,779	6,779	6,779	6,779	6,779	6,779	6,779	6,779	6,779	
Professional Services - Annual Audit	638	638	638	638	638	638	638	638	638	638	638	638	\$ 7,650
Sub-Total Fiscal Services	17,844	17,844	17,844	17,844	17,844	17,844	17,844	17,844	17,844	17,844	17,844	17,844	\$ 214,125.
Food Comitoe													
Food Services Salaries (Food Service Workers)			4,284	4,284	4,284	4,284	4,284	4,284	4,284	4,284	4,284	4,284	\$ 42,844.
Fringe Benefits			943	943	943	943	943	943	943	943	943		\$ 9,425
Food			-	-	-	-	-	-	-	-	-	-	\$ -
Food, Materials & Supplies - Vendor provided meals 70% Participation			22,924	22,924	22,924	22,924	22,924	22,924	22,924	22,924	22,924	22,924	
Equipment Rental / Lease (provided by food vendor)			,	,	,	,	,	,	,	,	,	,	\$ -
Inspection fees			15	15	15	15	15	15	15	15	15	15	\$ 153.
Sub-Total Food Services		-	28,166	28,166	28,166	28,166	28,166	28,166	28,166	28,166	28,166	28,166	\$ 281,660.
Pupil Transportation Services													
Salaries (Drivers & Transportation workers)			-	-	-	-	-	-	-	-	-	-	\$ -
Fringe Benefits			-	-	-	-	-	-	-	-	-	-	\$ -
Contracted Transportation Services - \$225 per bus 15% utilization			8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100		\$ 81,000
Field Trip Expenses for competitions			500	500	500	500	500	500	500	500	500		\$ 5,000
Buses Pagairs & Maintenance					-	-			-	-	-	-	\$ \$
Repairs & Maintenance Fuel			_			-	-	_	-	_	-	-	ş -
Sub-Total Pupil Transportation Services		_	8,600	8,600	8,600	8,600	8,600	8,600	8,600	8,600	8,600	8,600	\$ 86,000.
Sub-rotain apii mansportation scretces	- 		5,000	5,000	3,000	3,300	5,000	5,000	0,000	5,000	0,000	5,000	y 00,000.

SLAM Middle - Broward													YEAR	t 3
													100 % Enro	ollment
Operation of Plant														
Salaries (Custodian, crossing guards, security)	5,305	5,305	5,305	5,305	5,305	5,305	5,305	5,305	5,305	5,305	5,305	5,305	\$ 63	3,656.69
Fringe benefits	1,167	1,167	1,167	1,167	1,167	1,167	1,167	1,167	1,167	1,167	1,167	1,167	\$ 14	4,004.47
Purchased Service (Custodial, fire and alarm, pest control etc)	210	210	210	210	210	210	210	210	210	210	210	210	\$ 2	2,524.75
Lawn Maintenance	561	561	561	561	561	561	561	561	561	561	561	561	\$ 6	6,732.66
Pest Control	112	112	112	112	112	112	112	112	112	112	112	112	\$ 1	1,346.53
Security Services	102	102	102	102	102	102	102	102	102	102	102	102		1,224.12
Property Insurance	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	3,086	-	7,029.63
Telephone Services	306	306	306	306	306	306	306	306	306	306	306	306		3,672.36
Water & Sewer	224	224	224	224	224	224	224	224	224	224	224	224	-	2,693.06
Electricity	4,208	4,208	4,208	4,208	4,208	4,208	4,208	4,208	4,208	4,208	4,208	4,208	-	0,494.95
Custodial Supplies & Equipment	4,208	4,208	4,208	4,208	4,208	4,206	4,208	4,208	4,208	4,200	4,208	4,206	\$ 50	-
										-			\$ 6 403	
Sub-Total Operation of Plant	15,282	15,282	15,282	15,282	15,282	15,282	15,282	15,282	15,282	15,282	15,282	15,282	\$ 183,	3,379.22
Maintenance of Plant														
Repairs & Maintenance		3,427	3,427	3,427	3,427	3,427	3,427	3,427	3,427	3,427	3,427	3,427	\$ 37	7,700.00
Supplies		-	-	-	-	-	-	-	-	-	-	-	\$	
Sub-Total Maintenance of Plant	-	3,427	3,427	3,427	3,427	3,427	3,427	3,427	3,427	3,427	3,427	3,427	\$ 37,	7,700.00
Administrative Technology Services														
Internal Technology Support	_	_	_	_	_	_	_	_	-	_	-	_	s	_
Technology Personnel		_	_	_	_	_	_	_	_	_	_	_	•	
Systems Operation	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2 104	2 104	2,104	2,104	2,104	\$ 25	- 5,247.48
	2,104		2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	\$ 25	3,247.40
Systems Planning & Analysis		-		-	-		-	-		-	-	-	\$ 25	-
Sub-Total Administrative Technology Services	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	\$ 25,	5,247.48
After Care Programs														
After Care Salary			-	-	-	-	-	-	-	-	-	-	\$	-
Fringe Benefits			-	-	-	-	-	-	-	-	-	-	\$	-
Sub-Total After Care Programs				-			-	-		-	-	-	\$	-
Debt Service														
													_	
Redemption of Principal		-	-	-	-	-	-	-	-	-	-	-	\$	-
Interest (Interest Only at 6%)	_	-	-	-	-	-	-	-	-	-	-	-	\$	
Sub-Total Debt Service		-	-	-	-	-	-	-	-	-	-	-	Ş	-
Contingency														
Operating expense contigency - 5% of FEFP - Considered restricted funds				ĺ	ĺ					ĺ		250,414	\$ 250	0,413.53
Operating expense contigency - 5% of FEFF - Considered restricted funds												250,414	\$ 250	J,4 13.53
Sub-Total Contingency		-	-	-	-	-	-	-	-	-	-	250,414	\$ 250,	0,413.53
Total Expenditures	\$ 118,448.82	\$ 415,595.79	\$ 537,367.95	\$ 525,782.25	¢ 274 420 22	\$ 374,420.32	\$ 379,974.77	\$ 374,420.32	\$ 391,920.32	\$ 379,974.77	\$ 374,420.32	\$ 749,897.85	¢ 100c	6,643.83
Total expenditures	\$ 110,448.82	y 413,333.73	÷ 337,307.33	÷ 323,702.23	J 3/4,420.32	<i>→ 374,420.32</i>	<i>ب 3/3,3/4.//</i>	<i>→ 374,420.32</i>	J JJ1,J2U.32	<i>ب 3/3,3/4.//</i>	⊋ 3/4,42U.32	→ 143,031.03	4,330,	1,043.83
Excess of Revenues over Expenditures	\$ 268,987.74	\$ (50,946.04)	\$ (145,720.85)	\$ (93,857.37)	\$ 57,504.56	\$ 57,504.56	\$ 51,950.11	\$ 57,504.56	\$ 40,004.56	\$ 51,950.11	\$ 57,504.56	\$ (317,972.97)	\$ 34	4,413.53
Fund Balance	\$ 268,987.74	\$ 218,041.69	\$ 72,320.85	\$ (21,536.52)	\$ 35,968.03	\$ 93,472.59	\$ 145,422.71	\$ 202,927.27	\$ 242,931.82	\$ 294,881.94	\$ 352,386.50	\$ 34,413.53		

YEAR 4

100 % Enrollment

													100 % Enrollment
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
REVENUES													
State Sources with expected enrollment	390,561	390,561	390,561	390,561	390,561	390,561	390,561	390,561	390,561	390,561	390,561	390,561	\$ 4,686,730.13
Federal Sources - NSLP funds 60% of students	350,501	330,301	24,035	24,035	24,035	24,035	24,035	24,035	24,035	24,035	24,035		\$ 240,348.62
Local Sources - Lunch program paid students			4,173	4,173	4,173	4,173	4,173	4,173	4,173	4,173	4,173		\$ 240,346.02 \$ 41,727.19
Capital Outlay (SACS Accredited through Mater - Capital Outlay available year 1,)			4,173	4,173	41,667	4,173	4,173	41,667	41,667	41,667	41,667		\$ 375,000.00
Previous Years Balance Carry Forward	34,414			41,007	41,007	41,007	41,007	41,007	41,007	41,007	41,007	41,007	\$ 375,000.00 \$ 34,413.53
revious rears Balance Carry Forward	424,974	390,561	418,768	460,435	460,435	460,435	460,435	460,435	460,435	460.435	460,435	460,435	\$ 5,378,219.47
EXPENDITURES	424,374	330,301	410,700	400,433	400,433	400,433	400,433	400,433	400,433	400,433	400,433	400,433	ψ 0,070,210.47
Instruction													
Salaries (includes classroom teachers, contract or hourly, and teacher aides)		72,027	151,258	151,258	151,258	151,258	151,258	151,258	151,258	151,258	151,258	151,258	\$ 1,584,602.94
Fringe Benefits		15,846	33,277	33,277	33,277	33,277	33,277	33,277	33,277	33,277	33,277	33,277	\$ 348,612.65
Contracted Professional Services (includes Therapists & other contracted instructional services)				4,636	4,636	4,636	4,636	4,636	4,636	4,636	4,636	4,636	\$ 41,727.19
Classroom Supplies & Equipment		11,475	11,475	11,823									\$ 34,772.66
Teacher Supplies		8,925	8,925	9,195									\$ 27,045.40
Textbooks and/or ebooks/Student Activities		89,250	89,250	91,954									\$ 270,454.01
Supplemetal instructional materials (CIRP/SIRP and Technology)		19,125	19,125	19,705									\$ 57,954.43
SB 736 Merit Pay												129,387	\$ 129,387.00
Computer - Equipment for Instruction (* lease to include ebooks)		19,040	19,040	19,617									\$ 57,696.86
Computer Lab - Including Software		4,080	4,080	4,204									\$ 12,363.61
Sub-Total Instruction	-	239,768	336,429	345,668	189,171	189,171	189,171	189,171	189,171	189,171	189,171	318,558	\$ 2,564,616.75
Pupil Personnel Services													
Salaries (includes counselor, school nurse, health assistant)			8,242	8,242	8,242	8,242	8,242	8,242	8,242	8,242	8,242	8,242	
Fringe Benefits			1,813	1,813	1,813	1,813	1,813	1,813	1,813	1,813	1,813		\$ 18,133.30
Contracted Professional Services (counseling and psychological)			4,636	4,636	4,636	4,636	4,636	4,636	4,636	4,636	4,636	,	\$ 46,363.55
Sub-Total Pupil Personnel Services	-	-	14,692	14,692	14,692	14,692	14,692	14,692	14,692	14,692	14,692	14,692	\$ 146,920.92
Media Services													
Salaries (includes Librarian)		1,873	3,934	3,934	3,934	3,934	3,934	3,934	3,934	3,934	3,934	3,934	\$ 41,212.04
Fringe Benefits		412	865	865	865	865	865	865	865	865	865		\$ 9,066.65
Library Books		3,864	3,864	805	805	805	805	805	805	805	805	803	\$ 9,000.05 \$ 7,727.26
Audio Visual Materials		3,804	3,804										\$ 1,121.20 e
Sub-Total Media Services	_	6,149	8,663	4,799	4,799	4,799	4,799	4,799	4,799	4,799	4,799	4,799	\$ 58,005.95
Sub-Total Media Services	_	0,143	8,003	4,755	4,755	4,733	4,733	4,733	4,755	4,755	4,755	4,733	y 50,005.55
Curriculum Development													
Salaries (includes Curriculum Specialist)		-	-	-	-	-	-	-	-	-	-	-	\$ -
Fringe Benefits		-	-	-	-	-	-	-	-	-	-	-	\$ -
Curriculum Planning, Research, Development and Evaluation	7,405	7,405	7,405	7,405	7,405	7,405	7,405	7,405	7,405	7,405	7,405	7,405	\$ 88,863.46
Development Supplies		-	-		-								\$ -
Student Activities		11,591	11,591										\$ 23,181.77
Sub-Total Curriculum Development	7,405	18,996	18,996	7,405	7,405	7,405	7,405	7,405	7,405	7,405	7,405	7,405	\$ 112,045.23
Staff Development													
Workshops/Trainings (includes incentive pay for teachers)		18,500							18,500				\$ 37,000.00
Travel		-							-				\$ -
Professional Services		-							-				\$ -
Sub-Total Staff Development	-	18,500	-	-	-	-	-	-	18,500	-	-	-	\$ 37,000.00

Instruction Inhalized Frontancing Visional Confidence (Confidence of Confidence of C	SLAM Middle - Broward													YEAR 4
Solition Function Function Solition Function Solition Function Solition Function Solition Function Function Solition Function Function Solition Function Function Solition Function Funct														100 % Enrollment
Solitation (Indicate Personnelly Personnell)														
Foliage Desiration														
Facility Company Com			-	-		-	-			-			-	*
			- (10	- 610	-	-	-	-	-	-	-	-	-	
Compared teamining table			018	018	1 602	1 602	1 (02	1 (02	1 602	1 (02	1 (02	1 (02	1 (02	
Bear Comment					1,003	1,603	1,603	1,603	1,003	1,003	1,003	1,003	1,603	\$ 14,424.21
Professional Services (special Exercises (special	- ' 		- 610	- 610	1 602	1 602	1 602	1.602	1 602	1 602	1 602	1 602	1 602	\$ 15,660.58
Professional Servers (suppl) 2,756 5,950	3au-10tal Instruction Netween Technology	-	010	010	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	3 13,000.38
Instrument (General Lubbliny) 5,550 5,55	Board													
Instrument (General Lubbliny) 5,550 5,55	Professional Services (Legal)	2,576												\$ 2,575.75
Tright 2,661					5,950			5,950			5,950			
Central Administration 14,489 14,		2,061												\$ 2,060.60
Management Feer	Sub-Total Board	10,586	-	-	5,950	-	-	5,950	-	-	5,950		-	\$ 28,436.31
Management Fees														
Administrative Fee 1.600														l
School Administration 14489 1448	=	14,489	14,489	14,489	14,489	14,489	14,489	14,489	14,489	14,489	14,489	14,489	14,489	\$ 173,863.29
School Administration 18,456 18,4		-	-	-	-	-	-	-	-	-	-	-	-	\$ -
Salarie (Includes Principal, Secretary & other Office Personnel) 18,456	Sub-Total General Administration	14,489	14,489	14,489	14,489	14,489	14,489	14,489	14,489	14,489	14,489	14,489	14,489	\$ 1/3,863.29
Salarie (Includes Principal, Secretary & other Office Personnel) 18,456	School Administration													
Fringe Benefits 4,060 4,		18.456	18 456	18.456	18 456	18 456	18 456	18 456	18 456	18 456	18 456	18 456	18 456	\$ 221,474.49
Equipment Remail / Lasse 309 3			-							-	-			
Travel Advertising and Promotion 12,879														
Advertising and Promotion 12,8779 12,879		505	303	303		303	303	303	303	503	303	303	303	
License Fees		12.879	12.879	12.879	313									
Uniforms 309 180			,	,_,										
Postage 180														
Office Supplies 1,534 1,				180	180	180	180	180	180	180	180	180	180	
A 121 Computer Equipment 1,288 S S S S S S S S S	Printing	6,311	574	574	574	574	574	574	574	574	574	574	574	\$ 12,621.19
Computer Equipment 1,288	Office Supplies	5,625	1,534	1,534	1,534	1,534	1,534	1,534	1,534	1,534	1,534	1,534	1,534	\$ 22,500.00
Lib Total School Administration S3,564 37,812 37,993 25,629 25,114 25,		4,121												\$ 4,121.20
Facilities Acquisition & Construction Building Lease / Rent (see budget summary for calculation) 63,223	Computer Equipment	1,288												\$ 1,287.88
Building Lease / Rent (see budget summary for calculation) Remodeling & Renovations Purchase of Building & Renovations Purchase of Buildings & Fixed Equipment Land Sub-Total Food Services Salaries (Business Manager, Accounting & Bookkeeping Personnel) Salaries (Business Manager, Accounting & Salazie S	Sub-Total School Administration	53,564	37,812	37,993	25,629	25,114	25,114	25,114	25,114	25,114	25,114	25,114	25,114	\$ 355,907.85
Building Lease / Rent (see budget summary for calculation) Remodeling & Renovations Purchase of Buildings & Fixed Equipment Land Sub-Total Facilities Aquaistion & G.3223 63,223														
Remodeling & Renovations Purchase of Buildings & Fixed Equipment Land - Sub-Total Facilities Acquisition & Construction - Salaries (Business Manager, Accounting & Bookkeeping Personnel) - Salaries (
Purchase of Buildings & Fixed Equipment			63,223	63,223	63,223	63,223	63,223	63,223	63,223	63,223	63,223	63,223	63,223	\$ 695,453.18
Land -		-												-
Sub-Tatal Facilities Acquisition & Construction Salaries (Business Manager, Accounting & Bookkeeping Personnel) 3,434		-												\$ -
Fiscal Services Salaries (Business Manager, Accounting & Bookkeeping Personnel) 3,434 4,434 4,444 4,444 4,444 4,444		-	62 222	62 222	62 222	62 222	62 222	62 222	62 222	62 222	62 222	62 222	62 222	\$ 695.453.18
Salaries (Business Manager, Accounting & Bookkeeping Personnel) 3,434 4,1,212 2,480 2,708	Sau-Total Fucilities Acquisition & Construction		03,223	03,223	03,223	03,223	03,223	03,223	03,223	03,223	03,223	03,223	03,223	Ç 055,455.10
Salaries (Business Manager, Accounting & Bookkeeping Personnel) 3,434 4,1212 4,320 4,340 4	Fiscal Services													
Fringe Benefits 756 756 756 756 756 756 756 756 756 756		3,434	3,434	3,434	3,434	3,434	3,434	3,434	3,434	3,434	3,434	3,434	3,434	\$ 41,212.04
Fee to County School Board - up to 250 students 6,340														
Planning, Research, Development and Evaluation 7,083 7,0														
Professional Services - Annual Audit 644 44 44		7,083		7,083								7,083		
Food Services Salaries (Food Service Workers) 4,327 4,	Professional Services - Annual Audit													·
Salaries (Food Service Workers) 4,327 4,3	Sub-Total Fiscal Services	18,257	18,257	18,257	18,257	18,257	18,257	18,257	18,257	18,257	18,257	18,257	18,257	\$ 219,089.06
Salaries (Food Service Workers) 4,327 4,3	L													
Fringe Benefits 952 952 952 952 952 952 952 952 952 952														
Food														
Food, Materials & Supplies - Vendor provided meals 70% Participation 23,951 23,				952	952	952	952	952	952	952	952	952	952	
Equipment Rental / Lease (provided by food vendor)				- 22.054	- 22.054	- 22.054		22.054	- 22.054	22.054	22.054	22.054	22.054	Ÿ
				23,951	23,951	23,951	23,951	23,951	23,951	23,951	23,951	23,951	23,951	
Inspection rees 15 15 15 15 15 15 15				-	- 15	-	- 15	- 45	- 15	- 15	- 45	- 45	- 45	
		1												Ψ 104.00

SLAM Middle - Broward													YEAR 4
													100 % Enrollment
Pupil Transportation Services													
Salaries (Drivers & Transportation workers)			-	-	-	-	-	-	-	-	-	-	\$ -
Fringe Benefits			-	-	-	-	-	-	-	-	-	-	\$ -
Contracted Transportation Services - \$225 per bus 15% utilization			8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	\$ 81,000.00
Field Trip Expenses for competitions			500	500	500	500	500	500	500	500	500	500	\$ 5,000.00
Buses			-	-	-	-	-	-	-	-	-	-	\$ -
Repairs & Maintenance			-	-	-	-	-	-	-	-	-	-	\$ -
Fuel			-	-	-	-	-	-	-	-	-	-	\$ -
Sub-Total Pupil Transportation Services	-	-	8,600	8,600	8,600	8,600	8,600	8,600	8,600	8,600	8,600	8,600	\$ 86,000.00
Operation of Plant													
Salaries (Custodian, crossing guards, security)	5,358	5,358	5,358	5,358	5,358	5,358	5,358	5,358	5,358	5,358	5,358		\$ 64,293.26
Fringe benefits	1,179		1,179	1,179	1,179	1,179	1,179	1,179	1,179	1,179	1,179		\$ 14,144.52
Purchased Service (Custodial, fire and alarm, pest control etc)	225		225	225	225	225	225	225	225	225	225		\$ 2,704.54
Lawn Maintenance	601		601	601	601	601	601	601	601	601	601		\$ 7,212.11
Pest Control	120		120	120	120	120	120	120	120	120	120		\$ 1,442.42
Security Services	103		103	103	103	103	103	103	103	103	103		\$ 1,236.36
Property Insurance	3,306		3,306	3,306	3,306	3,306	3,306	3,306	3,306	3,306	3,306		\$ 39,666.59
Telephone Services	309		309	309	309	309	309	309	309	309	309		\$ 3,709.08
Water & Sewer Electricity	240 4,508		240 4,508	240 4,508	240 4,508	240 4,508	240 4,508	240 4,508	240 4,508	240 4,508	240 4,508		\$ 2,884.84 \$ 54,090.80
Custodial Supplies & Equipment	4,306	4,506	4,506	4,306	4,306	4,306	4,306	4,308	4,308	4,306	4,506	4,308	\$ 54,090.00 e
Sub-Total Operation of Plant	15,949	15,949	15,949	15,949	15,949	15,949	15,949	15,949	15,949	15,949	15,949	15,949	\$ 191,384.52
Maintenance of Plant													
Repairs & Maintenance		3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	\$ 39,000.00
Supplies		3,343	3,343	3,343	3,343	3,545	3,343	3,343	3,545	3,343	3,343	3,343	\$ 39,000.00
Sub-Total Maintenance of Plant		3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	\$ 39,000.00
Administrative Technology Services													
Internal Technology Support	-	-	-	-	-	-	-	-	-	-	-	-	\$ -
Technology Personnel	-	-	-	-	-	-	-	-	-	-	-	-	\$ -
Systems Operation	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254	\$ 27,045.40
Systems Planning & Analysis	-	-	-	-	-	-	-	-	-	-	-	-	\$ -
Sub-Total Administrative Technology Services	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254	2,254	\$ 27,045.40
After Care Programs													
After Care Salary			-	-	-	-	-	-	-	-	-	-	\$ -
Fringe Benefits			-	-	-	-	-	-	-	-	-	-	\$ -
Sub-Total After Care Programs			-	-	-	-	-	-	-	-	-	-	\$ -
Debt Service			l										
Redemption of Principal		-	-	-	-	-	-	-	-	-	-	-	\$ -
Interest (Interest Only at 6%)		-	-	-	-	-	-	-	-	-	-	-	\$ -
Sub-Total Debt Service		-	-	-	-	-	-	-	-	-	-	-	\$ -
Contingency													
Operating expense contigency - 5% of FEFP - Considered restricted funds												267,190	\$ 267,190.30
Sub-Total Contingency		-	-	-	-	-	-	-	-	-	-	267,190	\$ 267,190.30
Total Expenditures	\$ 122,504.40	\$ 439,560.72	\$ 572,953.95	\$ 561,309.54	\$ 398,346.83	\$ 398,346.83	\$ 404,296.82	\$ 398,346.83	\$ 416,846.83	\$ 404,296.82	\$ 398,346.83	\$ 794,924.13	\$ 5,310,080.57
Excess of Revenues over Expenditures	\$ 302,469.97	\$ (48,999.87)	\$ (154,185.52)	\$ (100,874.45)	\$ 62,088.26	\$ 62,088.26	\$ 56,138.27	\$ 62,088.26	\$ 43,588.26	\$ 56,138.27	\$ 62,088.26	\$ (334,489.04)	\$ 68,138.90
Fund Balance	\$ 302,469.97	\$ 253,470.10	\$ 99,284.57	\$ (1,589.88)	\$ 60,498.38	\$ 122,586.63	\$ 178,724.90	\$ 240,813.16	\$ 284,401.42	\$ 340,539.69	\$ 402,627.94	\$ 68,138.90	
					· ·								

YEAR 5

													100 % Enrollment
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
REVENUES													
State Sources with expected enrollment	394,466	394,466	394,466	394,466	394,466	394,466	394,466	394,466	394,466	394,466	394,466	394,466	\$ 4,733,597.43
Federal Sources - NSLP funds 60% of students	,	, ,	24,275	24,275	24,275	24,275	24,275	24,275	24,275	24,275	24,275	24,275	
Local Sources - Lunch program paid students			4,214	4,214	4,214	4,214	4,214	4,214	4,214	4,214	4,214	4,214	\$ 42,144.46
Capital Outlay (SACS Accredited through Mater - Capital Outlay available year 1,)			·	41,667	41,667	41,667	41,667	41,667	41,667	41,667	41,667	41,667	\$ 375,000.00
Previous Years Balance Carry Forward	68,139												\$ 68,138.90
	462,605	394,466	422,956	464,623	464,623	464,623	464,623	464,623	464,623	464,623	464,623	464,623	\$ 5,461,632.90
EXPENDITURES													
Instruction													
Salaries (includes classroom teachers, contract or hourly, and teacher aides)		71,802	150,784	150,784	150,784	150,784	150,784	150,784	150,784	150,784	150,784	150,784	\$ 1,579,636.89
Fringe Benefits		15,796	33,172	33,172	33,172	33,172	33,172	33,172	33,172	33,172	33,172	33,172	
Contracted Professional Services (includes Therapists & other contracted instructional services)		,	,	4,683	4,683	4,683	4,683	4,683	4,683	4,683	4,683	4,683	\$ 42,144.46
Classroom Supplies & Equipment		11,590	11,590	11,941		·	·	•	•	·	,		\$ 35,120.39
Teacher Supplies		9,014	9,014	9,287									\$ 27,315.86
Textbooks and/or ebooks/Student Activities		90,142	90,142	92,874									\$ 273,158.55
Supplemetal instructional materials (CIRP/SIRP and Technology)		19,316	19,316	19,902									\$ 58,533.98
SB 736 Merit Pay		•										129,387	\$ 129,387.00
Computer - Equipment for Instruction (* lease to include ebooks)		19,230	19,230	19,813									\$ 58,273.82
Computer Lab - Including Software		8,242	8,242	8,491									\$ 24,974.50
Sub-Total Instruction		245,132	341,490	350,947	188,639	188,639	188,639	188,639	188,639	188,639	188,639	318,026	\$ 2,576,065.55
D. Howards a few													
Pupil Personnel Services			0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.225	\$ 83.248.32
Salaries (includes counselor, school nurse, health assistant)			8,325	8,325	8,325	8,325	8,325	8,325	8,325	8,325	8,325	8,325	
Fringe Benefits			1,831	1,831	1,831 4,683	1,831	1,831	1,831 4,683	1,831	1,831	1,831 4,683	1,831 4,683	\$ 18,314.63 \$ 46,827.18
Contracted Professional Services (counseling and psychological) Sub-Total Pupil Personnel Services			4,683 14,839	4,683 14.839	4,683 14.839	4,683 14.839	4,683 14.839		4,683	4,683 14.839			φ 10,027.10
Sub-Total Pupil Personnel Services	-	-	14,839	14,839	14,839	14,839	14,839	14,839	14,839	14,839	14,839	14,839	\$ 148,390.13
Media Services													
Salaries (includes Librarian)		1,892	3,973	3,973	3,973	3,973	3,973	3,973	3,973	3,973	3,973	3,973	\$ 41,624.16
Fringe Benefits		416	874	874	874	874	874	874	874	874	874	874	\$ 9,157.32
Library Books		3,902	3,902										\$ 7,804.53
Audio Visual Materials		-	-										\$ -
Sub-Total Media Services		6,211	8,750	4,847	4,847	4,847	4,847	4,847	4,847	4,847	4,847	4,847	\$ 58,586.01
Curriculum Development													
Salaries (includes Curriculum Specialist)		_	_	_	_	_	_	_	-	_	-	_	s -
Fringe Benefits		_	_	_	_	_	_	_	-	_	-	_	\$ -
Curriculum Planning, Research, Development and Evaluation	7,479	7,479	7,479	7,479	7,479	7,479	7,479	7,479	7,479	7,479	7,479	7,479	\$ 89,752.10
Development Supplies		-	-			·	·	·		·	,		\$ -
Student Activities		11,707	11,707										\$ 23,413.59
Sub-Total Curriculum Development	7,479	19,186	19,186	7,479	7,479	7,479	7,479	7,479	7,479	7,479	7,479	7,479	\$ 113,165.69
Staff Development Workshop / Trainings / includes incentive new for teachers)		10.000							19,000				\$ 38,000.00
Workshops/Trainings (includes incentive pay for teachers)		19,000											_
Travel		-							-				\$ -
Professional Services		-							19,000	_			\$ 38,000.00
Sub-Total Staff Development		19,000		-		-	-	-	19,000	-	-	-	\$ 38,000.00
Instruction Related Technology													
Salaries (includes Technology Personnel)		-	-	-	-	-	-	-	-	-	-	-	\$ -
Fringe Benefits		-	-	-	-	-	-	-	-	-	-	-	\$ -
EduSoft Software and Scanner		624	624										\$ 1,248.72
Hardware Maintenance				1,619	1,619	1,619	1,619	1,619	1,619	1,619	1,619	1,619	\$ 14,568.46
Computer Learning Labs		-	-									<u> </u>	\$ -
Sub-Total Instruction Related Technology		624	624	1,619	1,619	1,619	1,619	1,619	1,619	1,619	1,619	1,619	\$ 15,817.18
Roard													
Board Professional Services (Legal)	2,602												\$ 2,601.51
Liniessiniai Services (FeRqi)	2,002	ı l		l	l .		l l	l l		l l	1	ı	2,001.51

SLAM Middle - Broward													YEAR 5
													100 %
Insurance (General Liability, D&O, Professional Liability)	6,009			6,009			6,009			6,009			### \$ 24,037.95
Travel Sub-Total Board	2,081 10,692		-	6,009	-	-	6,009	-	_	6,009	-		\$ 2,081.21 \$ 28,720.67
				,,,,,						,,,,,			, , , , , ,
General Administration Management Fees	14,633	14,633	14,633	14,633	14,633	14,633	14,633	14,633	14,633	14,633	14,633	14 633	\$ 175,601.93
Administrative Fee	-		-	-	-	-	-	-		-	-	-	\$ -
Sub-Total General Administration	14,633	14,633	14,633	14,633	14,633	14,633	14,633	14,633	14,633	14,633	14,633	14,633	\$ 175,601.93
School Administration													
Salaries (includes Principal, Secretary & other Office Personnel)	18,641	18,641	18,641	18,641	18,641	18,641	18,641	18,641	18,641	18,641	18,641	18,641	\$ 223.689.24
Fringe Benefits	4,101	4,101	4,101	4,101	4,101	4,101	4,101	4,101	4,101	4,101	4,101	4,101	\$ 49,211.63
Equipment Rental / Lease	312	312	312	312	312	312	312	312	312	312	312	312	\$ 3,746.17
Travel				520									\$ 520.30
Advertising and Promotion License Fees	13,008 208	13,008	13,008										\$ 39,022.65 \$ 208.12
Uniforms	312												\$ 312.18
Postage	312		182	182	182	182	182	182	182	182	182	182	
Printing	6,374	579	579	579	579	579	579	579	579	579	579	579	\$ 12,747.40
Office Supplies	5,625	1,534	1,534	1,534	1,534	1,534	1,534	1,534	1,534	1,534	1,534	1,534	
Office Equipment	4,162												\$ 4,162.42
Computer Equipment Sub-Total School Administration	1,301 54,044	38,175	38,357	25,870	25,350	25,350	25,350	25,350	25,350	25,350	25,350	25,350	\$ 1,300.76 \$ 359,241.93
Sub-Total School Administration	54,044	38,173	38,337	25,870	25,330	25,350	25,350	25,350	25,350	25,350	25,350	25,330	\$ 339,241.93
Facilities Acquisition & Construction													
Building Lease / Rent (see budget summary for calculation)		63,855	63,855	63,855	63,855	63,855	63,855	63,855	63,855	63,855	63,855	63,855	\$ 702,407.71
Remodeling & Renovations	-												\$ -
Purchase of Buildings & Fixed Equipment	-												\$ -
Land Sub-Total Facilities Acquisition & Construction	-	63,855	63,855	63,855	63,855	63,855	63,855	63,855	63,855	63,855	63,855	63,855	\$ 702,407.71
Sub Fotor Facilities Facquisition & Construction		03,033	03,033	03,033	03,033	03,033	03,033	05,035	03,033	03,033	03,033	03,033	ψ 702,107.71
Fiscal Services													İ
Salaries (Business Manager, Accounting & Bookkeeping Personnel)	3,469	3,469	3,469	3,469	3,469	3,469	3,469	3,469	3,469	3,469	3,469	3,469	
Fringe Benefits	763	763	763	763	763	763	763	763	763	763	763	763	
Fee to County School Board - up to 250 students Planning, Research, Development and Evaluation	6,404 7,154	6,404 7,154	6,404 7,154	6,404 7,154	6,404 7,154	6,404 7,154	6,404 7,154	6,404 7,154	6,404 7,154	6,404 7,154	6,404 7,154	6,404 7,154	
Professional Services - Annual Audit	650	650	650	650	650	650	650	650	650	650	650	650	\$ 7,804.53
Sub-Total Fiscal Services	18,440	18,440	18,440	18,440	18,440	18,440	18,440	18,440	18,440	18,440	18,440	18,440	
Food Services			4,371	4,371	4,371	4,371	4,371	4,371	4,371	4,371	4,371	4,371	\$ 43,705.37
Salaries (Food Service Workers) Fringe Benefits			962	962	962	962	962	962	962	962	962	962	\$ 43,705.37 \$ 9,615.18
Food			-	-	-	-	-	-	-	-	-	-	\$ -
Food, Materials & Supplies - Vendor provided meals 70% Participation			24,191	24,191	24,191	24,191	24,191	24,191	24,191	24,191	24,191	24,191	\$ 241,909.21
Equipment Rental / Lease (provided by food vendor)			-	-	-	-	-	-	-	-	-	-	\$ -
Inspection fees			16	16	16	16	16	16	16	16	16	16	\$ 156.09
Sub-Total Food Services	-	-	29,539	29,539	29,539	29,539	29,539	29,539	29,539	29,539	29,539	29,539	\$ 295,385.85
Pupil Transportation Services													
Salaries (Drivers & Transportation workers)			-	-	-	-	-	-	-	-	-	-	\$ -
Fringe Benefits			-	-	-	-	-	-	-	-	-	-	\$ -
Contracted Transportation Services - \$225 per bus 15% utilization			8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	\$ 81,000.00
Field Trip Expenses for competitions			500	500	500	500	500	500	500	500	500	500	\$ 5,000.00
Buses Repairs & Maintenance					<u> </u>		<u> </u>	[]		<u> </u>	[]	-	\$ - \$ -
Fuel				-	-		-			-	-	-	\$ -
Sub-Total Pupil Transportation Services	-		8,600	8,600	8,600	8,600	8,600	8,600	8,600	8,600	8,600	8,600	\$ 86,000.00
Convention of Plant													
Operation of Plant Salaries (Custodian, crossing guards, security)	5,411	5,411	5,411	5,411	5,411	5,411	5,411	5,411	5,411	5,411	5,411	5,411	\$ 64,936.19
Fringe benefits	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	
Purchased Service (Custodial, fire and alarm, pest control etc)	228	228	228	228	228	228	228	228	228	228	228	228	
, , , , , , , , , , ,						1		1		1			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

SLAM Middle - Broward													YEAR 5
													100 %
													Enrollment
Lawn Maintenance	607	607	607	607	607	607	607	607	607	607	607	607	\$ 7,284.23
Pest Control	121	121	121	121	121	121	121	121	121	121	121	121	\$ 1,456.85
Security Services	104	104	104	104	104	104	104	104	104	104	104	104	\$ 1,248.72
Property Insurance	3,339	3,339	3,339	3,339	3,339	3,339	3,339	3,339	3,339	3,339	3,339	3,339	\$ 40,063.25
Telephone Services	312	312	312	312	312	312	312	312	312	312	312	312	\$ 3,746.17
Water & Sewer	243	243	243	243	243	243	243	243	243	243	243	243	\$ 2,913.69
Electricity	4,553	4,553	4,553	4,553	4,553	4,553	4,553	4,553	4,553	4,553	4,553	4,553	\$ 54,631.71
Custodial Supplies & Equipment	-	-	-	-	-	-	-	-	-	-	-	-	\$ -
Sub-Total Operation of Plant	16,108	16,108	16,108	16,108	16,108	16,108	16,108	16,108	16,108	16,108	16,108	16,108	\$ 193,298.36
Maintenance of Plant													
Repairs & Maintenance		3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	\$ 39,000.00
Supplies		-	-	-		-		-	-		-	-	\$ -
Sub-Total Maintenance of Plant	_	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	3,545	\$ 39,000.00
no rotal maintenance of raint		3,343	3,343	3,343	3,343	3,343	3,343	3,343	3,343	3,543	3,343	3,343	\$ 33,000.00
Administrative Technology Services													
Internal Technology Support	-	-	-	-	-	-	-	-	-	-	-	-	\$ -
Technology Personnel	-	-	-	-	-	-	-	-	-	-	-	-	\$ -
Systems Operation	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	\$ 27,315.86
Systems Planning & Analysis	-	-	-	-	-	-	-	-	-	-	-	-	\$ -
Sub-Total Administrative Technology Services	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	\$ 27,315.86
After Care Programs													
After Care Salary			_	_	_	_	_	_	_	_	_	_	s -
Fringe Benefits			_	_	_	_	_	_	_	_	_	_	s -
Sub-Total After Care Programs					-	-	-		-		-	-	\$ -
Debt Service													
Redemption of Principal		_	_	_	_	_	_	_	_	_	_	_	s -
Interest (Interest Only at 6%)		_	_	_	_	_	_	_	_	_	_	_	s -
Sub-Total Debt Service			-	-	-			-	_	-	-	-	\$ -
Contingency													
Operating expense contigency - 5% of FEFP - Considered restricted funds												269,675	\$ 269,674.70
Sub-Total Contingency		-	-	-	-	-	-	-	-	-	-	269,675	\$ 269,674.70
Total Expenditures	\$ 123,673.20	\$ 447,187.20	\$ 580,243.82	\$ 568,607.85	\$ 399,769.85	\$ 399,769.85	\$ 405,779.33	\$ 399,769.85	\$ 418,769.85	\$ 405,779.33	\$ 399,769.85	\$ 798,831.55	\$ 5,347,951.51
Excess of Revenues over Expenditures	\$ 338,932.16	\$ (52,720.74)	\$ (157,287.71)	\$ (103,985.07)	\$ 64,852.93	\$ 64,852.93	\$ 58,843.44	\$ 64,852.93	\$ 45,852.93	\$ 58,843.44	\$ 64,852.93	\$ (334,208.77)	\$ 113,681.39
·	İ	1	· · · · · /									· · · · · · · · · · · · · · · · · · ·	
Fund Balance	\$ 338,932.16	\$ 286,211.41	\$ 128,923.70	\$ 24,938.63	\$ 89,791.56	\$ 154,644.49	\$ 213,487.93	\$ 278,340.86	\$ 324,193.79	\$ 383,037.23	\$ 447,890.16	\$ 113,681.39	

District: Broward

ESE Percent 12.00% ESOL Percent 20.00% Free & Reduced Lunch Percent 60.00%

Occupancy 100% 97% 100% 97% 97%

Homeroom Classrooms

	Year 1	Year 2	Year 3	Year 4	Year 5
Kindergarten					
1st Grade					
2nd Grade					
3rd Grade					
4th Grade					
5th Grade					
6th Grade	10	12	11	12	12
7th Grade	6	10	12	11	12
8th Grade	1	6	10	12	11
9th Grade					
10th Grade					
11th Grade					
12th Grade					
	17	28	33	35	35

Student Teacher Ratio

	Year 1	Year 2	Year 3	Year 4	Year 5
Kindergarten	0	0	0	0	0
1st Grade	0	0	0	0	0
2nd Grade	0	0	0	0	0
3rd Grade	0	0	0	0	0
4th Grade	0	0	0	0	0
5th Grade	0	0	0	0	0
6th Grade	22	22	22	22	22
7th Grade	22	22	22	22	22
8th Grade	22	22	22	22	22
9th Grade	0	0	0	0	0
10th Grade	0	0	0	0	0
11th Grade	0	0	0	0	0
12th Grade	0	0	0	0	0
0	374	616	726	770	770

Students by Grade Budgeted Enrollment

	Year 1	Year 2	Year 3	Year 4	Year 5
Kindergarten	0	0	0	0	0
1st Grade	0	0	0	0	0
2nd Grade	0	0	0	0	0
3rd Grade	0	0	0	0	0
4th Grade	0	0	0	0	0
5th Grade	0	0	0	0	0
6th Grade	220	257	242	257	257
7th Grade	132	214	263	236	257
8th Grade	22	129	220	257	236
9th Grade	0	0	0	0	0
10th Grade	0	0	0	0	0
11th Grade	0	0	0	0	0
12th Grade	<u>0</u>	0	0	0	0
	374	600	725	750	750

	Grade	Matrix		
ESE Guaranteed Allocation:	Level	Level		FTE
Additional Funding from the	K-3	251		0
ESE Guaranteed Allocation.	K-3	252		
Enter the FTE from 111,112,	K-3	253		
& 113 by grade and matrix	4-8	251		45
level. Students who do not	4-8	252		
have a matrix level should be	4-8	253		
considered 251. The total	9-12	<i>251</i>		0
should equal all FTE from	9-12	252		
programs 111, 112 & 113 above.	9-12	253		
			Total ESE	45.00

Revenue Estimate Worksheet for SLAM Middle - Broward Based on the First Calculation of the FEFP 2013-14

School District: Broward

1. 2013-14 FEFP State and Local Funding

	Base Student Allocation	\$3,752.30	District Cost Differential:	1.023
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			Weighted	2013-14 Base
		Program	FTE	Funding WFTE x
Program	Number of FTE	Cost Factor	(b) x (c)	BSA x DCD
(a)	(b)	(c)	(d)	(e)
101 Basic K-3	0.00	1.125	0.0000	\$ -
111 Basic K-3 with ESE Services	0.00	1.125	0.0000	\$ -
102 Basic 4-8	254.00	1.000	254.0000	\$ 975,482
112 Basic 4-8 with ESE Services	45.00	1.000	45.0000	\$ 172,822
103 Basic 9-12	0.00	1.011	0.0000	\$ -
113 Basic 9-12 with ESE Services	0.00	1.011	0.0000	\$ -
254 ESE Level 4 (Grade Level PK-3)		3.558	0.0000	\$ -
254 ESE Level 4 (Grade Level 4-8)		3.558	0.0000	\$ -
254 ESE Level 4 (Grade Level 9-12)		3.558	0.0000	\$ -
255 ESE Level 5 (Grade Level PK-3)		5.089	0.0000	\$ -
255 ESE Level 5 (Grade Level 4-8)		5.089	0.0000	\$ -
255 ESE Level 5 (Grade Level 9-12)		5.089	0.0000	\$ -
130 ESOL (Grade Level PK-3)	0.00	1.145	0.0000	\$ -
130 ESOL (Grade Level 4-8)	75.00	1.145	85.8750	\$ 329,801
130 ESOL (Grade Level 9-12)	0.00	1.145	0.0000	\$ -
300 Career Education (Grades 9-12)		1.011	0.0000	\$ -
Totals	374.00		384.8750	\$ 1,478,105

			Matrix	Gu	ıarantee	
2. ESE Guaranteed Allocation:	FTE	Grade Level	Level	Per	Student	
Additional Familias from the ECE	0.00	PK-3	251	\$	1,058	\$ -
Additional Funding from the ESE		PK-3	252	\$	3,418	\$ -
Guaranteed Allocation. Enter the FTE from 111,112, & 113 by grade and matrix level. Students who do not have a matrix level should be considered 251. This total should equal all FTE from programs 111, 112 & 113 above.		PK-3	253	\$	6,974	\$ -
	45.00	4-8	251	\$	1,187	\$ 53,415
		4-8	252	\$	3,546	\$ -
		4-8	253	\$	7,102	\$ -
	0.00	9-12	251	\$	845	\$ -
		9-12	252	\$	3,204	\$ -
		9-12	253	\$	6,760	\$ -
Total FTE with ESE Services	45.00	To	otal from E	SE G	uarantee	\$ 53,415

3. Supplemental Academic Instruction:

4. Reading Allocation:

Charter Schools should contact their school district sponsor regarding eligibility and distribution of reading allocation funds.

Total Base Funding, ESE Guarantee, and SAI \$ 1,608,564

5. Class size Reduction Funds:

	Weighted FTE (From Section 1)	X <u>DCD</u>	X Allocation factors				
PK - 3	0.0000	1.0235	1320.15	=	0		
4-8	384.8750	1.0235	900.48	=	354,717		
9-12	0.0000	1.0235	902.65	=	0		
Total *	384.8750		Total Class Size Reduction Funds				354,717

(*Total FTE should equal total in Section 1, column (d).)

6A. Divide school's Weighted FTE (WFTE) t in (d) above: to obtain school's WFTE share	384.8750	_by dist	rict's WFTE:	280,2	13.62 0.1374%	
6B. Divide school's Unweighted FTE (UFTE) in (b) above: to obtain school's UFTE share.	374.00	_by dist	rict's UFTE:	<u>257,6.</u>	37.67 0.1452%	
	Letters Refe	r to Note	s At Bottom:			
7. Other FEFP (WFTE share)		(a)	6,135,390	X	0.1374% \$	8,430
Applicable to all Charter Schools:						
Declining Enrollment Sparsity Supplement	0					
Program Related Requirements:						
Safe Schools Lab School Discretionary	6,135,390 0					
8. Discretionary Local Effort (WFTE share)	v	(d)	98,260,848	X	0.1374% \$	135,010
9. Discretionary Millage Compression Alloca	tion	-				
.748 mills (UFTE share)		(b)	0	X	0.1452% \$	-
10. Proration to Funds Available (WFTE sha	re)	(a)	0	X	0.1374% \$	-
11. Discretionary Lottery (WFTE share)		(a)	0	X	0.1374% \$	-
12. Instructional Materials Allocation (UFTE	E share)	(b)	19,884,665	X	0.1452% \$	28,873
Dual Enrollment Instructional Materi	als Allocation (S	ee footno	te i below)			
13. Student Transportation		(e))			
Ente	r All Riders	-	56.10	X	347_\$	19,467
Ente	r ESE Student R	Riders		X	1332 \$	-
14. Teacher Salary Allocation (WFTE share)		(j)	46,981,326	X	0.1374% \$	64,552
15. Florida Teachers Lead Program Stipend						
16. Food Service Allocation		(g))			
17. Performance Pay Plan						
					Total \$	2,219,613
18. Funding for the purpose of calculating the If you have more than a 75% ESE stude					(h)	<u>-</u>
			Average	Revenue	per Student: \$	5,935

NOTES:

- (a) District allocations multiplied by percentage from item 6A.
- (b) District allocations multiplied by percentage from item 6B.
- (d) Proceeds of 0.748 millage levy (s. 1011.71(3)(b), Florida Statutes) multiplied by percentage from item 6A.
- (e) Consistent with Section 1006.21, Florida Statutes and DOE Student Transportation General Instructions. Numbers entered here will be multiplied by the district level transportation funding per rider. "All Riders" should include both basic and ESE Riders. "ESE Student Riders" should include only ESE Riders.
- (f) Teacher Lead Program Allocation per Section 1012.71, Florida Statutes
- (g) Funding based on student eligibility and meals provided, if participating in the National School Lunch Program.
- (h) Consistent with Section 1002.33(20)(a), Florida Statutes, for charter schools with a population of 75% or more ESE students, the administrative fee shall be calculated based on unweighted full-time equivalent students.
- (i) As provided in the 2013 General Appropriations Act, school districts are required to pay for instructional materials used for the instruction of public school high school students who are earning credit toward high school graduation under the dual enrollment program as provided in section 1011.62(l)(i), Florida Statutes.
- (j) The Teacher Salary Allocation is provided pursuant to Specific Appropriation 87, Chapter 2013-40, Laws of Florida, and Section 26 of Chapter 2013-45, Laws of Florida.

Administrative fees charged by the school district shall be calculated based upon 5 percent of available funds from the FEFP and categorical funding for which charter students may be eligible. For charter schools with a population of 251 or more students the difference in the fee calculation and the fee withheld may only be used for capital outlay purposes specified in Section 1013.62(2) F.S. To calculate the administrative fee to be withheld for schools with more than 250 students, divide the school population into 250. Multiply that fraction times the funds available, then times 5%.

For high performing charter schools, administrative fees charged by the school district shall be calculated based upon 2 percent of available funds from the FEFP and categorical funding for which charter students may be eligible. For charter schools with a population of 251 or more students the difference in the fee calculation and the fee withheld may only be used for capital outlay purposes specified in Section 1013.62(2) F.S. To calculate the administrative fee to be withheld for schools with more than 250 students, divide the school population into 250. Multiply that fraction times the funds available, then times 2 percent.

FEFP and categorical funding are recalculated during the year to reflect the revised number of full-time equivalent students reported during the survey periods designated by the Commissioner of Education.

Revenues flow to districts from state sources and from county tax collectors on various distribution schedules.

Revenue Estimate Worksheet for SLAM Middle - Broward Based on the First Calculation of the FEFP 2013-14

School District: Broward

1. 2013-14 FEFP State and Local Funding

			Weighted	2013-14 Base
		Program	FTE	Funding WFTE x
Program	Number of FTE	Cost Factor	(b) x (c)	BSA x DCD
(a)	(b)	(c)	(d)	(e)
101 Basic K-3	0.00	1.125	0.0000	\$ -
111 Basic K-3 with ESE Services	0.00	1.125	0.0000	\$ -
102 Basic 4-8	408.00	1.000	408.0000	\$ 1,566,915
112 Basic 4-8 with ESE Services	72.00	1.000	72.0000	\$ 276,514
103 Basic 9-12	0.00	1.011	0.0000	\$ -
113 Basic 9-12 with ESE Services	0.00	1.011	0.0000	\$ -
254 ESE Level 4 (Grade Level PK-3)		3.558	0.0000	\$ -
254 ESE Level 4 (Grade Level 4-8)		3.558	0.0000	\$ -
254 ESE Level 4 (Grade Level 9-12)		3.558	0.0000	\$ -
255 ESE Level 5 (Grade Level PK-3)		5.089	0.0000	\$ -
255 ESE Level 5 (Grade Level 4-8)		5.089	0.0000	\$ -
255 ESE Level 5 (Grade Level 9-12)		5.089	0.0000	\$ -
130 ESOL (Grade Level PK-3)	0.00	1.145	0.0000	\$ -
130 ESOL (Grade Level 4-8)	120.00	1.145	137.4000	\$ 527,682
130 ESOL (Grade Level 9-12)	0.00	1.145	0.0000	\$ -
300 Career Education (Grades 9-12)		1.011	0.0000	\$ -
Totals	600.00		617.4000	\$ 2,371,111

			Matrix	Gu	arantee		
2. ESE Guaranteed Allocation:	FTE	Grade Level	Level	Per	Student	_	
Additional Funding from the	0.00	PK-3	251	\$	1,058	\$	-
ESE Guaranteed Allocation.		PK-3	252	\$	3,418	\$	-
Enter the FTE from 111,112, &		PK-3	253	\$	6,974	\$	-
113 by grade and matrix level.	72.00	4-8	251	\$	1,187	\$	85,464
Students who do not have a		4-8	252	\$	3,546	\$	-
matrix level should be		4-8	253	\$	7,102	\$	-
considered 251. This total	0.00	9-12	251	\$	845	\$	-
should equal all FTE from		9-12	252	\$	3,204	\$	-
programs 111, 112 & 113 above.		9-12	253	\$	6,760	\$	-

3. Supplemental Academic Instruction:

Total FTE with ESE Services

District SAI Allocation	#######################################		Per Studer	ıt
divided by district FTE	257,637.67	\$ 206	\$	123,600
(with eligible services)				

4. Reading Allocation:

Charter Schools should contact their school district sponsor regarding eligibility and distribution of reading allocation funds.

72.00

Total Base Funding	. ESE Guarantee, and SAL \$	2.580.175

Total from ESE Guarantee \$

85,464

5. Class size Reduction Funds:

	Weighted FTE (From Section 1)	X <u>D</u>	<u>CD</u>	X Allocation factors			
PK - 3	0.0000	1.0	0235	1320.15	=	0	
4-8	617.4000	1.0	0235	900.48	=	569,021	
9-12	0.0000	1.0	0235	902.65	=	0	
Total *	617.4000			Total Class Si	ze Red	uction Funds	\$ 569,021

 $(*Total\ FTE\ should\ equal\ total\ in\ Section\ 1,\ column\ (d).)$

6A. Divide school's Weighted FTE (WFTE) t in (d) above: to obtain school's WFTE share	617.4000	by distr	ict's WFTE:	280,2	1 <u>3.62</u> 0.2203%		
6B. Divide school's Unweighted FTE (UFTE)	total computed						
in (b) above:	600.00	by distr	ict's UFTE:	257,6	<u>37.67</u>		
to obtain school's UFTE share	•	_			0.2329%		
	Letters Refe	er to Notes	At Bottom:				
7. Other FEFP (WFTE share)		(a)	6,135,390	X	0.2203%	\$	13,516
Applicable to all Charter Schools:		· -			•		
Declining Enrollment	0						
Sparsity Supplement	0						
Program Related Requirements: Safe Schools	6,135,390						
Lab School Discretionary	0,135,550						
8. Discretionary Local Effort (WFTE share)		(d)	98,260,848	X	0.2203%	\$	216,469
9. Discretionary Millage Compression Alloca	ition	_			•		
.748 mills (UFTE share)		(b)	0	X	0.2329%	\$	-
10. Proration to Funds Available (WFTE sha	re)	(a)	0	X	0.2203%	\$	-
11. Discretionary Lottery (WFTE share)		(a)	0	x	0.2203%	\$	-
12. Instructional Materials Allocation (UFTI	E share)	(b)	19,884,665	X	0.2329%	\$	46,311
Dual Enrollment Instructional Materi	ials Allocation (S	see footno	te i below)				
13. Student Transportation		(e)					
Ente	r All Riders	_	56.10	x	347	\$	19,467
Ente	r ESE Student F	Riders		X	1,332	\$	-
14. Teacher Salary Allocation (WFTE share))	(j)	46,981,326	X	0.2203%	\$	103,500
15. Florida Teachers Lead Program Stipend							
16. Food Service Allocation		(g)			•		
17. Performance Pay Plan					•		
					Total	\$	3,548,459
					10001	Ψ	5,6 10,165
18. Funding for the purpose of calculating the	e administrative	fee for ES	E Charters.		(h)		
If you have more than a 75% ESE stude	nt population ple	ease place	a 1 in the follow	ing box:		\$	-
			Avaraga	Povenue	per Student:	•	5,914
			Ü		•	Ψ	,
			Revenue Increa				1%
			Adjusted	i Revenu	e Per Student	\$	5,973.24

NOTES:

- (a) District allocations multiplied by percentage from item 6A.
- (b) District allocations multiplied by percentage from item 6B.
- (d) Proceeds of 0.748 millage levy (s. 1011.71(3)(b), Florida Statutes) multiplied by percentage from item 6A.
- (e) Consistent with Section 1006.21, Florida Statutes and DOE Student Transportation General Instructions. Numbers entered here will be multiplied by the district level transportation funding per rider. "All Riders" should include both basic and ESE Riders. "ESE Student Riders" should include only ESE Riders.
- (f) Teacher Lead Program Allocation per Section 1012.71, Florida Statutes
- (g) Funding based on student eligibility and meals provided, if participating in the National School Lunch Program.
- (h) Consistent with Section 1002.33(20)(a), Florida Statutes, for charter schools with a population of 75% or more ESE students, the administrative fee shall be calculated based on unweighted full-time equivalent students.
- (i) As provided in the 2013 General Appropriations Act, school districts are required to pay for instructional materials used for the instruction of public school high school students who are earning credit toward high school graduation under the dual enrollment program as provided in section 1011.62(l)(i), Florida Statutes
- (j) The Teacher Salary Allocation is provided pursuant to Specific Appropriation 87, Chapter 2013-40, Laws of Florida, and Section 26 of Chapter 2013-45, Laws of Florida.

Administrative fees charged by the school district shall be calculated based upon 5 percent of available funds from the FEFP and categorical funding for which charter students may be eligible. For charter schools with a population of 251 or more students the difference in the fee calculation and the fee withheld may only be used for capital outlay purposes specified in Section 1013.62(2) F.S. To calculate the administrative fee to be withheld for schools with more than 250 students, divide the school population into 250. Multiply that fraction times the funds available, then times 5%.

For high performing charter schools, administrative fees charged by the school district shall be calculated based upon 2 percent of available funds from the FEFP and categorical funding for which charter students may be eligible. For charter schools with a population of 251 or more students the difference in the fee calculation and the fee withheld may only be used for capital outlay purposes specified in Section 1013.62(2) F.S. To calculate the administrative fee to be withheld for schools with more than 250 students, divide the school population into 250. Multiply that fraction times the funds available, then times 2 percent.

FEFP and categorical funding are recalculated during the year to reflect the revised number of full-time equivalent students reported during the survey periods designated by the Commissioner of Education.

Revenue Estimate Worksheet for SLAM Middle - Broward Based on the First Calculation of the FEFP 2013-14

School District: Broward

1. 2013-14 FEFP State and Local Funding

	Base Student Allocation	\$3,752.30	District Cost Differential:	1.0235
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			Weighted	2013-14 Base
		Program	FTE	Funding WFTE x
Program	Number of FTE	Cost Factor	(b) x (c)	BSA x DCD
(a)	(b)	(c)	(d)	(e)
101 Basic K-3	0.00	1.125	0.0000	\$ -
111 Basic K-3 with ESE Services	0.00	1.125	0.0000	\$ -
102 Basic 4-8	493.00	1.000	493.0000	\$ 1,893,356
112 Basic 4-8 with ESE Services	87.00	1.000	87.0000	\$ 334,122
103 Basic 9-12	0.00	1.011	0.0000	\$ -
113 Basic 9-12 with ESE Services	0.00	1.011	0.0000	\$ -
254 ESE Level 4 (Grade Level PK-3)		3.558	0.0000	\$ -
254 ESE Level 4 (Grade Level 4-8)		3.558	0.0000	\$ -
254 ESE Level 4 (Grade Level 9-12)		3.558	0.0000	\$ -
255 ESE Level 5 (Grade Level PK-3)		5.089	0.0000	\$ -
255 ESE Level 5 (Grade Level 4-8)		5.089	0.0000	\$ -
255 ESE Level 5 (Grade Level 9-12)		5.089	0.0000	\$ -
130 ESOL (Grade Level PK-3)	0.00	1.145	0.0000	\$ -
130 ESOL (Grade Level 4-8)	145.00	1.145	166.0250	\$ 637,616
130 ESOL (Grade Level 9-12)	0.00	1.145	0.0000	\$ -
300 Career Education (Grades 9-12)		1.011	0.0000	\$ -
Totals	725.00		746.0250	\$ 2,865,094

2. ESE Guaranteed Allocation:	FTE	Creade Level	Matrix Level		arantee Student	
2. ESE Guaranteed Anocation:		Grade Level	Level	rei		
Additional Funding from the	0.00	PK-3	251	\$	1,058	\$ -
ESE Guaranteed Allocation.		PK-3	252	\$	3,418	\$ -
Enter the FTE from 111,112, &		PK-3	253	\$	6,974	\$ -
113 by grade and matrix level.	87.00	4-8	251	\$	1,187	\$ 103,269
Students who do not have a		4-8	252	\$	3,546	\$ -
matrix level should be		4-8	253	\$	7,102	\$ -
considered 251. This total	0.00	9-12	251	\$	845	\$ -
should equal all FTE from		9-12	252	\$	3.204	\$ _

 programs 111, 112 & 113 above.
 9-12
 253
 \$ 6,760
 \$

 Total FTE with ESE Services
 87.00
 Total from ESE Guarantee
 \$ 103,269

3. Supplemental Academic Instruction:

4. Reading Allocation:

Charter Schools should contact their school district sponsor regarding eligibility and distribution of reading allocation funds.

Total Base Funding	, ESE Guarantee, and SAI	\$ 3,117,713

5. Class size Reduction Funds:

	Weighted FTE (From Section 1)	X <u>D</u>	<u>CD</u>	X Allocation factors	1		
PK - 3	0.0000	1.0	0235	1320.15	=	0	
4-8	746.0250	1.0	0235	900.48	=	687,567	
9-12	0.0000	1.0	0235	902.65	=	0	
Total *	746.0250			Total Class Si	ize Red	uction Funds	\$ 687,567

 $(*Total\ FTE\ should\ equal\ total\ in\ Section\ 1,\ column\ (d).)$

6A. Divide school's Weighted FTE (WFTE) to in (d) above: to obtain school's WFTE share	746.0250	by distr	ict's WFTE:	280,2	1 <u>3.62</u> 0.2662%		
6B. Divide school's Unweighted FTE (UFTE) total computed						
in (b) above:	725.00		ict's UFTE:	257,6	<u>37.67</u>		
to obtain school's UFTE share					0.2814%		
	Letters Refe	er to Notes	At Bottom:				
7. Other FEFP (WFTE share)		(a)	6,135,390	x	0.2662%	\$	16,332
Applicable to all Charter Schools:		' -					
Declining Enrollment	0						
Sparsity Supplement	0						
Program Related Requirements: Safe Schools	6,135,390						
Lab School Discretionary	0,133,370						
8. Discretionary Local Effort (WFTE share)		(d)	98,260,848	x	0.2662%	\$	261,570
9. Discretionary Millage Compression Alloca	ntion	_			•		
.748 mills (UFTE share)		(b)	0	x	0.2814%	\$	-
10. Proration to Funds Available (WFTE sha	are)	(a)	0	X	0.2662%	\$	-
11. Discretionary Lottery (WFTE share)		(a)	0	X	0.2662%	\$	-
12. Instructional Materials Allocation (UFT)	E share)	(b)	19,884,665	X	0.2814%	\$	55,955
Dual Enrollment Instructional Mater	ials Allocation (S	See footno	te i below)				
13. Student Transportation		(e)					
Ente	r All Riders	_	56.10	x	347	\$	19,467
Ente	er ESE Student F	Riders		X	1,332	\$	
14. Teacher Salary Allocation (WFTE share)	(j) _	46,981,326	X	0.2662%	\$	125,064
15. Florida Teachers Lead Program Stipend							
16. Food Service Allocation		(g)			•		
17. Performance Pay Plan							
					Total	\$	4,283,668
						<u> </u>	-,,
18. Funding for the purpose of calculating the	e administrative	fee for ES	E Charters.		(h)		
If you have more than a 75% ESE stude	nt population pl	ease place	a 1 in the follow	ving box:		\$	-
			Averso	Revenue	per Student:	\$	5,909
			Revenue Increa		•	Ψ	,
					revious Year e Per Student	¢	1% 6,027.27
			Aujustet	. ACTUR	c i ci studelli	Ψ	0,047.47

NOTES:

- (a) District allocations multiplied by percentage from item 6A.
- (b) District allocations multiplied by percentage from item 6B.
- (d) Proceeds of 0.748 millage levy (s. 1011.71(3)(b), Florida Statutes) multiplied by percentage from item 6A.
- (e) Consistent with Section 1006.21, Florida Statutes and DOE Student Transportation General Instructions. Numbers entered here will be multiplied by the district level transportation funding per rider. "All Riders" should include both basic and ESE Riders. "ESE Student Riders" should include only ESE Riders.
- (f) Teacher Lead Program Allocation per Section 1012.71, Florida Statutes
- (g) Funding based on student eligibility and meals provided, if participating in the National School Lunch Program.
- (h) Consistent with Section 1002.33(20)(a), Florida Statutes, for charter schools with a population of 75% or more ESE students, the administrative fee shall be calculated based on unweighted full-time equivalent students.
- (i) As provided in the 2013 General Appropriations Act, school districts are required to pay for instructional materials used for the instruction of public school high school students who are earning credit toward high school graduation under the dual enrollment program as provided in section 1011.62(l)(i), Florida Statutes
- (j) The Teacher Salary Allocation is provided pursuant to Specific Appropriation 87, Chapter 2013-40, Laws of Florida, and Section 26 of Chapter 2013-45, Laws of Florida.

Administrative fees charged by the school district shall be calculated based upon 5 percent of available funds from the FEFP and categorical funding for which charter students may be eligible. For charter schools with a population of 251 or more students the difference in the fee calculation and the fee withheld may only be used for capital outlay purposes specified in Section 1013.62(2) F.S. To calculate the administrative fee to be withheld for schools with more than 250 students, divide the school population into 250. Multiply that fraction times the funds available, then times 5%.

For high performing charter schools, administrative fees charged by the school district shall be calculated based upon 2 percent of available funds from the FEFP and categorical funding for which charter students may be eligible. For charter schools with a population of 251 or more students the difference in the fee calculation and the fee withheld may only be used for capital outlay purposes specified in Section 1013.62(2) F.S. To calculate the administrative fee to be withheld for schools with more than 250 students, divide the school population into 250. Multiply that fraction times the funds available, then times 2 percent.

FEFP and categorical funding are recalculated during the year to reflect the revised number of full-time equivalent students reported during the survey periods designated by the Commissioner of Education.

Revenue Estimate Worksheet for SLAM Middle - Broward Based on the First Calculation of the FEFP 2013-14

School District: Broward

1. 2013-14 FEFP State and Local Funding

Base Student Allocation	\$3,752.30	District Cost Differential:	1.0235

		_	Weighted	2013-14 Base
D.	N. I OFFI	Program	FTE	Funding WFTE x
Program	Number of FTE	Cost Factor	(b) x (c)	BSA x DCD
(a)	(b)	(c)	(d)	(e)
101 Basic K-3	0.00	1.125	0.0000	\$ -
111 Basic K-3 with ESE Services	0.00	1.125	0.0000	\$ -
102 Basic 4-8	510.00	1.000	510.0000	\$ 1,958,644
112 Basic 4-8 with ESE Services	90.00	1.000	90.0000	\$ 345,643
103 Basic 9-12	0.00	1.011	0.0000	\$ -
113 Basic 9-12 with ESE Services	0.00	1.011	0.0000	\$ -
254 ESE Level 4 (Grade Level PK-3)		3.558	0.0000	\$ -
254 ESE Level 4 (Grade Level 4-8)		3.558	0.0000	\$ -
254 ESE Level 4 (Grade Level 9-12)		3.558	0.0000	\$ -
255 ESE Level 5 (Grade Level PK-3)		5.089	0.0000	\$ -
255 ESE Level 5 (Grade Level 4-8)		5.089	0.0000	\$ -
255 ESE Level 5 (Grade Level 9-12)		5.089	0.0000	\$ -
130 ESOL (Grade Level PK-3)	0.00	1.145	0.0000	\$ -
130 ESOL (Grade Level 4-8)	150.00	1.145	171.7500	\$ 659,602
130 ESOL (Grade Level 9-12)	0.00	1.145	0.0000	\$ -
300 Career Education (Grades 9-12)		1.011	0.0000	\$ -
Totals	750.00		771.7500	\$ 2,963,889

			Matrix	Gu	arantee		
2. ESE Guaranteed Allocation:	FTE	Grade Level	Level	Per	Student	_	
Additional Funding from the	0.00	PK-3	251	\$	1,058	\$	-
ESE Guaranteed Allocation.		PK-3	252	\$	3,418	\$	-
Enter the FTE from 111,112, &		PK-3	253	\$	6,974	\$	-
113 by grade and matrix level.	90.00	4-8	251	\$	1,187	\$	106,830
Students who do not have a		4-8	252	\$	3,546	\$	-
matrix level should be		4-8	253	\$	7,102	\$	-
considered 251. This total	0.00	9-12	251	\$	845	\$	-
should equal all FTE from		9-12	252	\$	3,204	\$	-
programs 111, 112 & 113 above.		9-12	253	\$	6,760	\$	-
				_			

3. Supplemental Academic Instruction:

District SAI Allocation	#######################################		Per S	Student
divided by district FTE	257,637.67	\$ 206	\$	154,500
(with eligible services)				

4. Reading Allocation:

Charter Schools should contact their school district sponsor regarding eligibility and distribution of reading allocation funds.

Total Base Funding	ESE Guarantee, and SAL 5	3.225.219

Total from ESE Guarantee \$

5. Class size Reduction Funds:

	Weighted FTE (From Section 1)	X <u>DCD</u>	X Allocation factors			
PK - 3	0.0000	1.0235	1320.15	=	0	
4-8	771.7500	1.0235	900.48	=	711,277	
9-12	0.0000	1.0235	902.65	=	0	
Total *	771.7500		Total Class Siz	ze Re	duction Funds	\$ 711,277

 $(*Total\ FTE\ should\ equal\ total\ in\ Section\ 1,\ column\ (d).)$

Total FTE with ESE Services 90.00

6A. Divide school's Weighted FTE (WFTE) t in (d) above: to obtain school's WFTE share	771.7500	by distr	ict's WFTE:	280,2	13.62 0.2754%	ı	
6B. Divide school's Unweighted FTE (UFTE)	total computed						
in (b) above:	750.00	by distr	ict's UFTE:	<u>257,6</u>			
to obtain school's UFTE share	•				0.2911%	1	
	Letters Refe					_	
7. Other FEFP (WFTE share)		(a) _	6,135,390	X	0.2754%	\$	16,897
Applicable to all Charter Schools: Declining Enrollment	0						
Sparsity Supplement	0						
Program Related Requirements:	v						
Safe Schools	6,135,390						
Lab School Discretionary	0						
8. Discretionary Local Effort (WFTE share)		(d)	98,260,848	x	0.2754%	\$	270,610
9. Discretionary Millage Compression Alloca	ition						
.748 mills (UFTE share)		(b) _	0	X	0.2911%		-
10. Proration to Funds Available (WFTE sha	ire)	(a) _	0	X	0.2754%	\$	-
11. Discretionary Lottery (WFTE share)		(a)	0	X	0.2754%	\$	-
12. Instructional Materials Allocation (UFTI Dual Enrollment Instructional Materials	*	(b) See footnot	19,884,665	X	0.2911%	\$	57,884
13. Student Transportation	aus miocation (S	(e)	<i>'</i>		•		
-	r All Riders	(6)	56.10	X	347	¢	19,467
	r ESE Student F	_ Didone	30.10		•		19,407
Ente	r ESE Student B	duers _		X	1,332	Þ	<u>-</u>
14. Teacher Salary Allocation (WFTE share))	(j) _	46,981,326	X	0.2754%	\$	129,387
15. Florida Teachers Lead Program Stipend							
16. Food Service Allocation		(g)					
17. Performance Pay Plan							
					Total	¢	4 420 741
					Total	Þ	4,430,741
18. Funding for the purpose of calculating the	e administrative	fee for ES	E Charters.		(h)		
If you have more than a 75% ESE stude				ving box:		\$	-
	Fobamon bu	- Pauce				7	
			Average	Revenue	per Student:	\$	5,908
			Revenue Increa		•	Ψ	1%
						¢	
			Aajustee	ı Kevenu	e Per Student	Þ	6,086.66

NOTES:

- (a) District allocations multiplied by percentage from item 6A.
- (b) District allocations multiplied by percentage from item 6B.
- (d) Proceeds of 0.748 millage levy (s. 1011.71(3)(b), Florida Statutes) multiplied by percentage from item 6A.
- (e) Consistent with Section 1006.21, Florida Statutes and DOE Student Transportation General Instructions. Numbers entered here will be multiplied by the district level transportation funding per rider. "All Riders" should include both basic and ESE Riders. "ESE Student Riders" should include only ESE Riders.
- (f) Teacher Lead Program Allocation per Section 1012.71, Florida Statutes
- (g) Funding based on student eligibility and meals provided, if participating in the National School Lunch Program.
- (h) Consistent with Section 1002.33(20)(a), Florida Statutes, for charter schools with a population of 75% or more ESE students, the administrative fee shall be calculated based on unweighted full-time equivalent students.
- (i) As provided in the 2013 General Appropriations Act, school districts are required to pay for instructional materials used for the instruction of public school high school students who are earning credit toward high school graduation under the dual enrollment program as provided in section 1011.62(l)(i), Florida Statutes
- (j) The Teacher Salary Allocation is provided pursuant to Specific Appropriation 87, Chapter 2013-40, Laws of Florida, and Section 26 of Chapter 2013-45, Laws of Florida.

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For high performing charter schools, administrative fees charged by the school district shall be calculated based upon 2 percent of available funds from the FEFP and categorical funding for which charter students may be eligible. For charter schools with a population of 251 or more students the difference in the fee calculation and the fee withheld may only be used for capital outlay purposes specified in Section 1013.62(2) F.S. To calculate the administrative fee to be withheld for schools with more than 250 students, divide the school population into 250. Multiply that fraction times the funds available, then times 2 percent.

FEFP and categorical funding are recalculated during the year to reflect the revised number of full-time equivalent students reported during the survey periods designated by the Commissioner of Education.

Revenue Estimate Worksheet for SLAM Middle - Broward Based on the First Calculation of the FEFP 2013-14

School District: Broward

1. 2013-14 FEFP State and Local Funding

	Base Student Allocation	\$3,752.30	District Cost Differential:	1.0235
--	-------------------------	------------	-----------------------------	--------

			Weighted	2013-14 Base
		Program	FTE	Funding WFTE x
Program	Number of FTE	Cost Factor	(b) x (c)	BSA x DCD
(a)	(b)	(c)	(d)	(e)
101 Basic K-3	0.00	1.125	0.0000	\$ -
111 Basic K-3 with ESE Services	0.00	1.125	0.0000	\$ -
102 Basic 4-8	510.00	1.000	510.0000	\$ 1,958,644
112 Basic 4-8 with ESE Services	90.00	1.000	90.0000	\$ 345,643
103 Basic 9-12	0.00	1.011	0.0000	\$ -
113 Basic 9-12 with ESE Services	0.00	1.011	0.0000	\$ -
254 ESE Level 4 (Grade Level PK-3)		3.558	0.0000	\$ -
254 ESE Level 4 (Grade Level 4-8)		3.558	0.0000	\$ -
254 ESE Level 4 (Grade Level 9-12)		3.558	0.0000	\$ -
255 ESE Level 5 (Grade Level PK-3)		5.089	0.0000	\$ -
255 ESE Level 5 (Grade Level 4-8)		5.089	0.0000	\$ -
255 ESE Level 5 (Grade Level 9-12)		5.089	0.0000	\$ -
130 ESOL (Grade Level PK-3)	0.00	1.145	0.0000	\$ -
130 ESOL (Grade Level 4-8)	150.00	1.145	171.7500	\$ 659,602
130 ESOL (Grade Level 9-12)	0.00	1.145	0.0000	\$ -
300 Career Education (Grades 9-12)		1.011	0.0000	\$ -
Totals	750.00		771.7500	\$ 2,963,889

2. ESE Guaranteed Allocation:	FTE	Grade Level	Level	Per	Student	
Additional Funding from the	0.00	PK-3	251	\$	1,058	\$ -
ESE Guaranteed Allocation.		PK-3	252	\$	3,418	\$ -
Enter the FTE from 111,112, &		PK-3	253	\$	6,974	\$ -
113 by grade and matrix level.	90.00	4-8	251	\$	1,187	\$ 106,8
Students who do not have a		4-8	252	\$	3,546	\$ -
matrix level should be		4-8	253	\$	7,102	\$ -

0.00 considered 251. This total 9-12 251 845 \$ should equal all FTE from 3,204 9-12 252 \$ \$ programs 111, 112 & 113 above. 9-12 253 6,760 \$ **Total FTE with ESE Services** 90.00 **Total from ESE Guarantee \$** 106,830

3. Supplemental Academic Instruction:

4. Reading Allocation:

Charter Schools should contact their school district sponsor regarding eligibility and distribution of reading allocation funds.

Total Base Funding,	ESE Guarantee, and S	AI \$	3,225,219

Matrix

Guarantee

5. Class size Reduction Funds:

PK - 3	Weighted FTE (From Section 1) 0.0000	21	DCD 1.0235	X Allocation factor 1320.15	<u>=</u>	0	
1 K - 3	0.0000		1.0233	1320.13	_		
4-8	771.7500		1.0235	900.48	=	711,277	
9-12	0.0000	_	1.0235	902.65	=	0	
Total *	771.7500			Total Class Size Reduction Funds			\$ 711,277

 $(*Total\ FTE\ should\ equal\ total\ in\ Section\ 1,\ column\ (d).)$

6A. Divide school's Weighted FTE (WFTE) t in (d) above: to obtain school's WFTE share	771.7500	by distr	ict's WFTE:	280,2	1 <u>3.62</u> 0.2754%		
6B. Divide school's Unweighted FTE (UFTE)	total computed						
in (b) above:	750.00		ict's UFTE:	257,6	<u>37.67</u>		
to obtain school's UFTE share	•	_			0.2911%		
	Letters Refe	er to Notes	At Bottom:				
7. Other FEFP (WFTE share)		(a)	6,135,390	x	0.2754%	\$	16,897
Applicable to all Charter Schools:		· -					
Declining Enrollment	0						
Sparsity Supplement	0						
Program Related Requirements: Safe Schools	6,135,390						
Lab School Discretionary	0,135,550						
8. Discretionary Local Effort (WFTE share)		(d)	98,260,848	X	0.2754%	\$	270,610
9. Discretionary Millage Compression Alloca	ition	_			•		
.748 mills (UFTE share)		(b)	0	X	0.2911%	\$	-
10. Proration to Funds Available (WFTE sha	are)	(a)	0	X	0.2754%	\$	-
11. Discretionary Lottery (WFTE share)		(a)	0	X	0.2754%	\$	-
12. Instructional Materials Allocation (UFTE share)		(b)	19,884,665	X	0.2911%	\$	57,884
Dual Enrollment Instructional Materi	ials Allocation (S	see footno	te i below)				
13. Student Transportation		(e)					
Ente	r All Riders	_	56.10	x	347	\$	19,467
Ente	r ESE Student F	Riders		X	1,332	\$	-
14. Teacher Salary Allocation (WFTE share))	(j)	46,981,326	X	0.2754%	\$	129,387
15. Florida Teachers Lead Program Stipend							
16. Food Service Allocation		(g)			•		
17. Performance Pay Plan							
					Total	\$	4,430,741
					10441	Ψ	1,100,711
18. Funding for the purpose of calculating the	e administrative	fee for ES	E Charters.		(h)		
If you have more than a 75% ESE stude	nt population ple	ease place	a 1 in the follow	ving box:		\$	-
			Avaraga	Pavanua	ner Studente	¢	5,908
	Average Revenue per Student:				•	ψ	
Revenue Increase from Previous Year				_	1%		
			Adjusted	l Revenu	e Per Student	\$	6,147.53

NOTES:

- (a) District allocations multiplied by percentage from item 6A.
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SPORTS LEADERSHIP AND MANAGEMENT (SLAM) RESOURCE MANUAL

Resources for Thematic Lessons in Core Content Areas

The Connection



History

BASEBALL, RACE AND ETHNICITY

Lesson Overview

Students use primary sources focused on baseball to explore the American experience regarding race and ethnicity.

Objectives

Students will:

- · analyze historical images;
- · create an original argument using primary sources;
- pose historical questions after analyzing and reflecting on primary sources;
- employ search strategies to obtain primary historical data from targeted collections of sources;
- place the developments of race and ethnicity in America in historical context.

Time Required

Five classes

Topic

- Sports, Recreation & Leisure
- Immigration & Ethnic Heritage

Era

- Progressive Era to New Era, 1900-1929
- Rise of Industrial America, 1876-1900

Credits

Jennifer Schwelik & Greg Deegan

Lesson Preparation

- · Review lesson.
- Review information on <u>Using Primary Sources in the Classroom</u>.
- Learn how to search American Memory.
- · Learn Technical Information, such as how to save, and bookmark American Memory materials.
- Review Citing Electronic Resources.
- · Reserve Internet-accessible computers for student use.
- · Reserve books from school and local libraries.

Resources

- The African-American Experience in Ohio: Selections from the Ohio Historical Society
- America from the Great Depression to World War II: Black and White Photographs from the FSA and OWI, ca. 1935-1945
- American Life Histories: Manuscripts from the Federal Writers' Project, 1936 1940
- Baseball Cards, 1887-1914
- By Popular Demand: Jackie Robinson and Other Baseball Highlights, 1860s-1960s



History of the American West, 1860-1920: Photographs from the Collection of the Denver Public Library

Colonial Baseball Poem and Drawing from exhibit John Bull & Uncle Sam

Lesson Procedure

Activity One: Introduction

- Demonstrate to students how one can study U.S. history and culture by examining the topic of baseball. Show selected
 items from "Baseball: Across a Divided Society" Primary Source Set. Introduce the timeline Baseball, the Color
 Line, and <u>Jackie Robinson</u> as appropriate.
- Provide students with enough time to carefully observe the images and reflect on the comments. You may wish to let them take 5-10 minutes to write down their impressions in a journal.
- · Discuss the students' observations of the images.
- Explain the objectives of the lesson to the students. Emphasize that the heart of the lesson is observation, analysis, and evaluation of primary sources.
- · Have students review this primary document image of baseball.

Colonial Baseball Poem and Drawing

• Have students share their observations about these images with a partner, answering the following questions:

What do you see?

What does this primary source tell you about baseball in early America?

What do the sources tell you about U.S. culture at the time the image was made?

Why do you think this way about early baseball and U.S. culture?

 Explain that the students will trace the development of Americans' ideas about race and ethnicity through the history of baseball.

Activity Two: Research

- Divide students into five groups based on the following time periods: 1860-1879, 1880-1899, 1900-1919, 1920-1939, and 1940-1959.
- Briefly introduce students to the following American Memory collections:

The African-American Experience in Ohio: Selections from the Ohio Historical Society

Baseball Cards, 1887-1914

By Popular Demand: Jackie Robinson and Other Baseball Highlights, 1860s-1960s

History of the American West, 1860-1920: Photographs from the Collection of the Denver

Public Library

• Demonstrate how to search American Memory:

Review the list of search terms as needed.

Review the rules for Citing Electronic Sources.

- Have students spend some time browsing the collections to get a feel for the sources available. They should be directed to
 consider specific words, including words that may not be in use anymore, that would be helpful in retrieving
 appropriate source material.
- Have each student search the digital collections to find one image and one textual document from the time period
 assigned to his or her group. Strongly encourage students not to choose the first sources they come across in their
 search. The image and text selected should capture the developments, trends, or patterns of race or ethnicity during
 the assigned time period, as seen through the lens of baseball.



Roundtable Discussion

- Once each student has selected his or her primary image and textual document, bring students together for discussion in
 groups. The outcome of the discussion will be the selection of one primary image and one primary document that
 best captures the developments, trends, or patterns of race or ethnicity during their time period.
- Assign each group member a particular task in the discussion. Emphasize that all members are responsible for
 contributing to the discussion. Be sure that the students understand that they will be required to evaluate the quality
 of their discussion. Assign these roles to group members:

Researcher	Discussion Leader	Recorder
You must identify and		
explain important events,	You must keep the discussion on track and	You must take notes and try to capture the
people, and patterns during	focused.	group's discussion.
this time period.	You must ensure that all members' ideas are	Focus on why group members selected the
You may reference your	shared.	sources that best represent the changes or
notes, your text, or American	Remember that you are trying to characterize	challenges of race and ethnicity during your
Memory collections.	or capture the developments regarding race	time period.
Ultimately, your job is to set	and ethnicity in America during this time	Include comments from each member including
the historical context for the	period.	yourself.
discussion.		

Examine the primary sources (images and documents) selected by your group. List ideas from the sources that provide insight on how they reflect American attitudes regarding race.

Decide which **one** image and **one** textual document **best** capture your era.

Final Product

- 1. Student groups create a newspaper page that contains the following elements:
- a creative newspaper title;
- the group's time period;
- a visual image from their time period;
- a textual document from their time period;
- an editorial analyzing how Americans' ideas about race and ethnicity are illustrated in the group's baseball sources; and
- proper citation of the sources used.
- 2. You may wish to engage the whole class in a discussion at the end of the unit. For example, the class may identify trends or patterns regarding race and ethnicity that emerged during the unit activity. They may discuss further what the history of baseball suggests about the history of the United States.

Extension

The unit may be extended by further reading, writing, and research on the topics of race and ethnicity and the history of baseball, such as the following.

Writing

- 1. Provide students with an opportunity to react to this statement made by Jackie Robinson: "I'm not concerned with your liking or disliking me... All I ask is that you respect me as a human being."
- 2. Have students write an essay addressing the following questions:
- How can you relate this quote to the current debate about Native American sports mascots?
- What role does *respect* play in the discussion between those who seek to get rid of Native American mascots and names and those who seek to keep them?
- What does the debate reveal about American culture today? How "far" have we come since Jackie Robinson



spoke these words?

Research

Students may research the history of minorities in baseball, focusing on one of the following topics:

- 1. Have students research minorities in administrative positions in baseball since the 1970s. For example, students might examine the careers of Frank Robinson or Henry Aaron, both important African-American pioneers in baseball management. Students should address the following questions:
- What trends do you perceive?
- Why are more Hispanic, Latino, and Asian players becoming a part of major league rosters?
- What does this trend portend for the future?

Have students research the increasing diversity of major league players since the 1970s.

Lesson Evaluation

Evaluate student participation, interim and final products according to the criteria you establish. Points to consider might include:

Information

- · How clearly did you express your understanding of the sources?
- How effectively did you relate your ideas to the context of the time period?
- Were you able refer to specific people, events, policies, or patterns?

Page Craftsmanship and Organization

- Was the paper engaging and informative?
- · Were the sources powerful and interesting?

Editorial

- Did the editorial refer to and demonstrate knowledge of the time period?
- Was the information accurate and/or valid?

Bibliography

Was there a bibliography with sources, authors, publisher, date, and location?

Source: Library of Congress

http://www.loc.gov/teachers/classroommaterials/lessons/bases/

RECREATION YESTERDAY AND TODAY



Lesson Overview

Students research entertainment and recreation in the early 20th century using the American Memory collections. Students then compare the rural experience for this time period to the national experience and to their own experience. While this lesson is about recreational activities, it is also about being a teenager in the 1920s and 1930s.

Objectives

Students will:

- learn the difference between primary and secondary sources;
- understand and use research methodology, including online primary sources;
- identify key search terms and use synonyms in searching for other examples of recreation and entertainment in addition to those viewed in class; and

express ideas in writing

Time Required

Three to five classes

Topic

- · City & Regional History
- · Sports, Recreation & Leisure

Era

• Great Depression and WWII, 1929-1945

Credits

Dawn Jaeger & Marla Johnson

Lesson Preparation

Resources

- Washington As It Was: Photographs by Theodor Horydczak;
- Baseball Cards;
- Southern Mosiac: The John and Ruby Lomax 1939 Southern States Recording Trip;
- America from the Great Depression to World War II: Black and White Photographs from FSA/OWI 1935-1945;
- American Life Histories: Manuscripts from the Federal Writer's Project, 1936-1940;
- <u>The Northern Great Plains, 1880-1920:</u> Photographs from the Fred Hultstrand and F.A. Pazandak Photograph Collections;
- Buckaroos in Paradise: Ranching Culture in Northern Nevada.

Entertainment and Recreation Gallery

Lesson Procedure

Day One

Read definitions of primary and secondary sources in <u>Using Primary Sources</u> and discuss with students as necessary.

Optional: Introduce students to the strengths and limitations of the historical record.

· Assign students to work individually or in small groups. Alert students that they will share their activity responses with



the class.

- Ask students to think about all the activities they were involved in during the past 24 hours, and list as many of these
 activities as they can remember.
- · Have students write down what evidence, if any, each activity might have left behind.
- Direct students to review their lists, and then answer these questions:

Which of the daily activities were most likely to leave trace evidence behind?

What, if any, of that evidence might be preserved for the future? Why?

What might be left out of a historical record of these activities? Why?

What would a future historian be able to tell about your life and your society based on evidence of your daily activities that might be preserved for the future?

 Now think about a more public event currently happening (a court case, election, public controversy, law being debated), and answer these questions:

What kinds of evidence might this event leave behind?

Who records information about this event?

For what purpose are different records of this event made?

Based on this activity, students will write one sentence that describes how the historical record can be huge and limited at
the same time. As time allows, discuss as the strengths and limitations of the historical record.

Day Two

Students will view the Entertainment and Recreation Gallery and select or be assigned primary sources for further analysis. Students analyze the primary sources to learn more about recreation in the early 20th century. recording their thoughts on the Primary Source Analysis Tool. Before the students begin, select questions from the teacher's guide Analyzing Primary Sources to focus and prompt analysis.

Day Three

Students will form groups of two or three, and use the <u>resources</u> to find two photos to illustrate an example of the same types of recreation that they studied.

These photos will be reproduced and each group will present the photos and their analysis to the class. The photos may then be posted on the classroom bulletin boards to be viewed by the rest of the class.

Day Four

Following the presentations, the class will discuss similarities and differences in the conclusions reached by each of the groups about entertainment and recreation during the 1920s and 1930s, beginning with these questions:

- What similarities in activities from one section of the country to another did you notice as you looked at the pictures?
 What differences?
- What differences do you see between rural entertainment and urban entertainment?
- What differences do you see between your recreational activities and those you studied? Is this a matter of generation or
 is there a different factor such as rural/urban or region?

Extensions

- Students conduct oral histories with local people in order to test their conclusion about recreation and entertainment in their community.
- Use population density maps or settlement maps to hypothesize about a connection between distance and entertainment.
 Changes in transportation technology could also be brought into this discussion.



Lesson Evaluation

Evaluate completed homework according to your standard. Develop guidelines for evaluating the bulletin board displays and essays with your class as appropriate.

Source: Library of Congress

http://www.loc.gov/teachers/classroommaterials/lessons/recreation/evaluation.html

BASEBALL, RACE RELATIONS AND JACKIE ROBINSON

Lesson Overview

In this lesson students draw on their previous studies of American history and culture as they analyze primary sources from <u>Jackie Robinson and Other Baseball Highlights</u>, 1860s-1960s in American Memory. A close reading of two documents relating to Jackie Robinson's breaking of the racial barrier in professional baseball leads to a deeper exploration of racism in the United States, both in and out of sports.

Objectives

Students will:

- Analyze primary documents closely.
- · Research documents specific to the history of race relations in the mid-20th century United States.
- · Draw conclusions moving from the specific documents to the broader society and test them for validity.

Time Required

Two to three classes

Topic

- · African American History
- · Sports, Recreation & Leisure

Era

- · Great Depression and WWII, 1929-1945
- Postwar United States, 1945-present

Credits

Arnold Pulda

Lesson Preparation

Materials

The following materials will be used in this lesson.

Primary Source Analysis Tool

Resources

Jackie Robinson and Other Baseball Highlights, 1860s-1960s:



Letter from Jackie Robinson to Branch Rickey, 1950

Branch Rickey's Speech to the "100-Percent Wrong Club"

Special Presentation: Baseball, the Color Line, and Jackie Robinson

- <u>Using Primary Sources</u>
- Teacher's Guide: Analyzing Manuscripts
- Teacher's Guide: Analyzing Primary Sources

Lesson Procedure

Students will need to bring considerable knowledge to this lesson, including a basic understanding of race relations in the United States, as well as a more specific understanding of the history of race relations after the Civil War, in both the South and the North. For example, students must be familiar with the concept of "separate but equal" from their study of the Supreme Court case Plessy v. Ferguson, and with the struggle, during the twentieth century, to end segregation and achieve civil rights for African Americans. Students may be familiar with the role of white men within the sports community, both opposed to (Ty Cobb, Enos Slaughter) and supporting (Branch Rickey, Pee Wee Reese) the civil rights movement.

While research on these themes could consume an entire course, this lesson focuses narrowly on two documents, each worthy of close reading and analysis. Students will find in this exercise a wealth of ideas that will lead them to further research on the important, interesting, and relevant topic of the history of race relations in the United States. Other subthemes may occur to students, such as the place of sports in American life, and the conflict between urban and rural values in the United States (suggested by the location of ballparks in the center of busy cities.)

In addition to drawing on general background knowledge, students should be familiar with the information contained in the Special Presentation, <u>Baseball</u>, the Color Line, and Jackie Robinson.

- · Step One: Analysis of Jackie Robinson's Letter
- Step Two: Analysis of Branch Rickey's Speech
- Extension

Step One: Analysis of Jackie Robinson's Letter

Read definitions of primary and secondary sources in <u>Using Primary Sources</u> and discuss with students as necessary.

Students answer the following:

- What is the difference between a primary and a secondary source?
- · Give two familiar examples of each type of source.

Students read and analyze the letter, recording their thoughts on the <u>Primary Source Analysis Tool</u>. Before the students begin, select questions from the teacher's guide Analyzing Manuscripts to focus and prompt analysis and discussion.

- Students read the Special Presentation, Baseball, the Color Line, and Jackie Robinson
- Students read Jackie Robinson's 1950 letter to Branch Rickey, and then the transcription of the letter, if desired.
- Students may also answer the following questions, giving one-to-two sentence explanations of their answers.

In which form do you prefer reading the document? Is one form or the other more meaningful to you? Why?

Why do you think it was difficult for Robinson to write this letter to Rickey?

Why was Rickey's leaving Brooklyn harder on Robinson that on everyone else?

What did Robinson mean when he wrote "Baseball is like that"?

What "small part" did Robinson play in contributing to Rickey's success in Brooklyn?

In your opinion, to what "misunderstanding" was Robinson referring?



Step Two: Analysis of Branch Rickey's Speech

Students analyze the speech, recording their thoughts on the <u>Primary Source Analysis Tool</u>. Before the students begin, select questions from the teacher's guide <u>Analyzing Primary Sources</u> to focus and prompt analysis and discussion.

- 3. Students read Branch Rickey's speech to the "100-Percent Wrong Club."
- 4. Students analyze the speech, recording their thoughts on the <u>Primary Source Analysis Tool</u>. Before the students begin, select questions from the teacher's guide <u>Analyzing Primary Sources</u> to focus and prompt analysis and discussion.
- 5. Students may also answer the following questions:
- In the fourth paragraph of his speech, Rickey seems to be saying that he desired to bring a black player to the St. Louis ballclub. Why did this effort fail?
- According to Rickey, what were the four factors that were necessary for him to bring a black player to the major leagues successfully?
- Rickey stated that "the greatest danger, the greatest hazard, I felt was the negro race itself." What did he mean by that?
- Rickey stated that, according to the historian Frank Tannenbaum, four things were necessary for the acceptance of black players in baseball. What were those four factors?
- When Rickey stated, "I am completely color-blind," do you take him at his word?
- o Do you think that the following statement made by Branch Rickey was true in 1956? America is,--it's been proven Jackie,--is more interested in the grace of a man's swing, in the dexterity of his cutting a base, and his speed afoot, in his scientific body control, in his excellence as a competitor on the field,-- America, wide and broad, and in Atlanta, and in Georgia, will become instantly more interested in those marvelous, beautiful qualities than they are in the pigmentation of a man's skin.
- What did Rickey mean when he referred to "the last syllable in a man's name"?

Extension

Use the following topics for additional student research and reporting:

- 3. While serving in the Army during 1942, Jackie Robinson caused an incident when he refused to move to the back of a bus. Ask students to link the event to other protests, similar or dissimilar, individual or collective, black or white, and draw conclusions as to their effectiveness.
- 4. Branch Rickey's strategy in breaking the color line in baseball his been widely judged a success. To what extent is that judgment due to the fact that Robinson proved to be a marvelous ballplayer? What might have happened had Robinson performed poorly on the field?
- 5. After his retirement from baseball, Robinson expressed his disillusionment with certain matters. What was the cause of his disillusionment? Did he have good reason to be disappointed?

Lesson Evaluation

This lesson is intended to be part of a larger unit of study. Teachers may use traditional assessment tools to measure students' understanding of this unit with a test after the unit's completion. Teachers may also require a demonstration of students' findings, such as a thematic presentation or slide show using tools available to them in the school computer lab or at home.

Source: Library of Congress

http://www.loc.gov/teachers/classroommaterials/lessons/robinson/evaluation.html



ELA- Reading Material and Multimedia

Concussion crisis growing in girls' soccer

By Kate Snow, Sarah Koch, Deirdre Cohen and Jessica Hopper

Rock Center

Fifteen-year-old Allison Kasacavage, once a rising soccer star in Pennsylvania, is slowly recovering after suffering debilitating concussions while playing the game she loved.

"It's almost like I need a sign on my back saying, 'My head is broken.' And you can't see it. It's like not visible and it's like not many people understand, "said Allison in an interview with **Rock Center's Kate Snow**.

Allison, who lives with her family in Chester Springs, Pa., has had at least five concussions. She is only able to attend school four hours a day. Her room is lit with soft blue light to ease her headaches and her family now eats dinner by candlelight.

She is one of hundreds of girls across America each year who suffer concussions while playing soccer.

"People who think of concussions as only being present mostly in guys and mostly in the sport of football are just plain wrong," said **Dr. Bob Cantu**, who is chairman of the surgery division and the director of sports medicine at Emerson Hospital in Concord, Mass. "Soccer is right at the top of the list for girls."

With the steady popularity of youth soccer, more girls are playing the game than ever before. Girls make up 48 percent of the more than 3 million kids registered in US Youth Soccer leagues.

Cantu said that the country is in the midst of "a concussion crisis" and that **studies show** girls are reporting nearly twice as many concussions as boys in the sports they both play.

'Concussion Crisis' impacting girls' soccer

The number of girls suffering concussions in soccer accounts for the second largest amount of all concussions reported by young athletes, according to the **American Journal of Sports Medicine**. (Football tops the list.)

What's happening in this country is an epidemic of concussions, number one, and the realization that many of these individuals are going to go on to post-concussion syndrome, which can alter their ability to function at a high level for the rest of their lives," Dr. Cantu said.

Allison still remembers when she suffered her first serious concussion in October 2008. It came when she collided with another player on the field.

"When I like got up, my head was like pounding," Allison said. "There was, like, a pulse in my head. It was like the strangest thing. There was a heartbeat in my head and I had no idea what it was and why it was there. I have never felt that before and I was just so confused," she said.

Click here for more on concussion symptoms

After Allison had apparently healed from the concussion, she returned to soccer. She'd been a star player since she was six years old, working her way up to one of the top teams in Pennsylvania. She said that her identity had been wrapped up in the game and she felt pressure to please her coaches.



Allison said that she was nervous about heading the ball, but continued to do it.

"If you didn't head the ball, you were like the weakest link," Allison said.

When heading, players attempt to use their foreheads to direct the ball, often jumping with opposing players, a move that can lead to collisions between players, bumped heads and strained necks. Dr. Cantu says that the act of heading is one of the most dangerous parts of soccer because players often collide.

Allison suffered a third concussion in her final season of soccer and another two off the field, the latter because her spatial awareness had been impacted from her previous concussions and she hit her head on a table and other furniture, her mother said.

Her parents said that they knew about the danger of concussions in sports like football, but it wasn't until Allison had her first serious head injury that they realized what a big problem concussions can be in soccer.

"I think that we were blind to what was going on around us because, yes, it was about the team. It was about the winning. It was about all the, it was almost like a routine of, like I said, an awful lot of practices and you just went through it and really your lives rolled by with soccer being the most important thing," said Lex Kasacavage, Allison's father.

Sports psychologist **Richard Ginsburg** says that enthusiasm for the game and the kids by parents and coaches, while well-meaning, might be making the concussion crisis worse.

"We get wrapped up," said Ginsburg, the author of 'Whose Game is it Anyway?' "We want success for them and so sometimes we get, we lose perspective. It doesn't make us terrible people. It just makes us human."

In Allison's town of Chester Springs, about 30 miles from downtown Philadelphia, she is not alone. She has bonded with at least five other 14 and 15-year-old girls who have suffered concussions while playing soccer.

"My main friends are actually people that have head injuries," said one of the teens, Kimmie Zeffert, 14. "I've become so close with them because I can relate to them. They understand what I'm going through."

Kimmie had her first concussion when she was 12.

"I took another head ball and then I don't even remember," she said. "The next thing is I got, apparently, got elbowed in the back of the head. But (when) the coach asked me if I wanted to come out, I was like, 'No, I'm going, I'm going to stick it through."

Those hits -- heading the ball and being elbowed by a player in the head -- ended her soccer career.

Kimmie's teammate Jenna Rohr made the same choice to continue playing in her game after getting hit in the head.

"I didn't want to quit," she said. "I didn't want to let my team down because, like, so many people already had concussions on the team."

Both Jenna and Kimmie have been unable to make it through a full day of school for almost two years. They still suffer from intense headaches, dizziness, nausea and vision problems.

Along with their **physical ailments**, several of the girls NBC News spoke to have struggled with depression since leaving soccer. Some have taken anti-depressants. One teen soccer player, who is returning to the sport after suffering a concussion, said that she felt so terrible at one point that she even thought about suicide.

Despite their experiences, the teens still love soccer and say they don't discourage their former teammates from the sport.

The SAME Connection

"I think like speaking for all of us, like we would do anything to just be able to play one more game," Jenna said.

Should heading be banned from girls' soccer?

Dr. Cantu has made the bold proposal that heading be eliminated from youth soccer under the age of 14. He said girls, because of their anatomy, may be especially vulnerable to concussions.

"Girls as a group have far weaker necks," Cantu said. "The same force delivered to a girl's head spins the head much more because of the weak neck than it does the guys."

New research suggests some body types may be more at risk than others.

"We believe that individuals with very long, thin necks may be at greater risk," Cantu said.

With this evidence, Cantu said, "I would hope it would not only make parents look at their daughters, but make every one of those parents insist their daughters are on a neck strengthening program if they're playing a collision sport."

Brandi Chastain, the Olympian who helped the United States win a World Cup, strongly disagrees with Cantu's proposal to eliminate heading from girls' soccer.

"It's a part of the game and I think it's an important part and I think it's a beautiful part of the game, to be honest with you," she said. "I would never want to see that go away, but there's a right way to do it. There's a protective way to do it."

Chastain said that girls need to be taught to create protective space around their bodies. She says heading isn't dangerous if it's done correctly.

"I circle back to education and preparation and I put that on parents and coaches because the kids don't know any better," Chastain added. "You know, they just want to go out there and play, but if we can educate them in a fun environment that's safe, that teaches them the skill and gives them the confidence to try it and then they can put it into practice in the game."

Back in Pennsylvania, the girls and their families are trying to educate people based on their own experiences. Despite their concussions, though, they say they don't want to discourage girls from playing soccer.

"Please don't go and not play soccer because it's such a great opportunity for the girls to just prove themselves and challenge themselves and make friends and travel," said Wendy Zeffert, mother of Kimmie. "But be aware."

Video and Source:

http://rockcenter.nbcnews.com/_news/2012/05/09/11604307-concussion-crisis-growing-in-girls-soccer?lite

Should youth football be banned?

By **Jim Roope**, CNN

(CNN) – The growing number of concussions in football has prompted a proposal to ban high school football in Dover, New Hampshire.

Dr. Paul Butler, a retired surgeon and **Dover school board**, member said he's concerned about the repeated head trauma, both detected and undetected, that some younger football players suffer.



[1:29] "Football is the only game we have right now, in my opinion, that uses the head as a battering ram repeatedly during a given game or a given practice session."

He said, since 2002, studies on the long-term effects of concussions suggest football is simply too violent a sport, especially for kids.

Would youth football survive a tackling ban?

Fifteen-year-old high school sophomore linebacker James Aguirre suffered a severe concussion during tackling drills last spring:

[1:01] "I was told that one eye was looking at one direction and the one was looking in another direction."

Concussions are plaguing the pros too. It's currently one of the most hotly-discussed topics in the NFL.

According to the **NFL Concussion Report**, operated by the independently-run "**Concussion Blog**," there have been 51 concussions so far in 2012's six-week-old NFL-season.

Video and Source: http://cnnradio.cnn.com/2012/10/15/should-youth-football-be-banned/

Strategies and Methods for Common Core Lesson Development

To develop a real understanding, students must encounter new vocabulary words at least six or seven times in different circumstances (Incidental vocabulary acquisition: The effects of task type, word occurrence and their combination, Batia Laufer, Language Teaching Research, 2011).

The following example techniques provide ways to use vocabulary terms in different learning situations.

- KWL Organizers
- Venn Diagrams
- Student Created Videos
- Hands-on, Minds-on Explorations
- Explaining Using Their Own Definitions
- Student Created Illustrations

Additional strategies include writing in math and writing in science. These two strategies involve students writing to incorporate vocabulary terms in a manner that helps them develop a better understanding of the concepts behind the words.

Two examples of graphic organizers you can use to help students learn science and math terms are:

Vocabulary

Concept or Definition Map – begin by placing a new vocabulary term in the center of a graphic organizer. For example thermal energy.

Then descriptive words associated with this term are placed in the concept definition map boxes surrounding the term. For example – heat, energy transformation, etc.

Vocabulary Concept Cards (VOC) – in this vocabulary building technique students write the term on one side of a VOC (4 x 6 index card). Then divide the other side of the index card into for quadrants.

The left-hand side quadrants are:

- What the word is using own words
- What the word is not using own words

The right-hand quadrants are:

- Examples (next to what the word is) using drawings, words, or sentence
- Definition (next to what the word is not) provided by textbook or teacher provided resource



Differentiated Instruction

Students in all science and math classroom have a wide range of learning abilities, presenting differentiation challenges. The following strategies are designed to help you address these everyday challenges.

Differentiate Vocabulary Lists – addresses the needs of all students. For example gifted and talented or advanced students, struggling students and students with learning disabilities.

Required vocabulary terms are divided into three sections.

- Basic science or math terms all students must know in a chapter.
- Enrichment vocabulary words for gifted and talented students who need the extra challenge
- Essential words for students struggling with concepts and students with learning disabilities must learn to remain on grade-level

List-Group-Label - a form of structured brainstorming designed to help all students identify what they know regarding a concept and terms related to that concept, while provoking a degree of analysis and critical thinking. Directions for students:

- Think of all the words related to _____. (a key "big idea" in the text)
- Group the words listed by some shared characteristics or commonalities.
- Select a label for each group.
- Try to add words to the categories on the organized lists.

ALGEBRA & VARIOUS DISCIPLIES IN MATHEMATICS

SPORTS + ALGEBRA= STATS!

Using algebraic equations can assist with interpreting athletic performance. I found that one algebra equation can be used for basically any sports!

$$A = \frac{T \times S + K}{T + N}$$

That equation is used to find batting averages.

If a batter goes into a game with a seasonal batting average of "S" after a total of "T" times at bat, and gets "K" hits in that game for "N" times at bat, the player's new batting average is determined by this equation.

Luckily, I found the same equation could be used for other sports statistics.

$$\mathbf{A} = \mathbf{SC} \times \mathbf{W} + \mathbf{\#Y}$$
$$\mathbf{SC} + \mathbf{C}$$

This equation will give you the total seasonal carries where:

"W" = player's average seasonal yards

"Y" = yards in that game

"C" = carries in that game.

Easy as pi.

If you don't believe me, let's do another example together.

LET'S GET STARTED!

THIS IS THE SAME EQUATION IN FOOTBALL TERMS:



A baller goes into a game with a seasonal free throw average of F after a total number T free throw shots, he scores M free throws in that game for N times at the foul line.

$A = \frac{T \times F + M}{T + N}$

Now you can use your new math skills to figure out stats for any sport.

Source: http://prezi.com/0deyazepamwt/sports-algebra-stats/

Maths, algebra and sport

There is lots of maths involved in sport, such as:

- · working out the scores
- · working out who wins and by how much
- · working out which team is where on the ladder
- · working out who are the best players, etc.

But did you know working out sports scores often involves using algebra?

In many ball sports like basketball, Australian Rules football and rugby there are different scores given for different results in the game:

- in basketball, you can get either 1, 2 or 3 points for each time the ball goes through the ring
- in Australian Rules football, you can get either 6 points or 1 point depending on where the ball goes between the goal posts
- in rugby you get different points for tries, field goals and conversions.

We are going to look at how you use algebra and formulas to work out the score in Australian Rules football.

Algebra in Aussie Rules football

In Australian Rules football, you get:

- · 6 points for each goal you kick
- 1 point for each behind you kick.

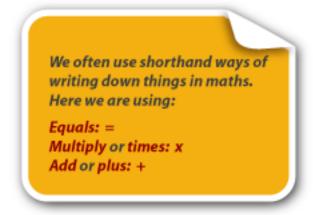
To work out how many points a team scores, you:

- multiply the number of goals by 6, and
- add on the number of behinds kicked.

This is an example where you use **algebra** or a **formula**. Most people can work this out in their heads, without realizing they are using algebra.



The start of writing a formula



How could you write this as a formula?

Here's how we might say this in words:

The score equals the number of goals multiplied by 6 and then add on the number of behinds kicked.

We can write this more simply using math symbols for multiplying (x) and adding (+):

Score = number of goals x 6 + number of behinds

So if Sydney kicks 10 goals and 12 behinds in a game, their final score would be:

 $Score = number \ of \ goals \ x \ 6 + number \ of \ behinds \ Score = 10 \ x \ 6 + 12 \ Score = 60 + 12 \ Score = 72 \ points$

So Sydney's score was 72 points.

The calculations of adding (+), subtracting (-), multiplying (x) and dividing (\div) are called

operations in mathematics.



Closer to a formula for football scores

The score (S), the number of goals (g) and the number of behinds (b) are called variables because they vary from game to game.

The letters that we use to stand for things (like S, g and b here) are called pronumerals in mathematics.

But we are even lazier than that in maths. We make it even shorter with no words - just all symbols. This makes it into a **formula**.

To do this we use symbols for all the things we are using here - the score in points, and the goals and behinds kicked.

We could use these symbols (but you can choose your own):

S = final score in points (or we could use**p**for points)

 \mathbf{g} = the number of goals kicked

 \mathbf{b} = the number of behinds kicked.

So we can write how we work out the score this way using these symbols:

Score = number of goals x 6 + number of behinds

$$S = g \qquad x 6 + b$$

So a formula for working out a football score is:

$$S = g \times 6 + b$$



One more step

But we are even lazier than that in maths. We take another step in how we write down algebra and formulas in mathematics.

When we multiply a number by a letter, like in g x 6 above, we shorten this to be simply 6g. It still means 6 lots of g or 6 multiplied by g. We normally put the number in front of the letter. So the formula S = g x 6 + b can be made shorter by writing:

$$S = 6g + b$$

This makes it into a formula.

So the mathematical formula for working out an Aussie Rules football score is:

$$S = 6g + b$$

Using the formula

When we put numbers into the formula to work out the answer, it is called substitution.

If Port Adelaide kicked 12 goals and 10 behinds, their final score would be:

$$S = 6g + b$$

$$= 6 \times 12 + 10$$

$$= 72 + 10$$

$$= 82 points$$

So Port Adelaide's score was equal to 82 points.

As this football example demonstrates you often don't realize that you are using a formula or algebra,

especially when you can work things out in your head.

Going further with scores

You could go further with using this formula for football scores.

Think about how you might work out these questions:



- If a team scored 100 points and kicked 14 goals, how many behinds did they kick?
- If a team scored 100 points and kicked 10 behinds, how many goals did they kick?
- How many ways could a team score 100 points if they kicked at least 12 goals?

Investigations

You could investigate the different scoring system used in the pre-season
 Australian Football League (AFL) competition where they have different scores, and write a formula for it.

You could investigate another sport like rugby or basketball and write a formula for its scoring system.

Incorporating Vocabulary- Language Arts

Math Definitions:

- Algebra: Algebra is a maths short-hand.
 - This shorthand is used to express rules and relationships, and to write and solve problems.
 - o It uses numbers and symbols or letter
 - The symbols or letters often stand for unknown values.
- Binomial: An expression which consists of two terms joined by + or
 - o For example: 4 + b, 7c a, $3x^2 + y^3$
- Expressions: The letters and numbers used in algebra are called terms.
 - o A collection of terms (when an equals sign is not used) is called an algebraic expression.
 - o It becomes an equation or formula when an equals sign (=) is used
- Variable: Variables are the quantities that vary and change in a formula.
 - They are usually represented by letters (called pronumerals)
 - Amount of money = m
 - Distance travelled = d
 - Volts = v
 - Hypotenuse = h

Source: http://www.mitac.org.au/algebra/content/01_introduction/01_algebrasport/001_algmathssport.htm



Teaching Mathematics and Statistics Using Tennis

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ABSTRACT: The widespread interest in sports in our culture provides a great opportunity to catch students' attention in mathematics and statistics classes. Many students whose eyes glaze over after few minutes of algebra will happily spend hours analyzing their favorite sport. As their teachers we may use this to enhance our teaching of mathematical and statistical concepts. Fortunately, many sports lend themselves to this. This article analyzes a tennis match with a view towards its use as an aid for teaching mathematical and statistical concepts. It shows that through sports students can be exposed to the basics of mathematical modeling and statistical reasoning using material that interests them. For those who plan to become mathematics teachers, in high school or college, it provides a source of material that could enrich their teaching. It has been my experience that using sports in the classroom increases students' interest in mathematics and statistics and the public's interest in university activities.

1. **INTRODUCTION**. The difficulties faced by educators teaching mathematics and statistics are well known. To help, many textbooks try to motivate students by introducing varied applications. This addresses both students' desire to see the relevance of their studies to the outside world and also their skepticism about whether mathematics and statistics have any value. This idea works mostly with students who are committed to a particular academic or career field. For typical students, applied examples may fail to motivate if they are not of immediate concern to them or they do not occur in their daily lives.

Fortunately, students have some common interests that we can build upon when teaching mathematics and statistics. Connecting their studies to something that interests or concerns them almost always works better. Unfortunately, it is not always easy to find something that will motivate the majority of students. I have tried several things and have concluded that games and sports are the best way to accomplish this. We can help students build their studies on a foundation, an understanding of a sport that they already possess. I think this is adaptable at all levels at which mathematics and statistics is taught, from junior high to graduate schools. In what follows we discuss other advantages of using sports.

General

- · Sports have a general appeal and scientific methods can be applied to them.
- · Sports are a part of everyday life, especially for young people.
- Students usually enjoy sports and show a great deal of interest in mathematics and statistics applied to them.
- · A major part of the calculus and statistics sequences offered at college level can be taught using a sport.
- Most students can relate to sports and can understand the rules and meanings of the statistics presented to them

Specific

Sports data offer a unique opportunity to test methodologies offered by mathematics and statistics. I believe it is hard to find an area other than sports where one could collect reliable data with the highest precision possible. In addition to the quality measurements, here we have access to the names, faces, and life history of the participants and their coaches, trainers, and everyone involved. Almost all other data producing disciplines are susceptible to "data manipulation and data mining" and error, since unlike sports, they are not watched by millions of fans and reported on in the media. A theoretical result can be tested only when data is reliable and satisfies the conditions under which it was developed. If the validity of data produced or collected by an individual or an organization cannot be confirmed, one may end up being suspicious of the results obtained and the methodology applied.



Consider, for example, track and field. The nature and general availability of track and field data have resulted in their extensive use by researchers, teachers, and sports enthusiasts. The data are unique in that they:

- (1) Possess a meaning that is apparent to most people.
- (2) Are collected under very constant and controlled conditions, and thus are very accurate and reliable.
- (3) Are recorded with great precision (e.g., to the hundredth of a second in races), and thus permit very fine differentiation of change or differences;
- (4) Are both longitudinal (100 years for men's records) and cross-sectional (over different distances and across gender).
- (5) Are publicly available at no cost. Thus, they provide wonderful data sets to test mathematical and statistical models of change.
- 2. **AN ILLUSTRATIVE EXAMPLE.** The focus of a lesson could be on a single concept based on examples from several different sports or on several different concepts based on a single sport. In this article we illustrate how a single sport, tennis, may be used to teach mathematical and statistical concepts.

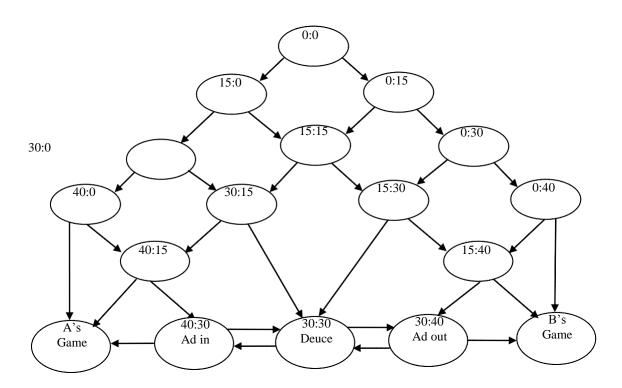
The Quirks of Scoring. During its early years, tennis used a variety of scoring systems. By the time of the first championship at Wimbledon in 1877, the All England Croquet Club had settled on a scoring system based on court tennis. This system remained unchanged until the introduction of tie-breakers in 1970.

One quirk of tennis scoring is that strange names are used for points in scoring a game: *love, fifteen, thirty, forty, game.* Although no one knows the origin of this odd system, it has been proposed that *fifteen, thirty, forty-five, sixty* were originally used to represent the four quarters of an hour. Over the years the score *forty-five* became abbreviated as *forty*. (In informal play, *fifteen* is sometimes abbreviated as *five*.) It would be simpler to score the game: *zero, one, two, three, and four*. However, the weird point names give no advantage to either player.

A more important quirk is that a game must be won by two points. If players each score three points, the score is called *deuce*, rather than 40:40. If the server wins the next point, the score becomes *advantage in*. If the server wins again, she wins the game, otherwise the score returns to *deuce*. If server loses the next point, the score becomes *advantage out*. If the server loses again, she loses the game, otherwise the score returns to *deuce*. This feature of tennis scoring increases the chance that the stronger player will win, as we shall see.



Consider a game of tennis between two players, A and B. The progression of the game can be used to teach many statistical concepts and critical thinking. Throughout, for any event E we use P(E) to denote the probability that E occurs.



1. Let

$$x = P (A \text{ wins a point})$$

 $y = 1 - x$ = P (B wins a point)

To simplify the modeling and analysis of the game we may first assume that x is fixed. Do you think this is a reasonable assumption?

 ${\it Objective:} \ \textbf{To teach critical and logical thinking versus practical significance.}$

2. Starting from 0:0 what are the possible outcomes after one exchange (one point), two exchanges, and so on?

Objective: To teach concepts such as sample space (universal set), events (sets) and their algebra.

3. How do you assign probabilities to the outcomes of the sample space after one exchange? The possible outcomes are: 0:15 and 15:0.

Objective: To teach concepts such as quantification of uncertainty, probability (classical, objective, and subjective), and odds.



4. Do you think winning a point will affect the probability of winning the next point?

Objective: To teach concepts such as conditional probability and independence.

5. Suppose that the answer to question 4 is no. Let x = 0.60. How do you find the probabilities such as P (15:15) or P (30:30) or P (40:15), etc.? How do you find these probabilities if the answer to question 4 is yes?

Objective: To teach combinations, multiplication rule, Bernoulli, Binomial and Poisson distributions.

- 6. Find (a) P (A wins the game without deuce),
 - (b) P (A wins the game after reaching deuce), (c) P (A wins the game).

Objective: To teach addition rule, infinite series, and geometric progression.

7. Find (a) P (A wins the set without tie-break), (b) P (A wins the set after a tie-break), (c) P (A wins the set).

Objective: To teach modeling and problem solving.

8. Find P (A wins the match).

Objective: To teach pattern identification and model building.

9. Find general formulas for probabilities in questions 6, 7 and 8.

Objective: To teach functions, graphs, and function of functions (composite functions).

10. Let e = x - y represent the edge in one point. For example, x = 0.51 means player A

has a 0.02 edge over player B in one point. Find edges in one game, one set, and the match. Hint: call the edge in one point Δx and edge in a game Δy .

Objective: To teach the derivative, chain rule, and differential equations.

11. Let r = x y. Since $0 \pounds x$, $y \pounds 1$ it follows that $0 \pounds r < Y$ and r = 1 for x = y = 0.5. Express the probabilities in question 9 in terms of r.

Objective: To teach transformations and homogeneous polynomials.

12. Let 0, 1, 2, 3, and 4 represent the scores 0, 15, 30, 40, and the game respectively.

Let g(i, j) = P (A wins the game starting from the score (i : j)). Show that

$$g(i, j) = xg(i+1, j) + yg(i, j+1)$$

Also show that $g(3,3) = \frac{x^2/(x^2+y^2)}{x^2}$.



Objective: To teach recursions and difference equations.

13. Think about a game that has reached the state deuce (or 30: 30). There is no limit to how long the game could go on. From this point, the game could reach one of the five possible states. Let 1, 2, 3, 4, and 5 denote the states: A's game, B's game, Deuce, Advantage A, and Advantage B, respectively. The game moves from state to state until one player wins. The probabilities of moving from one state to another can be summarized as

1	2		3	4	5
1	§ 1	0	0	0	Oø
2	O	1	0	0	O.
3	♦ O		0	x	y∳
4	≬ ^X	0	у	0	O ₀
5	O	у	X	0	O

Objective: To teach matrices, Markov chains and the states of a Markov chain.

14. Suppose that the game is now in state deuce (state 3). This can be expressed as the state matrix;

Show that after one and two exchanges the state matrices are respectively

Objective: To teach matrix algebra.

- 15. Starting from deuce
 - a. How many exchanges (points) are expected to be played before the game ends?
 - b. How many times is each state expected to be visited/revisited before the game ends?

Objective: To teach stationary solution, inverse of a matrix, and the fundamental matrix.

- 16. Suppose now that x_1 , x_2 represent respectively the probabilities in part a and x_3 , x_4 represent respectively the probabilities in part b.
 - a. P(A wins a point when serving) and P(A wins a point when receiving)
 - b. P(A wins a point after winning a point) and P(A wins a point after losing a point) Find the probabilities of winning a game, a set and the match for player A.

Objective: To teach basic concepts of modeling.



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17. Consider a tournament like the Davis Cup. Suppose that countries A and B each have three players represented as A_1 , A_2 , A_3 and B_1 , B_2 , B_3 respectively. Suppose that the following matrix represents their chances of winning or losing against each other.

Вı

	D_1	2	23
<i>A</i> ₁		52%	50%≬
		41%	30%
40%		45%	30%
A ₃ \55%			60%

For example, using this matrix, we have $P(A_1 \text{ beats } B_1) = 40\%$. In the Davis Cup, each team decides which player plays the first, second, etc. game without knowing about the selection of the other team. How do you think teams should make their selection?

Objective: To teach game theory.

18. In tennis, the server gets a second chance to serve after missing the first one. Ordinarily, players go for a speedy (strong) but risky first serve and a slow but a more conservative second serve. Analyze all the possible serving strategies and their consequences.

Objective: To teach basic concepts of decision analysis and its role in the game theory.

19. How do you summarize statistics related to a tennis player, a team, and a tournament?

Objective: To teach descriptive statistics.

- 20. Suppose that you have data for the speed of player A's first serve. How do you calculate the probability that in the next match the average speed of A's first serves would exceed a certain value?
- 21. Objective: To teach sampling distribution and central limit theorem.
- 22. How do you compare two tennis players? How do you rank tennis players?

Objective: To teach performance measures, measures of relative standing, z-score, etc.

23. A claim is made about the performance of a tennis player. Using the player's statistics, how do you validate the claim?

Objective: To teach hypothesis testing, Type I and Type II errors and P-value.

24. How can you use the past statistics of a player to predict his or her future performance?

Objective: To teach estimation (prediction), confidence intervals, regression, time series, and forecasting.

25. Suppose that you have statistics on the speed of player A's first serves. How do you predict the next record speed and perhaps the maximum possible speed of A's serves?



Objective: To teach theory of records, asymptotic theory of order statistics, extreme value theory, and threshold theory.

26. How do you organize a tennis tournament?

Objective: To teach planning and scheduling.

27. The winner of men's tennis match must win three out of five sets. Each set has six games. Do you think the present scoring system is fair? For example, player A could win two sets 6-0 and lose three tie-break sets 6-7. So, A could win 30 games and lose only 21 games and yet lose the match. Do you have any suggestion to make the match more balanced?

Objective: To teach methods for adaptive modeling.

3. ACTIVITIES. We conclude with some activities that use tennis and some mathematical and statistical concepts.

Activity 1: Bouncing Ball

The balls used in different sports have a different amount of bounce. Even the balls used in the same sport may bounce differently because of their age, coverings, or simply because they contain different amounts of air. For consistency, a standard for bounciness must be established for the ball in each sport.

On way to measure the bounciness of a ball is through a quantity known as the coefficient of restitution (COR), defined as square root of the ratio of the rebound height to the initial height from which the ball was dropped:

$$COR = \left(H_{Re \, bound} \, \left[H_{Initial} \right]^{1} \, \right]^{1}$$

Calculation

Provide answers to the following questions;

- 1. A tennis ball has a COR of 0.53. If this ball is dropped from a height of 8 feet, how high will it bounce?
- 2. From what height should a tennis ball with a COR of 0.54 be dropped so it will bounce 12 feet?
- 3. Suppose that a tennis ball with a COR of 0.55 hits a wall at a speed of 65 mph. With what speed will it rebound?

Critical Thinking

Make up a question pertaining to this lesson that you, the student, would ask if you were a teacher. For example;

- · You may want to know if bounciness can be quantified differently and, if so, what would be a consequence?
- · Is COR independent of speed? That is, if you throw two identical balls at a wall one with the speed twice the other, would speeds of the rebounds be 2 to 1 too?



Estimation, Modeling.

Select a tennis ball. Suppose that the ball is dropped from a point h feet high and has a COR equal to c.

- (a) Develop a model to calculate the heights of the first, second, third, and other bounces.
- (b) Think about the total distance traveled by the ball after one, two, etc. bounces. See if you could develop a model for this. Use the models you developed for a long run prediction. For example, what is the estimate for total distance traveled after n bounces?
- (c) Suppose that c is unknown. How can you estimate it? For example, you may estimate COR by measuring the bounce n times and by averaging the results. Suggest a value for n.
- (d) Estimate the second bounce by first directly measuring it n times and averaging as in part (c). Then apply the mathematical model in part (a) and predict the average of the second bounce. Which estimate do you prefer?
- (e) Repeat part (b) for the third, fourth, and other bounces. Do you see any pattern?

Trajectories, Some Classical Functions, and Model Building

Suppose now that a ball will be hit by a racket at a certain angle (similar to serves in tennis).

After hitting the ground it will bounce and follow a path like a parabola (similar to the trajectory of, for example, a lob shot in tennis). Model this first for a fixed angle and fixed initial speed. Repeat the process by keeping one variable fixed and letting the other vary. Finally, let both variables vary.

Activity 2: Applying Binomial Distribution, Matrices, Markov Chain, and Derivatives

Consider a match between two players, A and B. Suppose that player A has a 10% edge over Player B in one point. That is, the probability that player A will win a point is 55% and the probability that player B will win a point is 45%.

- Show that the probability calculations before reaching deuce can be carried out using a Binomial distribution.
- 2. Find the probability that player A wins a game, a set, and the match given the edge A has in one point. Also calculate the edge in a game, a set, and a match given the edge in one point.

Suppose that the information regarding the players A and B is summarized in a rectangular array as;

	1	2	3	4	5
1	♦ 1	0	0	0	0 🛊
2	.55	0	.45	0	0 🕴
3	0	.55	0	.45	0 1
4	0	0	.55	0	.45
5	0	0	0	0	1



This is called a transition matrix. It includes the probabilities of moving from one state to another after a point. Here state 1 represents A won the game, state 2 represents advantage A, state 3 represents deuce, state 4 represents advantage B, and state 5 is B won the game.

- 3. Apply matrix algebra and interpret the results in the context of a tennis game.
- 4. If we look at the tennis game as a Markov chain, what are the states? Which states are non-recurrent? Which states are absorbing?
- 5. Let x denote the probability that player A wins a point, and y = I x denote the probability that player B wins that point. It can be shown that

P (A wins the game) =
$$x^4 [1 + 4y + 10y^2 + 20xy^3/(x^2 + y^2)]$$
.

Replace y by 1-x in this equation and find its derivative with respect to x. Calculate the value of the derivative at the point x = 0.50. For players close in ability (when the edge in one point is small, e.g., 1%) the resulting value provides the edge in one game. Compare the value obtained using the derivative with the actual value of the edge.

- 6. Consider the equation in problem 5. Replace y by 1-x. The resulting function has several properties. For example, the function is symmetric with respect to x = 0.5. Study the other properties of this function.
- 7. Consider the formula in problem 5. Replace *y* by *1-x*. Suppose that P (A wins the game) = 0.60. Use numerical methods to find *x*.
- 8. Find the probability of winning a set as a function of x and show that it is an example of a function of a function. Use it to find the edge in a set both directly and by using the derivative (chain rule) as in problem 5.

Activity 3: Calculations Based on Normal Distribution

- 1. Suppose that the average speed of a tennis player's first serve is 117mph with a standard deviation of 5mph. What is the probability that this player's next first serve will be;
 - a) Slower than 115?
 - b) Faster than 120?
 - c) Between 116 and 122?
- 2. Suppose that tennis balls are produced to have COR = 55.5% (target value). To see if the process is on target once a day 50 balls are tested. If the average COR falls outside the interval 53.5% and 57.5 the process is judged out of control. What is the probability that the process will be judged out of control incorrectly? Assume that the standard deviation is 1.5%.

Activity 4: Constructing Confidence Intervals and Testing Hypotheses

- 1. Look up statistics for the number of aces made in 36 matches by a tennis player of your choice. Construct a 95% confidence interval for the average number of aces for this player. Hint: Use the Central Limit Theorem.
- 2. A sample of 36 serves of a top player on hard court has mean of 107mph and standard deviation of 6.5mph. His coach claims that the average speed of his serves is 110mph. Check to see if data supports this claim. Use a 0.05 level of significance.

The Connection

- 3. Another sample of 36 serves from the same player (problem 2) on a grass court has mean of 105mph and standard deviation of 10mph. Can we conclude that the mean speed of his serves on the hard court is greater (at the 0.05 level) than the mean speed of his serves on the grass court?
- 4. Construct a confidence interval for the difference between the population means in problems 2 and 3.

Activity 5: Applying Regression and Time Series for Prediction

- 1. Use statistics for a player of your choice who participated in the latest Wimbledon tournament. Use regression to predict the total points won using, for example, the number of opponents' unforced errors as predictor. Try other factors to see if you can find the best predictors.
- 3. If we cannot apply regression, we can still use smoothing techniques for prediction when the data form a time series. Time series refers to data with a time index. Use smoothing to predict the number of matches a player of your choice may win next year using the number of matches the player has won in previous years.

Activity 6: Research topics

The analysis of a tennis game can be expanded in many different directions. Examples include Canadian doubles or cut-throat, Australian doubles, regular doubles, and even a five- way game when server sits out for a game. Examples of research topics include determination of the size of a handicap to make a game a fair game and analyzing of the methods used for ranking tennis players.

ACKNOWLEDGMENTS. I would like to thank Professor Joe Gallian for providing me with help and direction.

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Applying Statistical Data

SLAM Fantasy League



- 1. Assist Students in drafting a fantasy basketball, football or baseball team. Look at the players' statistical track records and different salary-cap values to choose the right players for the team.
- 2. Look at the statistics for the starting players once or twice a week, depending on how often the players play. Look at how many points one player scores compared to another using the game statistics or calculate other statistics using the statistics you have.
- 3. Follow the team throughout the season, increasing the difficulty of the math questions, and incorporating multiplication, addition, subtraction, division, fractions and algebra as appropriate. Change the teams each season, using different statistics to help develop the students' mathematics skills.

Sample Problems

The following problems do not convey the excitement of the fantasy games themselves. The only way to understand how dynamic fantasy sports are in the classroom is to actually play the games. The purpose of these examples is to simply give you an idea of some of the types of concepts that are included in the programs.

Example for Fantasy Football

Using the default scoring system, how many points did Carson Palmer earn during Week 2 of the 2007 NFL season? Express the answer as a decimal rounded to the nearest thousandth.

Answer (Non-algebraic method)

Answer (Algebraic method)

Use
$$1/8 (T) + 1/24 (V) + 1/48 (P + R + C) - 1/12 (I) - 1/16 (F) = W$$

$$1/8(6) + 0 + 1/48 (17) - 1/12 (2) - 1/16 (0) = 45/48 = .938$$

Example for Fantasy Soccer

Using the default scoring system, how many points did David Beckham earn during Week 4 (April 28) of the 2007 MLS season? Express the answer as a decimal rounded to the nearest thousandth.

Answer (Non-algebraic method)



Connection

1 goal = 1/4

0 saves = 0

2 assists = 2/6 (1/6 for each assist)

0 yellow cards = 0

0 red cards = 0

11 total shots = 11/8 (1/8 for each total shot by player's team)

3 fouls = -3/24 (-1/24 for each foul)

3 offsides = -3/24 (-1/24 for each offside by player's team)

$$1/4 + 0 + 2/6 - 0 - 0 + 11/8 - 3/24 - 3/24 = 1 \ 17/24 = 1.708$$

Answer (Algebraic method)

Use
$$1/4$$
 (G) + $1/6$ (S + A) – $1/12$ (Y + R) + $1/8$ (T) – $1/24$ (F + O) = W

$$1/4(1) + 1/6(2) - 1/12(0) + 1/8(11) - 1/24(6) = 117/24 = 1.708$$

Answer (Algebraic method)

Use
$$1/4$$
 (G) + $1/6$ (S + A) – $1/12$ (Y + R) + $1/8$ (T) – $1/24$ (F + O) = W

$$1/4(1) + 1/6(2) - 1/12(0) + 1/8(11) - 1/24(6) = 117/24 = 1.708$$



Example for Fantasy Basketball

Using the default scoring system and basic method, how many points did Steve Nash earn against the Lakers on December 25, 2007? Express the answer as a decimal rounded to the nearest hundredth.

Answer (Non-algebraic method)

24 points = 24/36 (1/36 for each point scored)

2 rebounds = 2/9 (1/9 for each rebound)

1 blocked shot = 1/6

17 steals/assists = 17/12 (1/12 for each steal or assist)

4 turnovers/fouls = -4/18 (-1/18 for each turnover or foul)

$$24/36 + 2/9 + 1/6 + 17/12 - 4/18 = 81/36 = 29/36 = 21/4 = 2.25$$

Answer (Algebraic method)

Use
$$1/36$$
 (P) + $1/9$ (R) + $1/6$ (B) + $1/12$ (A + S) – $1/18$ (T + F)

$$1/36(24) + 1/9(2) + 1/6(1) + 1/12(17) - 1/18(4) = 29/36 = 21/4 = 2.25$$

Example for Fantasy Baseball

Using the default scoring system, how many points did Albert Pujols earn against the Angels on June 10, 2007? Express the answer as a decimal rounded to the nearest thousandth.

Answer (Non-algebraic method)

2 home runs = 1 (1/2 for each home run)

2 runs scored = 2/3 (1/3 for each run scored)

5 runs batted in (rbi) = 5/3 (1/3 for each rbi)

2 hits = 2/6 (1/6 for each hit)

0 stolen bases = 0

1 base on balls = 1/7

1 strikeout = -1/21



0 errors = 0

$$1 + 2/3 + 5/3 + 2/6 + 0 + 1/7 - 1/21 = 158/42 = 332/42 = 3.762$$

Answer (Algebraic method)

Use
$$1/2$$
 (H) + $1/3$ (R + I) + $1/6$ (B) - $1/7$ (S + W) - $1/21$ (K + E) = T

$$1/2(2) + 1/3(7) + 1/6(2) - 1/7(1) - 1/21(1) = 158/42 = 332/42 = 3.762$$

Additional Concepts

1. Interest

If a player signed a six-year contract for \$90,000,000 and invested 15% of his annual salary at a rate of 6.5%, how much interest will he earn at the end of the first year if the interest is compounded annually? (Assume that his income remains constant during the life of his contract). Use I = PRT

I = interest earned

P = principle

R = interest rate T

= time **Answer**

\$90,000,000/6 = \$15,000,000 annual salary

.15 * \$15,000,000 = \$2,250,000 invested

I = .065 * 2,250,000 * 1

I = \$146,250



2. Probability

The letters "Alfonso Soriano" are placed into a hat. Find the probability of the following random events.

- a. Selecting the letter o
- b. Selecting the letters a, r, or s c.

Selecting any letter except o

d. Selecting the letter f, replacing it, then selecting the letter f again

Answers

- a. 4/14
- b. 5/14
- c. 10/14
- d. 1/196

3. Finding a Percentage of a Number

Carl Crawford earned 1 and 3/8 points while Jim Thome earned 7/24 points. What percentage of Thome's points do Crawford's points represent?

Answer

$$\frac{}{}$$
 $\times \frac{7}{24} = 1\frac{3}{8}$

$$\frac{11}{8} \div \frac{7}{24} = \frac{11}{8} \times \frac{24}{7}$$

$$\frac{11}{8} \times \frac{24}{7} = \frac{33}{7} = 4.71 = 471\%$$

4. Percentage of Price Increase and Decrease

If the price of a ticket increased from \$25 to \$30, what is the percentage of price increase?

Answer
$$\frac{5}{25} = .20 = 20\%$$



5. Ratio and Proportion

The ratio of Ryan Howard's points to Juan Pierre's points is 3:1. If Pierre earned 4/7 points, how many points did Howard earn?

Answer

$$\frac{3}{1} = \frac{n}{\frac{4}{7}}$$

$$n = \frac{12}{7} = 1\frac{5}{7}$$

6. Adding and Subtracting Fractions (two problems)

A) Using the default scoring system, how many more points were earned by Carlos Beltran (NY Mets) than Matt Holliday (Colorado Rockies) from their games on April 4, 2007?

Answer

Points earned by Carlos Beltran

$$\frac{1}{2}(2) + \frac{1}{(2+4)} + \frac{1}{(2)} + \frac{1}{(0+0)} + \frac{1}{21}(1+0) = 3^{2} - \frac{1}{7}$$

Points earned by Matt Holliday

$$\frac{1}{2}(1) + \frac{1}{(2+4)} + \frac{1}{(4)} + \frac{1}{(0+0)} + \frac{1}{21}(0+0) = 3 + \frac{1}{6}$$

B) How many more points did Eli Manning earn compared to Ben Roethlisberger for Week 1 of the 2007 NFL season if Manning had 312 yards passing, 4 touchdowns, and 1 interception, while Roethlisberger had 161 yards passing and 1 touchdown? Use the default scoring system.

Answer

Roethlisberger:

$$4 \text{ TD's} = 4/8$$

The Connection

161 passing yds. = 6/48

4/8 + 6/48 = 30/48

Eli Manning:

4 TD's = 4/8

312 passing yds. = 12/48

1 int. = -1/12

4/8 + 12/48 - 1/12 = 32/48

32/48 (Manning) - 30/48 (Roethlisberger) = 2/48 = 1/24

7. Rounding Decimals

Express Holliday's points earned in the problem above as a decimal rounded to the nearest tenth, hundredth, and thousandth.

Answer

$$3\frac{1}{6} = 3.16$$

3.16 rounded to the nearest 10th, 100th, & 1000th

= 3.2 3.17 3.167

8. Proportions

If A-Rod hit four home runs in his first 10 games, how many home runs is he projected to hit in his first 40 games?

Answer

$$\frac{4}{10} = \frac{n}{40}$$

10n = 160 n

= 16

9. Mean

Find the average player value for the players below: LaDainian

Tomlinson \$12,050,000

Peyton Manning \$9,605,000

The Sall Connection

Steve Smith \$7,875,000

Antonio Gates \$6,915,000

Answer \$36,445,000 / 4 = \$9,111,250

10. Multiplying Decimals



If Tom Brady earned 1.208 points using a scoring system that is based on a common denominator of 24, how many points did he earn expressed as a fraction?

Answer .208 x 24 = 5, so Brady earned 1 5/24

11. Measurement

Joseph Addai gained 131 yards rushing. How many feet did he gain? How many inches? How many centimeters?

Answer

$$131 \times 3 = 393 \text{ feet}$$

$$393 \times 12 = 4{,}716 \text{ inches}$$

$$4,716 \times 2.54 = 11,978.64 \text{ cm.}$$
 (2.54 cm. = 1 in.)

12. Division with Whole Numbers

If the New England Patriots spent 7,200 minutes practicing in training camp, how many hours did they spend practicing?

Answer

$$7,200 / 60 = 120 \text{ hours}$$

13. Permutations and Combinations

If Coach Mike Shanahan started two of his five running backs, how many combinations could he choose from?

Answer

$$5! / 2!(5-2)! = 10$$

14. Linear Equations

Solve for the variable below.

$$5^{4}(2)+5^{3}(7)+5^{2}(k)-5^{1}(2)-5^{0}(5+2)=2208$$

$$1250 + 875 + 25k - 10 - 7 = 2208$$

$$25k + 2108 = 2208$$

$$25k = 100 k$$

= 4

15. Diameter



Find the diameter of an on-deck circle on a baseball field if the area of the circle is 7.065 ft.²

Answer

$$A = \pi r^2$$

$$7.065 = 3.14 \,\mathrm{r}^2$$

$$2.25 = r^2$$

$$r = 1.5$$

16. The Pythagorean Theorem

The distance between consecutive bases on a baseball diamond is 60 feet. Find the distance from home plate to second base.

Answer

$$a^2 + b^2 = c^2$$

$$60^2 + 60^2 = c^2$$

$$7200 = c^2$$

$$c = 84.9$$
 feet

17. Functions

Write the function rule and solve for the variable. x

= bases on balls; y = strikeouts

X	y
4	3
12	9
36	27
108	n

Answer

$$n = 81$$

Function rule .75x = y



18. Area and Perimeter of Rectangles

Find the area and perimeter of a ballpark in the following units if the length is 1,300 feet and the width is 850 feet.

Answer:

Area in square feet 1,300 * 850 = 1,105,000 sq. ft.

Area in square inches 1,105,000 * 144 (# of sq. in. in 1 sq. ft.) = 159,120,000 sq. in.

Area in square yards 1,105,000 / 9 (# of sq. ft. in 1 sq. yd.) = 122,777.78 sq. yds.

Area in square centimeters 159,120,000 * 6.45 (# of sq. cm. in 1 sq. in.) = 1,026,324,000 sq. cm.

19. Extra Credit

Students create their own scoring systems for any fantasy sport, and compute their points based on those scoring systems. The entire class could compute points based on a scoring system that was developed by a student.

20. Graphing

Students create circle graphs, bar graphs, and line graphs based on the scoring breakdown of their teams each week. Click on "Examples of Graphs" on the main menu to view examples.

Suggested Texts:

 $\underline{http://www.amazon.com/exec/obidos/search-handle-url/index=books\&field-author-exact=Dan\%20Flockhart\&results-process=default$

Informational Video on effectiveness:

https://www.youtube.com/watch?v=Cq6V6A3LF9M

GEOMETRY

PROJECT IDEA-

Host billiard tournament (3 Cushion) where students will use angles and calculations to determine their shots and positions. Tournament can be conducted in team settings to facilitate collaborative while rotating responsibilities.

APPLICATION FOR VARIOUS DISCIPLINES:

- Create a marketing campaign for the tournament: create flyers, t-shirts, etc.
- Broadcast interviews and document preparation i.e. class study time, teacher/coaching.
- Supplemental video: Donald Duck plays three-cushion billiards- YouTube http://www.youtube.com/watch?v=yuntK56wL7A



Sports and Geometry

Subjects

Mathematics Physics Geometry

Brief Description

Understand why geometry is important by seeing the connections between sports and geometry.

Keywords

angles, arch, measurement, shape, speed, size, weight

Objectives

Students will recognize

- the various shapes in sports (their fields, their equipment, their rules).
- angles, arches, measurement, and shapes in sports.
- the concepts of size, speed, and weight as they apply to sports.

Help students become familiar with the layouts of a

- · basketball court
- · tennis court
- · baseball field
- · pool table
- soccer field You can find some helpful sources of this information on these Web sites:
- · Athletic Field Dimensions
- Sports Court and Field Dimensions
- · Sport and Activity Dimension Index

Note: A standard tournament-play pool table is 4.5 x 9 feet.

The Lesson Arrange students into groups of 3 or 4 students. Ask each group to choose a sporting event from the list of field layouts you've made available. Challenge students to use the field layouts to identify geometry concepts in those sports/activities. They should identify the various shapes in their sport field and the tools/equipment of the sport too. They will create a miniature version of the field layout and plan a presentation that shares with the other groups how geometry plays a role in the sport.

Assessment

You might use a presentation rubric (example 1 or 2) to grade student presentations. Perhaps students will use the rubric to grade their peers and/or themselves.

Extension activity: Discuss the importance of why standards are set for sports playing areas. Or, lead a discussion



of other ways -- outside of sports -- in which geometry applies to everyday life.

Submitted By Debbie Miskiel, Workman High School in La Puente, California

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Source: http://www.educationworld.com/a tsl/archives/07-1/lesson018.shtml

Additional lessons and activities can be found at:

http://plus.maths.org/content/teacher-package-mathematics-sport

VARIOUS SCIENCE DISCIPLINES

SCIENCE OF NHL HOCKEY: Force, Impulse & Collisions

Video & Source available at: http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey

Objective:

1.Students will design and carry out a procedure to measure the acceleration of a body produced by a known impulse. 2.Students will design and carry out an investigation on momentum transfer in an elastic collision. 3.Students will design and carry out an investigation on momentum transfer in an inelastic collision.

Introduction Notes:

Science of NHL Hockey:Force, Impulse, and Collisions

Subject Area: Physical Science

Lesson Title: Force, Impulse, and Collisions

Suggested Prior Knowledge: concepts of mass, velocity, momentum, acceleration, force, and Newton's second law of motion; lab techniques of measuring mass and velocity. Note that students might more easily grasp the concepts in this video if they have already viewed the video *Newton's Three Laws of Motion*.

Purpose and Introduction: This video focuses in the interactions of the hockey stick and the puck to advance the understanding of force, impulse, and collisions. The activity will help students to understand the concept of impulse and to observe the difference between elastic and inelastic collisions.

Key Vocabulary:

velocity—the change of an object's position over time.

elasticcollision—an impact of bodies resulting in a change in velocities and a transfer of kinetic energy without loss.

force—an influence on an object that causes a change in velocity or shape.

impulse—a force multiplied by the amount of time during which it acts.

inelastic collision—an impact of bodies resulting in a change in velocities and a transfer of kinetic



energy with some loss.

Objectives:

- Students will design and carry out a procedure to measure the acceleration of a body produced by a known impulse.
- Students will design and carry out an investigation on momentum transfer in an elastic collision.
- Students will design and carry out an investigation on momentum transfer in an inelastic collision.

Materials:

- Safety goggles
- Skateboard
- Bricks
- Spring scale
- Stopwatch
- Tape
- Marker
- Marbles
- Trough or grooved track 1 m long
- Sheet of cardboard
- Two or more books of the same thickness
- Meter stick
- Lab balance
- Newton's cradle
- Modeling clay

Procedure:

1. After students watch the video, discuss with them the fundamentals of collisions—force, velocity, impulse, momentum, and energy. Students might use a field hockey stick and puck to demonstrate the meaning of each of these terms. Note the video's definition of force: *The push or pull that can accelerate an object by changing its velocity or changing its shape.*

This might imply to students that changing the shape of an object is a way of accelerating it. Remind students that <u>acceleration is a change in velocity</u>. Then help them recast this definition of force as a "push or pull that can change the shape of an object or accelerate it, which means a change in its velocity" to be sure they are clear on that point. Then, use questions such as these to progress students' discussion:

How is impulse related to momentum?

What happens to momentum in a collision?

What happens to energy in a collision?

- 2. Lab protocols should be followed, incorporating safety equipment. Goggles must be worn at all times.
- 3. Guide students to design investigations that are valid and will allow them to observe the conservation of momentum. The equipment will allow them to measure mass and velocity, which should be familiar lab processes for them. Using a spring scale to exert a constant force may require practice. Following are some questions to help focus students' plans and guide them:

How can you measure impulse?

How can you measure momentum?

What investigation can you design to determine how impulse and momentum are related?

What are the characteristics of an elastic collision?

What are the characteristics of an inelastic collision?

How can you measure momentum for a body on a string?

Part 1: Relating Impulse and Momentum

4. Remind students that the video treats impulse as the product of force and time, $F\Delta t$. The video does not equate impulse to change in momentum, but it does state that a force changes the motion of an object. Guide students to



understand that an impulse acting on an object must therefore change its momentum. The materials list allows for at least two methods of investigating impulse. Encourage students to think of other methods they might use either with this equipment or other easily obtainable items.

- For a direct measurement of impulse, students might load the skateboard with enough bricks that the skateboard can be accelerated on the level for several seconds using the spring scale. Students should practice using the spring scale to apply a constant horizontal force to the loaded skateboard. Students can vary both time and force to produce different impulses.
- Three students are needed to measure velocity. One measures the time the skateboard accelerates. The second marks the point where the skateboard finishes accelerating. The third measures the time the skateboard takes to roll from that point to the end of a predetermined course. The distance along the course and the mass of the loaded skateboard can be measured either before or after the velocity measurement. The skateboard's momentum is the product of its mass and final velocity.
- Students should find that the momentum they have measured for the skateboard is equal to the impulse they have measured: $F\Delta t = mv$.
- 5. Students may find it easier to investigate impulse using marbles and a ramp. By propping up one end of a board with a book, students can see that the force of gravity accelerates a marble for as long as it rolls down the board. (They should tape the sheet of cardboard to the lower end of the ramp so that the marble rolls smoothly onto the floor or lab table.) The force can be doubled by adding a second book. Increasing the distance the marble rolls increases the time that the force acts. It may simplify students' calculations if they use distances of 5 cm, 20 cm, 45 cm, and 80 cm on the ramp.

As with the skateboard, three students should measure the final velocity of the marble. The marble's momentum is the product of its mass and its velocity. In this case, of course, they have not measured the force in absolute units, but they should see that increasing the force gives a proportionate increase in momentum.

Part 2: Elastic Collisions

6. Students can roll marbles in a trough to gain a qualitative understanding of collisions. Remind students that, as discussed in the video, the force acting during a collision is an impulse that lasts a very short time. The video also stated that a collision of a hockey puck with the boards is *elastic* because very little energy is lost. Encourage students to devise their own methods for making observations. The simplest collision is one marble striking another of the same mass that is at rest. More complex cases involve collisions between marbles with different velocities and different masses.

Note that students probably will not discover an exact formula for conservation of momentum with this apparatus. With two or more observers estimating speeds before and after collisions, they should observe patterns of behavior. For instance, a small mass striking a large mass at rest reverses the direction of the smaller object. Students do not need to know that momentum is a vector, but for an understanding of momentum conservation they need to see that momentum can be added and subtracted.

7. Students who haven't seen a Newton's cradle may find it fascinating, and they can learn from it simply by playing with it on their own. The simplest collision involves only two spheres that are adjacent to each other. A single sphere is drawn back and strikes a stationary sphere. More complex cases involve more spheres and different velocities. Students can create different masses by taping together adjacent spheres. Encourage them to devise their own methods of exploration, perhaps using multiple observers.

With Newton's cradle students can make better measurements of momentum. They do not need to measure mass and velocity directly to show that momentum is conserved for an elastic collision. Masses of all the spheres are equal, and the velocity is proportional to the distance of the initial swing or the distance of the recoil. The distance of the initial swing is equal to the recoil distance of the sphere that is struck, so for a single body, initial mass times velocity is equal to final mass times velocity: m1v1i = m2v2f. For more complex situations, the sum of initial momenta is equal to the sum of final momenta.

Part 3: Inelastic Collisions



Students can use the Newton's cradle again to create a simple inelastic collision that involves two spheres, each with a small piece of modeling clay attached. The spheres come together with equal speeds in opposite directions. The clay acts as a cushion, keeping the two spheres together, and they come to rest. Students should be able to explain why the collision is inelastic. (All kinetic energy is lost). They should also see that momentum is conserved. (The momentum of one sphere was the opposite of the momentum of the other sphere, so the total momentum was zero both before and after the collision.)

Ask students to think about two pairs of spheres in Newton's cradle, with equal but opposite velocities, colliding. Clay keeps the two inner spheres stuck together. What happens to the outer spheres? (They rebound.) How much kinetic energy is lost? (Half of the initial amount)

Follow up

8. As a follow-up exercise, have students work in small groups to analyze a goalie catching a slap shot. The puck has a mass of 160 g and travels at 36 m/s. What is the momentum of the puck? The goalie has a mass of 80 kg. If he is standing still when he catches the puck and then slides backward, what is his momentum after he catches the puck? What is his velocity? Explain whether this collision is elastic or inelastic. Groups should share their rationales and calculations, helping one another make corrections to thinking, as needed.

Additional Resources:

Experiment Title:

- http://www.mme.wsu.edu/~ssl/pubs/imac2008c.pdf
- http://serc.carleton.edu/sp/compadre/demonstrations/examples/19119.html
- http://www.yenka.com/activities/Elastic and Inelastic Collisions Activity/
- http://www.education.com/science-fair/article/elastic-collisions/
- http://www.exploratorium.edu/hockey/shooting1.html
- http://www.physicsclassroom.com/class/momentum/u4l1b.cfm

Student Worksheet for Force, Impulse, and Collisions

1
Student Hypothesis:
Materials: - Safety goggles - Skateboard - Bricks - Spring scale - Stop watch - Tape - Marker - Meter stick - Newton's cradle - Modeling clay
Procedure:
Wear safety goggles for all lab work
Data and Observations:
Analysis of Data:
Conclusion:

Date:

Name:



SCIENCE OF NHL HOCKEY: Mass, Volume & Density

Video & Source available at: http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey

Objective:

1.Students will be able to compare the density of two solids (concrete and ice) to a liquid (water). 2.Students will design and carry out an investigation to determine the density of ice, water, concrete, and air and compare those densities.

Introduction Notes:

Science of NHL Hockey: Mass, Volume, and Density

Subject Area: Physical Science, Math Lesson Title: Mass, Volume, and Density

Suggested Prior Knowledge: concepts of mass, weight, volume, and density; lab techniques of measuring length, mass, and volume

Purpose and Introduction: One of the "stars" of this video is the Zamboni®— the particular brand of machine used by the National Hockey League (NHL) that smoothes the ice between periods of a hockey game. A Zamboni weighs about 10,000 pounds empty, and travels about ¾ of a mile during each resurfacing. Before ice-resurfacing machines were invented, people resurfaced the ice manually using scrapers, water hoses, and squeegees. The basic science underlying the resurfacing action involves knowledge of solids, liquids, and gases and an understanding of the physical properties of mass and volume of matter and the relationships between mass, volume, and density

Key Vocabulary:

density—a measure of how tightly packed something is in a specific volume; the measure of the quantity of matter per unit volume.

mass—the measure of the amount of matter in something.

volume—the measure, in cubic meters, of how much space something occupies in terms of height, width, and depth.

weight—the force of Earth's gravity pulling on an object's mass.

Objectives:

- Students will be able to compare the density of two solids (concrete and ice) to a liquid (water).
- Students will design and carry out an investigation to determine the density of ice, water, concrete, and air and
 compare those densities.

Materials:

- Safety goggles
- Balance
- Centimeter ruler
- Tongs
- 150 mL graduated cylinder
- Tap water
- Large rectangular ice cube
- Irregular piece of concrete
 - Spherical balloons

Preparation Notes:



Use pint or quart milk cartons or rectangular plastic boxes of various sizes to make large regular-shaped ice cubes.

Procedure:

- 1. Prepare students for watching the video by eliciting from students what they know about the three states of matter—solid, liquid, and gas. (The fourth state—plasma—is not relevant to this lesson.) As students watch the segment relating temperature to states of water, point out that many resources call water vapor "steam." Be sure students understand, however, that water vapor, or steam, is invisible. The visible water commonly called steam is composed of tiny condensed water droplets—liquid water. Discuss students' ideas about states of matter and the physical properties of mass, volume, and density. Some questions to guide discussion include the following:
 - What are mass, volume, and density?
 - How can you compare the properties of solids, liquids, and gases?
 - How can solids, liquids, and gases be described in terms of mass, volume, and density?
- 2. Laboratory protocols should be followed, incorporating safety equipment. Goggles must be worn at all times.
- 3. Guide students to design an investigation that is valid and will allow them to observe some of the physical properties of solids, liquids, and gases. Work with students to design procedures similar to those outlined in this lesson plan.
- 4. Some questions to help focus their plans and guide them include the following:
 - How can you measure the mass of a solid (or liquid or gas) with the lab equipment available?
 - How can you measure the volume of a solid (or liquid or gas) with the lab equipment available?
 - How can you determine the density of a solid (or liquid or gas)?
- 5. Students should be familiar with measuring mass, as well as with measuring linear dimensions. You may want to review how to read a graduated cylinder. Remind students that the accuracy of their results will be affected by how carefully they measure quantities in the lab.
- 6. Some procedures students might use include the following:
 - Measuring mass of a solid is a straightforward procedure with a balance.
 - Measuring the volume of a regular solid requires careful use of the ruler and use of the proper formula. (For a rectangular solid, the formula is volume = height × width × length.)
 - Density is then calculated by dividing:
 - density of solid = (mass of solid)/(volume of solid)
 - To measure the volume of an irregular solid, students can place the object in a graduated cylinder that has a known quantity of water in it. The volume of the object is the difference between the "after" and "before" readings.
 - Determining the mass of a liquid requires two measurements. First, measure the mass
 of an empty 150 mL graduated cylinder. Then fill the cylinder with a specific volume of
 the liquid (50 or 100 mL), and measure its mass again. Subtract the mass of the empty
 cylinder from the total mass.
 - Students in this way obtain both the mass and volume of a sample of a liquid. They can substitute these measurements into the density formula:
 - density of liquid = (mass of liquid)/(volume of liquid)
 - Determining the mass of a gas requires two measurements. First measure the mass of a



deflated balloon. Then blow up the balloon and measure its mass. Subtract the mass of the empty balloon from the total mass.

- The ease of determining the volume of gas in a balloon depends greatly on the balloon's shape. If the balloon is spherical or cylindrical, use the formula for the volume of the shape for determining the volume. If the balloon is irregularly shaped, you might use the water displacement method. This would result in a measurement slightly less than the actual volume, since submerging the balloon will compress it. Another method would be to insert a balloon into an open container of known volume, and blow up the balloon until it fills that container. If this method is used, the container would need to be included in the calculation of mass.
- Students can substitute these measurements into the density formula: density of gas = (mass of gas)/(volume of gas)
- 7. Encourage students to discuss what they observed in this investigation and to compare their results to those of their classmates and what they observed in the video. The following are some topics to guide the discussion:
 - How are the quantities mass, volume, and density related?
 - What is the relation of the density of a solid to the density of a liquid in which it floats? In which is sinks?
 - What is the relation of the density of ice to the density of liquid water?
 - How does the density of a gas compare to the density of a liquid or a solid?

The video points out that 40,000 liters of water expands to 43,600 liters when it freezes. (You might need to remind students that 1 ml is equal to 1 cm3.) Point out to students that it is that volume of ice that still has a mass of 40,000 kg. Be sure they understand that the *volume* of water is not equal to the *mass* of the resulting ice sheet.

- 8. After the students have finished their investigation, have them think about a 1 m square section of a hockey rink. It has ice 2.5 cm thick on top of a concrete slab 25 cm thick. Students should answer the following questions, using their own density values.
 - What is the mass of concrete in this 1 m2 section?
 - What is the mass of ice in this 1 m2 section?
 - What is the height of a column of air that exerts a force of $1.01 \times 105 \text{ N}$ on the 1 m2 section of ice? (Assume the air has a uniform density.)

Additional Resources:

- http://www.ajdesigner.com/phpdensity/density_equation.php
- http://www.zamboni.com/about/how-it-works/
- http://www.zamboni.com/about/fun-facts/
- http://www.mentalfloss.com/blogs/archives/55859
- http://ga.water.usgs.gov/edu/waterproperties.html

Centimeter ruler

• http://entertainment.howstuffworks.com/ice-rink6.htm

Student Worksheet for Investigation of Mass, Volume, and Density

Experiment Title: _		Date:	Name:	
Student Hypothesis	::			
Materials:				
-	 Safety gogg 	les		
-	- Balance			



- Tongs
- 150 mL graduated cylinder
- Tap water
- Large rectangular ice cube
- Irregular piece of concrete
- Spherical balloons

Procedure:

Data and Observations:

Lab safety equipment should be used, and safety protocols followed.

Analysis of Data: ______Conclusion:

SCIENCE OF NHL HOCKEY: Hockey Geometry

Video & Source available at: http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey

Objective:

1. Students will investigate some properties of quadrilaterals and circles. 2. Students will investigate the angles occupied (subtended) by objects and how those change with distance. 3. Students will explore the relationship of the angle of incidence to the angle of reflection.

Introduction Notes:

Science of NHL Hockey: Hockey Geometry

Subject Area: Physical Science, Geometry

Lesson Title: <u>Hockey Geometry</u>

Suggested Prior Knowledge: concepts of angle, circle, and quadrilateral; lab techniques for measuring angles and distances

Purpose and Introduction: This video focuses on the geometry of the perfect hockey shot—the angle that gets the puck into the goal. The activity will give students an understanding of the basic properties of angles and the basic properties of circles and rectangles that can be applied to the game of hockey.

Key Vocabulary:

angle—two rays with the same endpoint, the vertex.

angle of incidence—the angle that a straight line, ray of light, etc., meeting a surface, makes with a perpendicular to the surface.

angle of reflection—the angle that a straight line, ray of light, etc., reflecting off a surface, makes with a perpendicular to the surface.

circle—a closed curve in which all points are the same distance from the center.

quadrilateral—a closed figure formed by four line segments linked end to end; a four-sided polygon.



Objectives:

- Students will investigate some properties of quadrilaterals and circles.
- Students will investigate the angles occupied (subtended) by objects and how those change with distance.
- Students will explore the relationship of the angle of incidence to the angle of reflection.

Materials:

- safety goggles
- assorted paper rectangles, parallelograms, trapezoids, and circles
- compass
- ruler
- rectangular block
- pencil
- can
- newsprint
- marker
- tennis, golf, or table tennis ball
- tape
- meter stick
- framing square
- mirror (optional)
- carbon paper or cooking spray (optional)

Procedure:

- After students view the hockey video, have them recall the various geometric shapes that appear on a
 hockey rink. Ask volunteers to create operational definitions of rectangles, circles, and angles using
 information from the video. Then, elicit instructions from the class in drawing a diagram that illustrates
 angle of incidence and angle of reflection. Use questions such as the following to encourage discussion:
 - What are some examples of rectangles (circles, angles) encountered in everyday life? What makes each example a good one?
 - A hockey goalie wants to make an attacker's angle of access as small as possible. What are
 examples of angles you would like to be as small as possible? What angles would you like to
 be as large as possible?
 - If you drop a ball vertically on the floor, it will bounce back vertically, following the same line. Suppose you want to bounce a ball to a friend nearby (for instance, you make a bounce pass to a basketball teammate). Then the path of the ball is no longer exactly vertical. For the ball you bounced, which is the angle of incidence and which is the angle of reflection?
- 2. Lab protocols should be followed, incorporating safety equipment. Goggles must be worn at all times.
- 3. Encourage students to speculate on geometric relations and ways of exploring them with the apparatus supplied. The following questions can help focus their plans and guide them:
 - What relation describes the four angles of a quadrilateral?
 - What are the relationships of the four sides of a quadrilateral?
 - How can you measure the angle occupied (subtended) by an object?
 - How does the angle occupied by an object vary with distance?
 - How does a reflected light ray resemble the path of a bouncing ball?
 - How can you measure the angle of incidence and angle of reflection for a light ray?
- 4. Students should explore possible relations involving the angles of the quadrilaterals by measuring the angles of the paper quadrilaterals. Depending on their grade level, students may not be aware that the sum of the interior angles of a quadrilateral is always 360°.
- 5. Again, depending on their grade level, students may not be aware of the differences between a trapezoid, a parallelogram, and a rectangle. Using the ruler and compass, they can explore which pairs of sides are parallel and which pairs are equal in length in each figure.



- 6. Encourage students to explore the central angles formed in a circle, and perhaps approximations to measuring the circumference. They can manipulate the paper circles—folding them in half and then into quarters or smaller segments.
- 7. Suggest students use the block, can, and ball to explore how the angle an object occupies depends on its distance from an observer and on the way it is oriented. For instance, students might measure angles occupied by the objects at distances of 10, 30, and 50 cm and with two or three different angles of orientation. Then, remind students that a hockey player likes to be directly in front of the goal and as close as possible when he or she takes a shot. Elicit from students that in that position, the angle of attack is as large as possible and the goalie's task is to block as much of that angle as possible. After students come to this conclusion, review just this portion of the video to confirm their thinking.
- 8. Give small groups of students a tennis, golf, or table tennis ball and challenge them to track the path of the moving ball as it is reflected off a vertical surface. If needed, suggest they appoint spotters that will identify the point of each action in the process—start, reflection point, and end. Students might roll the ball over sheets of newsprint and have spotters use markers to document each of these points. Then students should recreate the path of the puck with a straightedge and establish the perpendicular. Students might also roll a ball over carbon paper or coat a ball with a substance that will leave a trail, such as cooking spray. Direct students to measure the resulting angles and draw a diagram with the angles labeled. Some students may need to be reminded that the perpendicular forms two right angles (which have a sum of 180°).
- 9. Remind students that, just as a ball that is dropped vertically bounces back vertically, a hockey puck that strikes the boards perpendicularly bounces straight back along the same path. Explain that in that case the angle of incidence and the angle of reflection are both zero. Refer students back to the video to observe that if the path of the puck before it strikes the boards is not perpendicular to the boards, then the puck has an angle of incidence of a certain number of degrees. The path of the puck's rebound also makes an angle to the perpendicular, and the angle of reflection is equal to the angle of incidence. Have students compare this with their drawings.
- 10. After the students have finished their investigations, present this challenge problem to them: A hockey player stands on the center line in a rink, a few meters to one side of the center, and shoots the puck into the opponents' goal. The path of the puck is not exactly perpendicular to the center line. It makes an angle α with the perpendicular. Now suppose the player instead takes a shot on his own goal. What angle does the puck's path make with the perpendicular to the center line? Ask students to draw what they think is going to happen first and then discuss their ideas in small groups. The groups can then try out the activity and report back to the class where comparisons can be made and a mathematical rule based on their observations established.

Connect to Optics:

You might use this video in conjunction with students' study of optics as well. Tell students that tracking the path of a ball or a hockey puck can be difficult, and ask them if they can think of anything else that might obey the same law. Asking what else they know that *reflects* should bring light rays to mind. If not, then ask what reflects from a mirror. If they think that they cannot track the path of a light ray directly, suggest that a line of sight is the same as the path of a ray of light. Encourage them to experiment with the mirror to make observations about the reflection of light. If they are making slow progress, give hints about a procedure similar to the following:

Measuring angles of incidence and reflection with a mirror is straightforward. One student looks at his feet in the mirror, and another marks the spot on the mirror where the feet appear to be. Using the framing square, the second student constructs a perpendicular to the mirror surface at that spot. The students then measure the angles made by the sight lines to the first student's eyes and to his feet.

Additional Resources:



- $\bullet \qquad http://www.nsc discovery.org/Teacher Tools/Adobe/Mirror Mirror on the Wall.pdf$
- www.goalrobber.com/links_39_2505472894.pptx
- http://biology.wsc.ma.edu/Math251/node/15
- http://icehockey.isport.com/icehockey-videos/play/geometry-of-a-slap-shot-10961

Student Worksheet for Hockey Geometry			
Experiment Title:	Date:	Name:	
Student Hypothesis or Question:			
Materials: - safety goggles - assorted paper rectangles, parallelograms, t - compass - ruler - rectangular block - pencil - can - newsprint - marker - tennis, golf, or table tennis ball - tape - meter stick - framing square - mirror (optional) - carbon paper or cooking spray (optional)	rapezoids, an	d circles	
Procedure: (Include all safety procedures)			
Analysis of Data:			
Conclusion:			
SCIENCE OF NHL HOCKEY: Kinematic		n/portal/site/learn/science-of-nhl-	hockey

Objective:

1.Students will design and carry out an investigation to measure acceleration. 2.Students will determine the relation between speed and constant acceleration. 3.Students will determine the dependence of acceleration on



the inclination of a ramp.

Introduction Notes:

Science of NHL Hockey: Kinematics

Subject Area: Physical Science, Math

Lesson Title: <u>Kinematics</u>

Suggested Prior Knowledge: definition of speed; definition of constant acceleration; use of stopwatch and measuring tape or meter stick

Purpose and Introduction: This video focuses on the motion of individual hockey players, making the relationship to science concepts of speed, velocity, and acceleration. The activity enables students to understand the basics of kinematics and to measure speed and acceleration with simple equipment.

Key Vocabulary:

acceleration—change in velocity over time; either a change in speed or a change in the direction of motion.

kinematics—description of the motion of objects without consideration of the causes of the motion.

position—the location of an object in space.

velocity—the change of an object's position over time.

Objectives:

- Students will design and carry out an investigation to measure acceleration.
- Students will determine the relation between speed and constant acceleration.
- Students will determine the dependence of acceleration on the inclination of a ramp.

Materials:

- safety goggles
- hard rubber ball (if available, a hockey puck for a visual connection)
- grooved track 1 m long (if unavailable, substitute a board with cardboard taped to the end to create a ramp)
- two books of the same thickness
- measuring tape or meter stick
- two stopwatches

Procedure:

- 1. Review with students the definitions of speed and velocity. Remind them how time, distance, and speed are related. Summarize the discussion of acceleration in the video. Speed and acceleration are crucial for players in hockey (and other sports, such as basketball, soccer, lacrosse, and jai alai). Speed and acceleration are also vital to moving the puck (or a ball, in other sports). Make sure students recognize acceleration can be either a change in speed *or* a change in direction.
- 2. Discuss with students how they can design an experiment to measure acceleration. Begin with a leading question, such as *How can you describe the motion of a moving hockey puck?* Then guide discussion with questions such as the following:

What kind of acceleration does a falling puck undergo?

How can you slow down this acceleration so that it is easier to study?

What equipment is necessary to measure the acceleration?

How can you vary the rate of acceleration?

What formula for velocity involves a constant acceleration?

This should take some time. A good discussion about acceleration can lead to students deriving the formula v2 - v1/t2 - t1



- 3. Lab protocols should be followed, incorporating safety equipment. Goggles must be worn at all times.
- 4. The basic procedure suggested here is to measure the final speed of a ball that rolls down a track for various time intervals. From their measurements, students should be able to find a linear equation relating speed and time. However, students may prefer to construct another activity using these materials. For instance, they may choose to measure the time a ball takes to roll several distances down the track and relate those times to the distance it rolls on the ramp. Encourage students to think of other ways to measure acceleration.
- 5. If students need prompting, suggest they begin by propping up one end of a track with a single book. Students can then measure the time a ball takes to roll a fixed distance after it reaches the bottom of the track. One student measures the time from the top of the track to the bottom, and a second measures the time from the top of the ramp to the end of the level course. Then the first time is subtracted from the second. Encourage students to increase accuracy by making repeated measurements and averaging them.
- 6. After students measure times for a few different distances on the track, they should graph speed on the level vs. time accelerating. (Distances such as 5 cm, 20 cm, 45 cm, and 80 cm are convenient to work with, but students may not recognize this.) The graph should show a straight line, and students can calculate the acceleration using the formula v = at.

Data

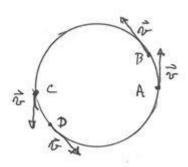
Angle of	Track	Distance	Down	Time	to	Time to) E	End of	Time	on	Level	Speed	on	the
(degrees)		Track (meters))	Bottom	of	Level		Course	Course	(secor	nds)	Level (1	m/s)	
				Track		(seconds))							
				(seconds)										

- 7. Suggest students increase the angle of inclination of the track and repeat their procedures, measuring the times for the same distances as in their first trials. When the track is propped up with two books, the acceleration should be twice that measured for a single book.
- 8. Revisit the video to make connections between the aspects of kinematics of the balls on the track and the hockey players on the ice. Have students compare their graphs and calculations to those in the video.
- 9. To conclude the activity, ask students to think about a hockey player skating in a circle at a constant speed. What does it mean to say that the speed of the hockey player is constant? Is the velocity of the player constant? How do you know?

Is the hockey player accelerating as he moves around the circle?

If students are familiar with vectors, show them the diagram below for an object that moves in a circle with constant speed v. Ask them to describe how the acceleration of the hockey player changes. Figure 1:





Additional Resources:

- http://www.physics.ucla.edu/demoweb/demomanual/mechanics/kinematics/acceleration _down_an_inclined_plane.html
- http://www.utm.edu/departments/cece/cesme/psam/PSAM/psam17.pdf
- http://www.quora.com/What-is-the-maximum-speed-ice-hockey-players-reach
- http://www.real-world-physics-problems.com/physics-of-hockey.html
- http://www.hockeyplayer.com/paid/publish/article_359.shtml
- http://www.laurastamm.net/Power-Skating-Crossovers.aspx

Student Worksheet for Kinematics

Experiment Title:	Date:	Name:
Student Hypothesis or Question	n:	
Materials: - safety goggles - hard rubber ball (if available, - grooved track 1 m long (if ur - two books of the same thickn - measuring tape or meter stick - two stopwatches	navailable, substitute a boness	pard with cardboard taped to the end to create a ramp)
Procedure: (Include all safety p	procedures.)	
Conclusion:		
SCIENCE OF NHL HOCKE	EY: Newton's Three La	ws of Motion
Video & Source available at:	http://www.nbclearn.c	om/portal/site/learn/science-of-nhl-hockey

Objective:

1.Students will design and carry out a demonstration of Newton's first law of motion. 2.Students will design and carry out an investigation of Newton's second law of motion. 3.Students will design and carry out a demonstration of the conservation of momentum and explain its relation to Newton's third law of motion.



Introduction Notes:

Science of NHL Hockey: Newton's Three Laws of Motion

-

Subject Area: Physical Science

Lesson Title: Newton's Three Laws of Motion

Suggested Prior Knowledge: concepts of mass, velocity, and acceleration; lab techniques of measuring mass, distance, and time. Note that students might more easily grasp the concepts in this video if they have already viewed the video *Kinematics*.

Purpose: This video focuses on the actions involved in playing the game of hockey. Although all sports are subject to Newton's three laws of motion in one way or another, hockey shows especially clear examples. The activity will help students to understand Newton's three laws of motion and how they relate to the conservation of momentum.

Key Vocabulary:

conservation of momentum—constancy of the total moment of a closed system; derived from Newton's third law.

impulse—force applied over a time interval; equal to the change in momentum, or the product of mass and change in velocity, of an object the force acts on.

inertia—resistance to a change in motion of a moving object or a stationary object.

momentum—the product of an object's mass and its velocity.

Newton's first law of motion—Objects remain at rest or in motion with a constant speed and direction unless acted upon by a force.

Newton's second law of motion—The net force applied to an object is equal to the product of the object's mass and its acceleration; F = ma (net force = mass × acceleration).

Newton's third law of motion—Every action has an equal but opposite reaction. For instance, in a collision between two objects, the forces acting are equal in magnitude and opposite in directions: F1 = -F2.

Objectives:

- Students will design and carry out a demonstration of Newton's first law of motion.
- Students will design and carry out an investigation of Newton's second law of motion.
- Students will design and carry out a demonstration of the conservation of momentum and explain its relation to Newton's third law of motion.

Materials:

- Safety goggles
- Metal toy car
- Book
- Hockey puck or coins
- Skateboard
- Bricks
- Spring scale
- Stopwatches
- Meter stick



- Tape or markers
- Newton's cradle (or equivalent)

Procedure:

1. After students view the video, discuss with them Newton's three laws of motion. Have volunteers summarize the presentation of inertia and conservation of momentum in the video, and point out examples of the three laws as they view the video again—perhaps in slow motion or with the sound muted. Emphasize to students that a hockey puck obeys Newton's laws, just as colliding hockey players do. (The same is true for a ball in other sports, such as basketball, soccer, golf, or jai alai.) Focus on exploring each of the laws, using the following questions to start the discussion:

How might a struck hockey puck demonstrate Newton's first law of motion?

How might two hockey players demonstrate Newton's second law of motion?

According to Newton's third law of motion, how are forces applied between two colliding hockey players?

What is momentum?

What does it mean that momentum is conserved?

- 2. Lab protocols should be followed, incorporating safety equipment. Goggles must be worn at all times.
- 3. Guide students to design investigations for Newton's three laws. Allow students to examine the materials available. Alternately, you might be able to borrow field hockey or street hockey equipment from the physical education department for students to use in the gym, cafeteria, or parking lot. Following are some questions to help focus students' plans:

What is true of a moving object? How can this tendency be shown by stopping an object

What law describes the behavior of a body acted on by a force?

How can this law be demonstrated with a constant force and constant mass?

What is true of a collision between bodies?

What will happen when bodies with unequal masses and equal velocities collide?

What will happen when bodies with unequal masses and unequal velocities collide?

- 4. The procedures suggested here are simple demonstrations of Newton's three laws. However, students may prefer to construct other activities using these materials. For instance, to demonstrate Newton's first law, a student walks at a constant, moderate speed and tries to drop a hockey puck onto a piece of tape on the floor. Dropping the puck when it is directly over the tape will not work. The student must drop the puck slightly before reaching the mark. The horizontal motion of the puck is unaffected by its vertical motion. Students should be encouraged to think of alternative ways this or other simple equipment they have can be used to demonstrate Newton's laws.
- 5. Students may choose to use the toy car, hockey puck (or coins), and book for a simple demonstration of inertia. One student places the puck on top of the toy car and gently pushes it toward the book. The car will stop when it hits the book, but the puck will continue. Students record and analyze their results to explain how the law of inertia (Newton's first law) is involved.
- 6. The skateboard and bricks comprise a body with a fixed mass. The spring scale allows students to measure a variable accelerating force. The meter stick, markers, and stop watches are needed to measure the speed of the accelerated body and the time the force acts. Students will need to practice pulling the loaded skateboard with a constant force. They can measure the final speed of the skateboard or its average speed while it is accelerating. Either method will demonstrate Newton's second law.
- 7. Newton's cradle demonstrates conservation of momentum for elastic collisions, because the steel spheres are highly elastic (unlike two colliding hockey players). The simplest case is seen by using only two spheres, and drawing them back the same distance before releasing them. The two have equal and opposite momenta, which are reversed during the collision. (It is not necessary to measure absolute speeds with Newton's cradle. Students can judge relative speeds by comparing the distance a sphere swings before a collision to the distance of recoil after a collision.) A slightly more complex situation has two spheres with unequal velocities, and again the velocities are reversed during the collision. A large number of combinations of mass and velocity are possible if more spheres are used for the collisions, and students should be able to verify that momentum is conserved in all



cases. They should be able to give a clear explanation of how conservation of momentum is related to Newton's third law.

8. In areas where students are not involved with ice hockey, students could video record groups playing a few minutes of their favorite sport(s) and then analyze the motion in the video for examples of the three laws of motion and compare those with the motion in the ice hockey video.

Additional Resources:

http://www.mdsci.org/science-encounters/Demo/CupandCoin.html

Student Worksheet for Newton's Three Laws of Motion

- http://www.teachersdomain.org/resource/lsps07.sci.phys.maf.airtrack/
- http://www.usahockeymagazine.com/article/2009-08/science-hockey
- http://www.dummies.com/how-to/content/physics-understanding-newtons-first-law-of-motion.html
- http://science.discovery.com/videos/100-greatest-discoveries-shorts-laws-of-motion.html

Experiment Title:	_Date:	_Name:	
Student Hypothesis:			_
Materials: - Safety goggles - Metal toy car - Book - Coins - Skateboard - Bricks - Spring scale - Stopwatches - Meter stick - Tape or markers - Newton's cradle (or equivalent)			
Procedure:			
Wear safety goggles for all lab work.			
Data and Observations:			
Analysis of Data:			
Conclusions:			



SCIENCE OF NHL HOCKEY: Projectile Motion

Video & Source available at: http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey

Objective:

1.Students will differentiate among three common kinds of motion in two dimensions. 2.Students will design and carry out an investigation to measure linear and angular velocity. 3.Students will design and carry out an investigation to determine the shape of a projectile's path.

Introduction Notes:

Science of NHL Hockey: Projectile Motion

Subject Area: Physical Science
Lesson Title: Projectile Motion

Suggested Prior Knowledge: concepts of velocity and angles; lab techniques of measuring velocity and angles. Note that students might more easily grasp the concepts in this video if they have already viewed the video *Newton's Three Laws of Motion*.

Purpose and Introduction: This video uses the hockey technique of a wrist shot to give students an understanding of the relation between uniform linear motion and uniform angular motion, and how a projectile moves.

Key Vocabulary:

angular motion—movement of an object around a fixed point or axis.

angular velocity—the number of rotations an object makes around a fixed point or axis per unit of time.

linear motion—movement of an object along a straight line.

motion—change in the position of an object with respect to time.

projectile motion—movement of an object through space along a path determined by an initial velocity and the effect of gravity and air resistance.

Objectives:

- Students will differentiate among three common kinds of motion in two dimensions.
- Students will design and carry out an investigation to measure linear and angular velocity.
- Students will design and carry out an investigation to determine the shape of a projectile's path.

Materials:

- safety goggles
- 2 stopwatches
- tape measure
- small flexible tubing
- adapter to faucet
- nozzle
- catch pan (or sink)
- ring stand
- clamps
- clear plastic sheet



- erasable marker
- paper
- pencil

Procedure:

1. Before students watch the video, ask them what projectiles are and how they might describe the path of a projectile. Most will likely describe something like a bullet and a path that shoots straight out, and keeps going. After students watch the video, lead a discussion in which they can correct their own thinking about projectile motion. Have volunteers describe the other kinds of motion in the video and compare and contrast them. Use questions such as these to prompt discussion:

What is an example of linear motion?

What is an example of angular motion?

What is a projectile?

What path does a projectile follow?

- 2. Lab protocols should be followed incorporating safety equipment. Goggles must be worn at all times.
- 3. Guide students to design an investigation that will allow them to observe the connections among linear, angular, and projectile motion. Questions such as the following can help focus students' plans and guide them:

What are the units of linear velocity?

How do you measure linear velocity?

If an object rotates around its axis once per second, what is its angular velocity in rotations/second?

How do you measure angular velocity?

How can you record the path of a projectile?

How can you measure the velocity of a projectile?

Comparing Linear and Angular Speed

- 4. One way students might explore linear and angular speed is with one student spinning slowly in the center of an open space (a football field, for example). The student should make one complete rotation every 12 seconds (one quarter of a rotation in 3 seconds, or 0.083 rotation/second). Make sure he or she does not get dizzy.
- 5. Then two students could link arms with the spinning student, one on each side, and walk in small circles. Expand the line of students by having more pairs of students link arms, while the student at the center spins at the same rate. One student with a stopwatch measures the angular velocity of rotation. (Make sure that all parts of the line move with the same angular speed *f*.)
- 6. More students could link arms until the circle grows too large for the outermost students to keep up easily (or no other students are available). Students should make two complete circles at maximum size. The two outermost students should then break away from the others and walk in a straight line at the same speed. (They may need to follow one of the lines marked on the field.) A second student with a stopwatch measures the time they need to cover a predetermined distance.
- 7. Measure the radius of the circle traveled by the students at the end of the line. Calculate the speed of the outermost students using their angular speed, the radius of the circle, and the formula $v = 2\pi rf$. Students compare the speed calculated for the outermost students walking in a circle to the linear speed measured directly. (They should be equal).

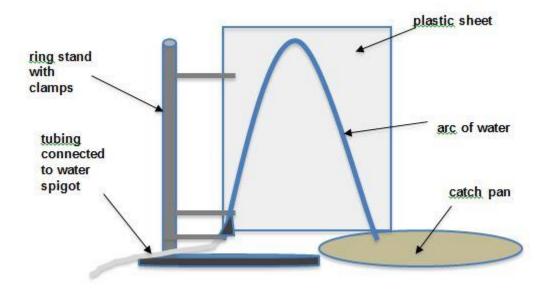
Graphing Projectile Motion

8. Brainstorm ways with students that they might be able to document the path of a projectile so that they could then transfer the patterns to graph paper. One possibility students might envision is to connect tubing to a faucet to fashion a hose and clamp it to a ring stand near its base. They can adjust the tubing so that it is pointed upward and produces an arc of the size that would fit on a regular sheet of graph paper (about 20 cm wide and about 30 cm high). Elicit from students where the speed of the water is greatest (at the bottom of the arc) and where it is



least (at the top of the arc).

9. Students could then clamp a plastic sheet vertically and align it close to the stream of water. This allows them to trace the path of the water on the dry side of the plastic with the marker.



- 10. With the water off, students could attach a sheet of graph paper to the dry side of the plastic, making sure that the paper is vertical. They trace the arc onto the graph paper. By folding the graph paper students should be able to recognize that it is symmetrical. If they do not know the name of the figure, remind them that the video identified the path of a projectile as a parabola.
- 11. To follow up this investigation, have students determine what initial angle for the stream of water produces the greatest horizontal range. Have each group sketch all the paths they try on a single piece of paper and compare its sketch to sketches by other groups. Then ask the groups what angle a hockey goalie should use in order to get maximum range when throwing a puck (The puck should leave his hand with a path 45 degrees from the vertical).

Additional Resources:

- http://www.korpisworld.com/Mathematics/diversions/activity_for_angular_velocity.htm
- http://www.uwstout.edu/physics/upload/UNIFORM-CIRCULAR-MOTION.pdf
- http://www.srri.umass.edu/sites/srri/files/mop_samples/ActAT016.pdf
- http://teachingphysics.wordpress.com/2009/03/01/projectile-motion-activity/
- http://www.srri.umass.edu/sites/srri/files/mop_samples/ActAT009.pdf
- http://jersey.uoregon.edu/vlab/Cannon/
- http://pdgusers.lbl.gov/~aerzber/aps_motion.html#projectile
- http://www.livestrong.com/article/447525-projectile-motion-of-golf-balls/
- http://mrfizzix.com/basketball/index.htm

Student Worksheet for Projectile Motion

Experiment Title:	_Date:	_ Name:	
Student Hypothesis:			



Materials:	
Wear safety goggles for all lab work.	
Data and Observations:	
Analysis of Data:	
Conclusion:	
SCIENCE OF NHL HOCKEY: Statistics & Averages	

Objective:

1. Students will be able to distinguish between numerical and non-numerical data. 2. Students will be able to distinguish among the mean, median, and mode of a data set. 3. Students will design and carry out an investigation to collect a set of data and find the mean, median, mode, and range of a set of data.

Video & Source available at: http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey

Introduction Notes:

Science of NHL Hockey: Statistics & Averages

Subject Area: Math, Science
Lesson Title: Statistics & Averages

Suggested Prior Knowledge: concepts of data sets; techniques of collecting data.

Purpose and Introduction: The video uses statistical data collected about NHL goal tenders to give students an understanding of the measures of central tendency of a data set: mean, median, and mode. The activities enable students to apply these concepts to their own data sets.

Key Vocabulary:

mean—the sum of a set of numbers divided by the number of members of the set.

median—the central value in a list of numbers arranged in ascending or descending order; for a set of numbers with an odd number of members, the mean of the two central numbers.

mode—the member that occurs most often in a set of data.

 $\it range$ —the difference between the least member and the greatest member in a set of numbers.

statistics—the scientific application of mathematical principles to the collection, analysis and presentation of numerical data.

Objectives:

- Students will be able to distinguish between numerical and non-numerical data.
- Students will be able to distinguish among the mean, median, and mode of a data set.



 Students will design and carry out an investigation to collect a set of data and find the mean, median, mode, and range of a set of data.

Materials:

- safety goggles (optional)
- deck of playing cards
- tape measure (optional)
- graph paper

Procedure:

- 1. Review the video with students and elicit from volunteers how to determine the mean, median, and mode of a data set using examples from the video. Introduce the idea of non-numerical data and contrast it to numerical data. Use questions such as the following to prompt discussion:
 - What are some examples of non-numerical data?
 - Can you find the mean, median, and mode of a set of non-numerical data?
 - What are some examples of numerical data from hockey, baseball, or other sports?
 - Why is it useful to have a single value (mean, median, or mode) to represent a set of data?
- 2. Lab protocols should be followed, incorporating safety equipment. If conducted in a science lab, use your discretion on whether or not students are to wear cover goggles.
- 3. Allow students to examine the materials and then design an investigation that will allow them to collect a data set and derive its range, mean, median, and mode. Consider having students work individually or in small groups and compare their computed values. The following steps describe examples of non-numerical and numerical data, but students should be encouraged to think of others. Use your discretion about whether distance of the students' homes to the school would produce a varied enough data set. If not, they may choose to work with sports statistics researched on the Internet (see Additional Resources). Students might think about using personal characteristics such as height or arm span or birth date, but steer them away from data sets that might be sensitive or embarrassing to a few. Questions such as the following can help focus students' plans:
 - How do you record a set of data?
 - What is the first step in finding the median of a set of data?
 - What is the mode of a set of data?
 - How do you find the mean of a set of data?
 - What is the range of a set of data?

Numerical and Non-numerical Data

- 4. Remove all face cards and jokers from the deck of cards, and then deal nine cards face up. Record the numbers and suits of the cards on the board as they are drawn. Then direct students to find the mode, median, and mean for the values. If needed, refer to the video to refresh students' memories. Students could write down the nine cards in increasing numerical order to find the range and the mode for numerical values (if there is a mode) and do calculations for to find the median and the mean. Elicit from students whether mode, median, and mean are equal, and whether there is any relationship among them.
- 5. Next, have students characterize the suits for the set of cards. The suits are non-numerical, so while there may be more than one mode for the suits of the nine cards, there is no mean or median for the suits. Students calculate what percent of cards belong to each suit. (The total should be 100%.)

Student-Generated Data

6. Have students brainstorm a set of data they might generate, such as height, number of windows in each person's home, number of pens and pencils in each person's backpack, etc. Again, steer students away



from data sets that might be sensitive or embarrassing for a few students. On the board, write down the data for all students in the class.

- 7. Again, have students arrange and analyze the data to find the range, mode, mean, and median of the dataset. Elicit from students whether they expect mean, median, and mode to be equal. Ask questions such as the following:
- When is the median of a data set a better way to characterize the set than the mean?
- What percent of values are above the mean?
- 8. To follow up this investigation, have students prepare histograms from the distance data (or from hockey or other sports statistics). Have a class discussion on how closely the data resemble a normal distribution.

Additional Resources:

- http://regentsprep.org/REgents/math/ALGEBRA/AD3/DataTeacher.htm
- http://esa21.kennesaw.edu/activities/stats/stats.pdf
- http://www.sciencebuddies.org/science-fair-projects/project_data_analysis_summarizing_data.shtml
- http://www.regentsprep.org/Regents/math/algtrig/ATS2/NormalLesson.htm
- http://www.hockeydb.com/
- http://espn.go.com/nhl/statistics
- http://www.ncaa.com/stats/icehockey-women/d1

Student Worksheet for Statistics & Averages

Experiment Title:	Date:	Name:	
Student Hypothesis:			
Materials: - safety goggles (optional) - deck of playing cards - tape measure (optional) - graph paper			
Procedure:			
Data and Observations:			
Analysis of Data:			
Conclusion:			

The Connection

SCIENCE OF NHL HOCKEY: Force, Impulse & Collisions

Video & Source available at: http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey

Objective:

1.Students will design and carry out a procedure to measure the acceleration of a body produced by a known impulse. 2.Students will design and carry out an investigation to measure momentum and energy transfer in an elastic collision. 3.Students will design and carry out an investigation to measure momentum and energy transfer in an inelastic collision.

Introduction Notes:

Science of NHL Hockey: Force, Impulse, and Collisions

Subject Area: Physics

Lesson Title: Force, Impulse, and Collisions

Suggested Prior Knowledge: concepts of mass, velocity, momentum, acceleration, force, and Newton's second law of motion; lab techniques of measuring mass and velocity. Note that students might more easily grasp the concepts in this video if they have already viewed the video *Newton's Three Laws of Motion*.

Purpose and Introduction: This video focuses on the interactions of the hockey stick and the puck to advance the understanding of force, impulse, and collisions. The activity will help students to understand the concept of impulse and to observe the difference between elastic and inelastic collisions.

Key Vocabulary:

velocity—the change of an object's position over time.

elasticcollision—an impact of bodies resulting in a change in velocities and a transfer of kinetic energy without loss

force—an influence on an object that causes a change in velocity or shape.

impulse—a force multiplied by the amount of time during which it acts.

inelastic collision—an impact of bodies resulting in a change in velocities and a transfer of kinetic energy with some loss.

Objectives:

- Students will design and carry out a procedure to measure the acceleration of a body produced by a known impulse.
- Students will design and carry out an investigation to measure momentum and energy transfer in an elastic collision.
- Students will design and carry out an investigation to measure momentum and energy transfer in an inelastic collision

Materials:

- Safety goggles
- Skateboard
- Bricks
- Standard masses
- Fixed pulley
- String
- Stopwatch



- Tape
- Marker
- Meter stick
- Blocks of different masses
- Ring stands
- Modeling clay

Procedure:

1. After students review the video, discuss with students the fundamentals of collisions. Elicit from volunteers examples and explanations of the concepts of impulse, momentum, and energy. Ask students to critically analyze the video's definition of force (the push or pull that can accelerate an object by changing its velocity or changing its shape) and suggest how it might be improved. Guide them to realize that the original definition implies that changing the shape of an object is a way of accelerating it. Ask students to recast the definition so it does not foster misconceptions, such as "a force is a push or pull that can change the shape of an object or accelerate it, which means change its velocity." Use questions such as these to progress students' discussion:

How is impulse related to momentum?

What quantity is always conserved in a collision?

What quantity may not be conserved in a collision?

- 2. Lab protocols should be followed, incorporating safety equipment. Goggles must be worn at all times.
- 3. Guide students to design an investigation that is valid and that allows them to observe the conservation of momentum. The equipment will allow them to measure mass and velocity, which should be familiar lab processes for most. Students may need a hint that producing a constant horizontal force with standard masses requires using the fixed pulley. Some questions to help focus students' plans and guide them include the following:

How can you measure impulse?

How can you measure momentum?

What investigation can you design to determine how impulse and momentum are related?

What are the characteristics of an elastic collision?

What are the characteristics of an inelastic collision?

How can you measure momentum for a body on a string?

- 4. Remind students that the video treats impulse as the product of force and time, $F\Delta t$. The video does not equate impulse to change in momentum, but it does state that a force changes the motion of an object. So elicit from students that an impulse acting on an object must therefore change its momentum. The standard masses are a convenient way to provide a constant force. They can be suspended from a string that runs over a pulley at the edge of a table. Make sure students arrange the pulley so that the string pulling the skateboard is horizontal. Students should load the skateboard with enough bricks that it can be accelerated on the level for several seconds using the available weights.
- 5. Students might develop a procedure for measuring momentum for horizontal motion such as the following, where three students are needed to measure velocity. One measures the time the skateboard accelerates, the second marks the point where the skateboard finishes accelerating, and the third measures the time the skateboard takes to roll from that point to the end of a predetermined course. The distance along the course and the mass of the loaded skateboard can be measured either before or after the velocity measurement. Students should find that the momentum they have measured for the skateboard is equal to the impulse they have measured: $F\Delta t = mv$.
- 6. Remind students that, as discussed in the video, the force acting during a collision is an impulse that lasts a very short time. Have students cite an example from the video that explains why a collision between marbles is elastic (a collision in which very little energy is lost). Then instruct students to develop a procedure for showing



conservation of momentum for an elastic collision involving objects suspended on strings. They might use the materials to show the simplest case involving two blocks with the same mass. One block is drawn back and strikes the other, stationary, block. Point out to students that it is not necessary to measure velocity directly to show that energy and momentum are conserved for an elastic collision. It is only necessary to show that m1v1i = m2v2f. Because the two masses are equal, the distance of the initial swing should be equal to the recoil distance.

- 7. To show conservation of energy and momentum in the general case, students need to verify the conservation equation m1v1i = m1v1f + m2v2f. If masses are unequal, the initial moving block will either recoil or continue in the same direction after the collision, so v1 fand v2 f may not be in the same direction. Again, students do not need direct measurements of initial and final velocities. Because the arcs the blocks swing through are small, velocity is proportional to the initial swing or the recoil distance. Regardless of the relative sizes of the two masses, energy should be conserved: m1v1i2 = m1v1f2 + m2v2f2.
- 8. Review the portion of the video that shows a hockey puck striking a goalie's pad as an example of an inelastic collision (a collision in which kinetic energy is lost). Then instruct students to develop a procedure for showing conservation of momentum for an inelastic collision between objects suspended on strings. You might hint that the simplest case is the same as that for an elastic collision, one involving two blocks with the same mass. To produce an inelastic collision, students could attach a small piece of modeling clay to each block. When the moving block strikes the stationary block, the two stick together. The conservation of momentum requires that the final velocity be half the initial velocity. Therefore the recoil distance will be half the initial swing distance.

Students should be able to explain that half of the initial kinetic energy is lost in this collision: m1v1i2 = 2(m1v1f2 + m2v2f2). Point out that inelastic collisions with unequal masses are still subject to the conservation of momentum. Again, absolute velocities are not needed to obtain correct results, but the ratios of velocities are needed.

9. As a follow-up exercise, have students work in pairs to analyze a collision of two hockey players. The two players both have a mass of 85 kg, and they have velocities of 4.5 m/s and 9.0 m/s, at right angles to each other. If one checks the other and both run into the boards together, what is their velocity before they hit the boards? How much energy is lost when they collide? How much energy is lost when they hit they boards? Consider varying the values and have pairs share and compare their work. Or have small groups work at the board, "racing" one another to the final answer. The winners are those who finish the quickest *and* show the most complete, accurate steps to their answer.

Additional Resources:

- http://www.mme.wsu.edu/~ssl/pubs/imac2008c.pdf
- http://serc.carleton.edu/sp/compadre/demonstrations/examples/19119.html
- http://www.yenka.com/activities/Elastic_and_Inelastic_Collisions_-_Activity/
- http://www.education.com/science-fair/article/elastic-collisions/
- http://www.exploratorium.edu/hockey/shooting1.html
- http://www.physicsclassroom.com/class/momentum/u4l1b.cfm

Student Worksheet for Force, Impulse, and Collisions

Experiment Title:	Date	:Name: _	
Student Hypothesis:			
Matarials			

Materials:

- Safety goggles
- Skateboard



- Bricks
- Standard masses
- Fixed pulley
- String
- Stopwatch
- Tape
- Marker
- Meter stick
- Blocks of different masses
- Ring stands
- Modeling clay

Procedure:

Wear safety goggles for all lab work.

Data and Observations:

Analysis of Data:

Conclusion:

SCIENCE OF NHL HOCKEY: Hockey Geometry

Video & Source available at: http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey

Objective:

1. Students will investigate some properties of quadrilaterals and circles. 2. Students will investigate the angles occupied (subtended) by objects and how those change with distance. 3. Students will design and carry out an investigation of the relation of angle of incidence to angle of reflection.

Introduction Notes:

Science of NHL Hockey: Hockey Geometry

Subject Area: Geometry, Physics, and Trigonometry

Lesson Title: <u>Hockey Geometry</u>

Common Core State Standards for Mathematics

High School: Geometry

Suggested Prior Knowledge: concepts of angles and triangles; lab techniques for measuring angles and distances

Purpose and Introduction: This video focuses on the geometry of the perfect hockey shot—the angle that gets the puck into the goal. The activity will give students an understanding of the basic properties of angles and the basic properties of triangles that can be applied to the game of hockey. Students who are not ready for basic trigonometry concepts might focus only on the quadrilaterals and circles.



Key Vocabulary:

angle—two rays with the same endpoint, the vertex.

angle of incidence—the angle that a straight line, ray of light, etc., meeting a surface, makes with a perpendicular to the surface.

angle of reflection—the angle that a straight line, ray of light, etc., reflecting off a surface, makes with a perpendicular to the surface.

circle—a closed curve in which all points are the same distance from the center.

quadrilateral—a closed figure formed by four line segments linked end to end; a four-sided polygon.

right triangle—a triangle in which one angle is a right angle.

triangle—a closed figure formed by three line segments linked end to end; a three-sided polygon.

Objectives:

- Students will investigate some properties of quadrilaterals and circles.
- Students will investigate the angles occupied (subtended) by objects and how those change with distance.
- Students will design and carry out an investigation of the relation of angle of incidence to angle of reflection.

Materials:

- safety goggles
- compass
- rectangular block
- cylindrical can
- tennis ball
- 30 cm loop of string
- pushpins
- cork board
- ruler
- framing square or equivalent
- ripple tank
- tape
- straightedge
- pencil
- mirror
- laser or slide projector
- chalk dust or smoke/fog machine

Procedure:

- 1. As students view the video, have them jot down the geometry-related terms they hear. Ask volunteers to create operational definitions of the terms using the video content as their base. Then, draw a diagram to illustrate angle of incidence and angle of reflection. Use questions such as the following to encourage class discussion:
 - What are some examples of circles encountered in everyday life?
 - What are some examples of quadrilaterals encountered in everyday life?
 - What are some examples of angles encountered in everyday life?
 - What are some examples of triangles encountered in everyday life?
 - A hockey goalie wants to make an attacker's angle of access as small as possible. What are examples of angles you would like to be as small as possible?
 - What angles would you like to be as large as possible?
 - How would you describe the motion of a ball as it is bounced once between two people?
- 2. Lab protocols should be followed, incorporating safety equipment. Goggles must be worn at all times.
- 3. Encourage students to speculate on geometric relations and ways of exploring them with the apparatus supplied. The following questions can help focus their plans and guide them:
 - How can you construct a circle?
 - How can you construct a trapezoid, a parallelogram, or a rectangle?
 - What are the sine and cosine functions for a right triangle?
 - What relationships exist between sines and cosines?
 - How can you measure the angle occupied (subtended) by an object?



- How does the angle occupied by an object vary with distance?
- How does a reflected wave resemble the motion of a bouncing ball?
- How can you measure the angle of incidence and angle of reflection for a wave?
- 4. Most students know that they can use a compass to construct a circle. Ask them to speculate how they can use a loop of string to construct a circle. If they need a hint, suggest they use a pushpin and the cork board as well. Then, ask them how can they construct a circle with a diameter half that of the one they have without changing the loop of string.
- 5. Have students explore the properties of quadrilaterals by constructing them with the loop of string, the cork board, and four pushpins. If no vertices are predetermined, an infinite number of quadrilaterals are possible, and students should recognize that the only common property is that all have the same perimeter. If students choose two vertices, the possibilities for the remaining two vertices are restricted. Students should determine what figures they can make (trapezoid, parallelogram, or rectangle), and what figures they cannot make. If students choose three vertices, ask them where the fourth can be located and how they can construct a square.
- 6. Ask students who grasp basic trigonometry concepts to make a hypothesis about the relation of the cosine and sine of an angle to the cosine and sine of its complement. Encourage them to use the straightedge and the short leg of the framing square to construct right triangles containing the angles 15°, 30°, 45°, 60°, and 75°. By calculating the sine of each angle (opposite: hypotenuse) and the cosine (adjacent: hypotenuse) students can demonstrate that the sine of an angle is equal to the cosine of its complement.
- 7. Remind students that a hockey player likes to be directly in front of the goal and as close as possible when he or she takes a shot. In that position, the goal subtends the largest possible angle. A goalie's task is to block as much of that angle as possible. Students could use the block, can, and tennis ball to explore how the angle an object occupies depends on its distance from an observer and on the way it is oriented. For instance, students might measure angles occupied by the objects at distances of 10, 30, and 50 cm and with two or three different angles of orientation.
- 8. Many students will recognize that for a ball bouncing on the ground, or a hockey puck banking off the boards, the angle of incidence is equal to the angle of reflection. However, they are likely to think of the angles the path of the ball makes with the ground. Explain that the angles of incidence and reflection are defined with respect to the perpendicular to the surface.

Help students make the connection to wave behavior, as it may not be obvious. Use a laser beam (or slide projector beam) with smoke or chalk dust as a demonstration. A beam of light striking a mirror and then reflecting in a different direction should remind students of the path of the puck seen in the hockey video.

Students who have seen a ripple tank before (or who have watched waves in a pool or bathtub) may know what to expect. Others will need a demonstration of reflection of a straight wave front. To measure the angles of incidence and reflection, students first choose a point on the side of the ripple tank so that they can construct a perpendicular to the side (using the framing square). Then they need to use the framing square to locate the perpendiculars for the incident and reflected wave fronts.

9. After the students have finished their investigation, present this challenge problem to them: A mirror is attached to a wall vertically. A hockey player 1.8 meters tall stands 2 meters from the mirror. If he can see nothing higher than the top of his head, and nothing lower than his feet, how tall is the mirror? How tall would the mirror need to be if he stood 5 meters away from it? Ask for volunteers to lead a class discussion. To help them understand the situation, encourage students to draw a diagram.

Additional Resources:

- http://www.uen.org/Lessonplan/preview.cgi?LPid=19845
- http://www.youtube.com/watch?v=gwmq6u3nuh8
- www.goalrobber.com/links_39_2505472894.pptx
- http://biology.wsc.ma.edu/Math251/node/15
- http://icehockey.isport.com/icehockey-videos/play/geometry-of-a-slap-shot-10961



Student Worksheet for Hockey Geometry

Experiment Title:	Date:	_Name:
Student Hypothesis:		
Materials:	safety goggles compass rectangular block cylindrical can tennis ball 30 cm loop of string pushpins cork board ruler framing square or equivalent ripple tank tape straightedge pencil	
Procedure:		
Wear safety goggles for	r all lab work.	
Data and Observations:		
Analysis of Data:		
Conclusion:		

SCIENCE OF NHL HOCKEY: Newton's Three Laws of Motion

Video & Source available at: http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey

Objective:

1. Students will design and carry out a demonstration of Newton's first law of motion. 2. Students will design and carry out an investigation of Newton's second law of motion. 3. Students will design and carry out a demonstration of the conservation of momentum and explain its relation to Newton's third law of motion.

Introduction Notes:



Science of NHL Hockey: Newton's Three Laws of Motion

Subject Area: Physics

Lesson Title: Newton's Three Laws of Motion

Suggested Prior Knowledge: concepts of mass, velocity, and acceleration; lab techniques of measuring mass, distance, and time. Note that students might more easily grasp the concepts in this video if they have already viewed the video *Kinematics*.

Purpose and Introduction: This video focuses on the actions involved in playing the game of hockey. Although all sports are subject to Newton's three laws of motion in one way or another, hockey shows especially clear examples. The activity will help students to understand Newton's three laws of motion and how they relate to the conservation of momentum.

Key Vocabulary

conservation of momentum—constancy of the total moment of a closed system; derived from Newton's third law.

impulse—force applied over a time interval; equal to the change in momentum, or the product of mass and change in velocity, of an object the force acts on.

inertia—resistance to a change in motion of a moving object or a stationary object.

momentum—the product of an object's mass and its velocity.

Newton's first law of motion—Objects remain at rest or in motion with a constant speed and direction unless acted upon by a force.

Newton's second law of motion—The net force applied to an object is equal to the product of the object's mass and its acceleration; F = ma (net force = mass × acceleration).

Newton's third law of motion—Every action has an equal but opposite reaction. For instance, in a collision between two objects, the forces acting are equal in magnitude and opposite in directions: F1 = -F2.

Objectives:

- Students will design and carry out a demonstration of Newton's first law of motion.
- Students will design and carry out an investigation of Newton's second law of motion.
- Students will design and carry out a demonstration of the conservation of momentum and explain its relation to Newton's third law of motion.

Materials:

- Safety goggles
- Hockey puck or bean bag
- Chalk
- Skateboard
- Bricks
- Spring scale
- Stopwatches
- Meter stick
- Tape or markers
- Ring stands
- String
- Blocks



- Spring
- Thread
- Scissors

Procedure:

- 1. After students view the video, discuss with them Newton's three laws of motion. Have volunteers summarize the presentation of inertia and conservation of momentum in the video, and point out examples of the three laws as they view the video again—perhaps in slow motion or with the sound muted. Emphasize to students that a hockey puck obeys Newton's laws, just as colliding hockey players do. (The same is true for a ball in other sports, such as basketball, soccer, golf, or jai alai.) Focus on exploring each of the laws:
 - How might a struck hockey puck demonstrate Newton's first law of motion?
 - How might two hockey players demonstrate Newton's second law of motion?
 - According to Newton's third law of motion, how are forces applied between two colliding hockey players?
 - What is momentum?
 - What does it mean that momentum is conserved?
- 2. Lab protocols should be followed incorporating safety equipment. Goggles must be worn at all times.
- 3. Guide students to design investigations for Newton's three laws. Allow students to examine the materials available. Alternately, you might be able to borrow field hockey or street hockey equipment from the physical education department for students to use in the gym, cafeteria, or parking lot. The following are some questions to help focus students' plans:
 - What is true of a moving object? How can this tendency be shown by dropping an object?
 - What law describes the behavior of an object acted on by a force?
 - How can this law be demonstrated with a constant force and variable mass?
 - What is true of two bodies forced apart by an expanding spring?
- 4. The procedures suggested here are simple demonstrations of Newton's three laws. However, students may prefer to construct other demonstrations or activities using these materials. For instance, the hockey puck can be placed on the skateboard for a demonstration of Newton's first law. If the skateboard is rolled and brought to a stop, the puck will continue in motion and slide off the skateboard. Students should be encouraged to think of alternative ways the equipment they have can be used to demonstrate Newton's laws.
- 5. The hockey puck (or beanbag) and chalk are useful for a simple demonstration of inertia. One student walks at a constant, moderate speed and tries to drop the puck onto a chalk mark. Dropping the puck when it is directly over the chalk mark will not work. The student must drop the puck slightly before reaching the mark. Students should be able to observe that the puck hits the mark at the same time the student passes the mark. Students record and analyze their results to explain how the law of inertia (Newton's first law) is involved.
- 6. Students might demonstrate Newton's second law using the skateboard and bricks to form a body with a fixed mass. Encourage students to use the spring scale to measure the variable accelerating force. They can use the meter stick, markers, and stop watches to measure the speed of the accelerated body and the time the force acts. Students might need to practice pulling the loaded skateboard with a constant force. They can measure the final speed of the skateboard or its average speed while it is accelerating. Either method will demonstrate Newton's second law.
- 7. Like two colliding hockey players, unequal masses forced apart by an expanding spring provide a simple example of conservation of momentum. Suggest students suspend two blocks on strings of the same length from the ring stands, as pendulums. Then instruct students to compress the spring and tie it with thread to maintain the compressed state. Students should then firmly attach the spring to the side of one of the blocks between the two blocks, being sure to measure the mass of that block including the spring. Students should then cut the thread without disturbing the blocks, which may take practice. Students should recognize that the more massive block will have the lesser velocity. If the arcs the blocks swing are small, the distance each block recoils is proportional



to its velocity. Students should be able to verify that momentum is conserved, and they should be able to give a clear explanation of how conservation of momentum is related to Newton's third law.

8. As a follow-up activity, have students research deceleration in skating. How does a skater increase friction to come to a sudden stop? What is the maximum deceleration possible? Students can prepare posters or slide shows and share them with the class.

Additional Resources:

- http://www.mdsci.org/science-encounters/Demo/CupandCoin.html
- http://www.teachersdomain.org/resource/lsps07.sci.phys.maf.airtrack/
- http://www.usahockeymagazine.com/article/2009-08/science-hockey
- http://www.dummies.com/how-to/content/physics-understanding-newtons-first-law-of-motion.html
- http://science.discovery.com/videos/100-greatest-discoveries-shorts-laws-of-motion.html

Student Worksheet for Newton's Three Laws of Motion

Experiment Title:	Date:	Name:
Student Hypothesis:		
Materials: - Safety goggles - Bean bag - Chalk - Skateboard - Bricks - Spring scale - Stopwatches - Meter stick - Tape or markers - Ring stands - String - Blocks - Spring - Thread - Scissors		
Procedure:		
Wear safety goggles for all lab work.		
Data and Observations:		
Analysis of Data:		
Conclusions:		



SCIENCE OF NHL HOCKEY: Projectile Motion

Video & Source available at: http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey

Objective:

1.Students will understand three common kinds of motion that can occur in two dimensions. 2.Students will design and carry out an investigation to measure linear and angular velocity. 3.Students will design and carry out an investigation to determine the shape of a projectile's path.

Introduction Notes:

Science of NHL Hockey: Projectile Motion

Subject Area: Physics

Lesson Title: Projectile Motion

Suggested Prior Knowledge: concepts of velocity and angles; lab techniques of measuring velocity and angles. Note that students might more easily grasp the concepts in this video if they have already viewed the video Newton's Three Laws of Motion.

Purpose and Introduction: This video uses the hockey technique of a wrist shot to give students an understanding of the relation between uniform linear motion and uniform angular motion as well as the relation between linear motion and projectile motion

Key Vocabulary:

angular motion—movement of an object around a fixed point or axis.

angular velocity—the number of rotations an object makes around a fixed point or axis per unit of time.

linear motion—movement of an object along a straight line.

motion—change in the position of an object with respect to time.

projectile motion—movement of an object through space along a path determined by an initial velocity and the effect of gravity and air resistance.

Objectives:

- Students will understand three common kinds of motion that can occur in two dimensions.
- . Students will design and carry out an investigation to measure linear and angular velocity.
- Students will design and carry out an investigation to determine the shape of a projectile's path.

Materials:

- safety goggles
- bicycle with rear derailleur
- stopwatch
- meter stick
- 2 marbles
- grooved ruler
- string
- tape
- ring stand
- clamps
- board, about 1" x 4" x 12" (or ½" to ¾" plywood strip)
- carbon paper
- paper
- tape

Procedure:



1. After students watch the video, review with students the concepts of linear motion, angular motion, and projectile motion discussed in the NHL video. Point out that although they may not have played hockey, many other sports involve projectile motion. Elicit from students that if they've hit a golf ball, a baseball, or a volleyball – or even thrown a stone – they have produced projectile motion. Have volunteers describe the other kinds of motion in the video and compare and contrast them. Use questions such as these to prompt discussion:

What is an example of linear motion?

Is linear motion accelerated?

What is an example of angular motion?

How do you know that projectile motion is confined to a plane?

Can you sketch the path of a projectile?

What kind of symmetry relates the upward path and the downward path of a projectile?

- 2. Lab protocols should be followed, incorporating safety equipment. Goggles must be worn at all times.
- 3. Guide students to design an investigation that allows them to make simple but accurate observations of three kinds of motion. They will use their observations to distinguish between accelerated motion and unaccelerated motion. The following are questions to help focus students' plans and guide them. While students might immediately jump to their textbook or other resources for the answers, explain that they will be applying these concepts in their lab work and thus will need to demonstrate knowledge as well.

What are the units of linear velocity?

How do you measure linear velocity?

If an object rotates around its axis once per second, what is its angular velocity (one rotation/second)?

How do you measure angular velocity?

How can you record the path of a projectile?

How can you measure the velocity of a projectile?

Comparing Linear and Angular Speed

- 4. One way that students can explore linear and angular speed is with the derailleurs of a bicycle. Each group would measure the radii of the largest and smallest cogs on the rear derailleur as well as the largest cog on the front derailleur. Each group then turns its bicycle upside down, on its seat and handlebars, and sets the rear derailleur to its lowest speed (largest cog) and the front derailleur to its highest speed (largest cog). The group would then measure the distance the chain travels between the rear derailleur and the front derailleur.
- 5. One member of each group turns the pedals of the bicycle at a uniform moderate speed. A second measures the time needed for the pedals to make 10 complete revolutions, the time needed for the rear wheel to complete 10 revolutions, and the time needed for the master link of the chain to travel the straight line from the top of the rear derailleur to the top of the front derailleur.
- 6. Each group calculates the angular speed of the front and rear cogs from their measurements of the rotation: f = number of rotations/time. Groups should find that the ratio of the angular speeds of front and rear cogs are the inverse of the ratio of the front and rear radii:
- 7. Each group calculates the linear speed of the chain v = d/t, using their measurements of time and distance traveled by the chain. Next, each team uses the angular speed and radius of the front and rear cogs to calculate the circumferential speed of the teeth of each cog: $v = 2\pi rf$. The linear speed of the chain should be equal to the circumferential speed of both cogs.
- 8. Students could then repeat steps 5–7, using the highest speed (smallest cog) for the rear derailleur. Students should find that the linear speed of the chain is equal to the circumferential speed of the cogs in both cases. Ask them to explain why the circular motion of the teeth of the cogs is accelerated.

Graphing Projectile Motion



- 9. Students might envision a method to graph projectile motion, such as the following. Each team clamps a ruler horizontally to a ring stand, 35 or 40 cm above the surface of the lab table. Using the second clamp, the team constructs a pendulum by taping string to a marble and tying the string to a clamp. The pendulum should swing parallel to the length of the ruler, with the lowest point in its arc at the end of the ruler. When the pendulum strikes a marble set in the groove of the ruler, it launches the marble as a projectile. Students should practice using the pendulum to launch the projectile until they can make it hit the same spot on the lab table repeatedly.
- 10. Each team tapes carbon paper with paper underneath it on top of the board. The team then attaches the board to the ring stand 5 cm below the ruler. The board must be horizontal and level. Teams launch the marble so that it lands on the board and leaves a mark. The team measures the x and y distances the marble traveled and records them in a table.

Side View of Setup The View of Setup

Sample Data Table: Vertical and Horizontal Coordinates

y	X	x2	x3
5 cm	cm		
10 cm	cm		
15 cm	cm		
20 cm	cm		
25 cm	cm		
30 cm	cm		

- 11. Teams should repeat steps 8 and 9 with the plastic sheet 10, 15, 20, 25, and 30 cm below the ruler.
- 12. Each team calculates values of x2 and x3 and compares them to the values of y in the table. Students should recognize that the equation y = kx2 represents a parabola. Ask students to explain what it means to say the motion of a projectile is accelerated. How is the acceleration of a projectile different from the acceleration of the tooth on a rotating cog?
- 13. To follow up this investigation, have students consider these challenge problems. Students might work in small groups, and then compare their analyses with other groups. (Perceptive students will realize that the underlying kinematics is the same for the two problems.)

A hockey player asks a goalie to help him make a trick shot. If the goalie drops his glove from shoulder height, the other player will hit it with a wrist shot before the glove hits the ground. The player will stand 10 meters from the goalie, and the goalie must drop the glove at the same moment the player takes his shot. In order to hit the falling glove, what must be the direction the puck takes as it leaves the blade of the hockey stick?

An archer wants to hit an apple that is dropped from a balcony. She will fire her arrow at precisely the same moment that the apple is dropped. Where should she point her arrow in order to hit the apple?

Additional Resources:

- http://www.korpisworld.com/Mathematics/diversions/activity_for_angular_velocity.htm
- http://www.uwstout.edu/physics/upload/UNIFORM-CIRCULAR-MOTION.pdf
- http://www.srri.umass.edu/sites/srri/files/mop_samples/ActAT016.pdf
- http://teachingphysics.wordpress.com/2009/03/01/projectile-motion-activity/
- http://www.srri.umass.edu/sites/srri/files/mop_samples/ActAT009.pdf
- http://jersey.uoregon.edu/vlab/Cannon/
- http://pdgusers.lbl.gov/~aerzber/aps motion.html#projectile
- http://www.livestrong.com/article/447525-projectile-motion-of-golf-balls/
- http://mrfizzix.com/basketball/index.htm



Student	Worksheet	for Projectile Motion
Experim	ent Title: _	Date:Name:
Student	Hypothesis	
Material	s:	
Procedu	re:	
Wear sa	fety goggle	s for all lab work.
Sample	Data Table	Vertical and Horizontal Coordinates
y 5 cm 10 cm 15 cm 20 cm 25 cm 30 cm	cm cm cm cm cm	2 x3
Analysis	s of Data:	
	CE OF NH	L HOCKEY: Statistics & Averages railable at: http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey
Objecti	ve:	
distingu	ish among	able to distinguish between numerical and non-numerical data. 2. Students will be able t the mean, median, and mode of a data set. 3. Students will design and carry out a ect a set of data and find the mean, median, mode, and range of a set of data.
Introdu	ction Note	::
Science	of NHL H	ockey: Statistics & Averages
Subject Lesson		Statistics, Math, Science Statistics & Averages



Suggested Prior Knowledge: concepts of data sets; techniques of collecting data.

Purpose and Introduction: The video uses statistical data collected about NHL goal tenders to give students an understanding of the measures of central tendency of a data set: mean, median, and mode. The activities enable students to apply these concepts to their own data sets.

Key Vocabulary:

mean—the sum of a set of numbers divided by the number of members of the set.

median—the central value in a list of numbers arranged in ascending or descending order; for a set of numbers with an odd number of members, the mean of the two central numbers.

mode—the member that occurs most often in a set of data.

range—the difference between the least member and the greatest member in a set of numbers.

statistics—the scientific application of mathematical principles to the collection, analysis, and presentation of numerical data.

Objectives:

- Students will be able to distinguish between numerical and non-numerical data.
- Students will be able to distinguish among the mean, median, and mode of a data set.
- Students will design and carry out an investigation to collect a set of data and find the mean, median, mode, and range of a set of data.

Materials:

- safety goggles (optional)
- deck of playing cards
- map of community or school district
- meter stick or metric ruler
- graph paper

Procedure:

- 1. Review the video with students and elicit from volunteers how to determine the mean, median, and mode of a data set using examples from the video. Introduce the idea of non-numerical data and contrast it to numerical data. Use questions such as the following to prompt discussion:
 - What are some examples of non-numerical data?
 - Can you find the mean, median, and mode of a set of non-numerical data?
 - What are some examples of numerical data from hockey, baseball, or other sports?
 - Why is it useful to have a single value (mean, median, or mode) to represent a set of data?
- 2. Lab protocols should be followed, incorporating safety equipment. If conducted in a science lab, use your discretion on whether or not students are to wear cover goggles.
- 3. Allow students to examine the materials and then design an investigation that will allow them to collect a data set and derive its range, mean, median, and mode. Consider having students work individually or in small groups and compare their computed values. The following steps describe examples of non-numerical and numerical data, but students should be encouraged to think of others. Use your discretion about whether distance of the students' homes to the school would produce a varied enough data set. If not, they may choose to work with sports statistics researched on the Internet (see Additional Resources). Students might think about using personal characteristics such as height or arm span or birth date, but steer them away from data sets that might be sensitive or embarrassing to a few. Questions such as the following can help focus students' plans:
 - How do you record a set of data?
 - What is the first step in finding the median of a set of data?
 - What is the mode of a set of data?
 - How do you find the mean of a set of data?



• What is the range of a set of data?

Numerical and Non-numerical Data

- 4. Remove all face cards and jokers from the deck of cards, and then deal nine cards face up. Record the numbers and suits of the cards on the board as they are drawn. Then direct students to find the mode, median, and mean for the values. If needed, refer to the video to refresh students' memories. Students could write down the nine cards in increasing numerical order to find the range and the mode for numerical values (if there is a mode) and do calculations to find the median and the mean. Elicit from students whether mode, median, and mean are equal, and whether there is any relationship among them.
- 5. Next, have students characterize the suits for the set of cards. The suits are non-numerical, so while there may be more than one mode for the suits of the nine cards, there is no mean or median for the suits. Students calculate what percent of cards belong to each suit. (The total should be 100%.)

Student-Generated Data

- 6. Instruct each student to use the meter stick to measure the distance from his or her home to the school on the map, round it to the nearest centimeter, and write it on the board. Or students can use the map scale to convert centimeters to actual distances. If computers or smartphones are available, students may use map sites or GPS apps to find their distances. Encourage them to use kilometers for distance.
- 7. Again, have students arrange and analyze the data to find the range, mode, mean, and median of the dataset. Elicit from students whether they expect mean, median, and mode to be equal. Ask questions such as the following:
- When is the median of a data set a better way to characterize the set than the mean?
- What percent of values are above the mean?
- 8. To follow up this investigation, have students prepare histograms from the distance data (or from hockey or other sports statistics). Have a class discussion on how closely the data resemble a normal distribution.

Additional Resources:

- http://regentsprep.org/REgents/math/ALGEBRA/AD3/DataTeacher.htm
- http://esa21.kennesaw.edu/activities/stats/stats.pdf
- http://www.sciencebuddies.org/science-fair-projects/project_data_analysis_summarizing_data.shtml
- http://www.regentsprep.org/Regents/math/algtrig/ATS2/NormalLesson.htm
- http://www.hockeydb.com/
- http://espn.go.com/nhl/statistics
- http://www.ncaa.com/stats/icehockey-women/d1

Student Worksheet for Statistics & Averages

Experiment Title:	_Date:	_Name:
Student Hypothesis:		
M		

Materials:

- safety goggles (optional)
- deck of playing cards
- map of community or school district
- meter stick or metric ruler
- graph paper



Procedure:	
Data and Obser	vations:
Analysis of Data	:
Conclusion:	
	HL HOCKEY: Vectors available at: http://www.nbclearn.com/portal/site/learn/science-of-nhl-hockey
Objective:	
Students will fin	design and carry out an activity adding vector components that represent displacements. 2. d a resultant displacement in two dimensions. 3. Students will calculate a resultant for three n three dimensions.
Introduction No	tes:
Science of NHL	Hockey: Vectors
Subject Area: Lesson Title:	Physics, Math Vectors
	State Standards for Mathematics

High School: Number and Quantity

Suggested Prior Knowledge: concepts of position, direction, and speed; lab techniques of measuring position.

Purpose and Introduction: This video focuses on the science of how a player can pass the puck to another player while both of them are moving. The activity will help students to understand the basic properties of vectors and their components, and how to add vectors.

Key Vocabulary:

vector—a quantity (such as velocity) that has both magnitude and direction.

Objectives:

- Students will design and carry out an activity adding vector components that represent displacements.
- Students will find a resultant displacement in two dimensions.
- Students will calculate a resultant for three velocity vectors in three dimensions.

Materials:

- safety goggles
- measuring tape



- graph paper
- pencils
- scientific calculator

Procedure:

- 1. After students review the video, discuss with students the idea of vectors and what they may be used for. Ask for examples of how vectors are involved in other sports such as football and soccer, or other activities such as hiking cross-country. Questions such as the following may help lead the discussion:
 - What is a vector?
 - What are some examples of vectors in other sports? In other activities?
 - What does it mean to add vectors?
- 2. Lab protocols should be followed, incorporating safety equipment. Goggles must be worn at all times.
- 3. Guide students to design an investigation that is valid and will lead them to the parallelogram method of vector addition. The procedures outlined in this lesson plan might be used to give students ideas. Following are some questions to help focus their plans and guide them:
 - How can you add displacements in different directions?
 - How can you find a resultant vector, given its components?
- 4. Students can carry out part of this vector-addition activity outdoors if your school has a football field or other large sports field. Otherwise, it can be adapted for the classroom or done entirely on paper. Dividing the class into an even number of three-member teams is suggested but is not the only possible procedure. The activity requires one team of students to write three sets of directions that correspond to adding three vectors. Another team of students has to follow the directions.

Indoors

- 5. Label half of the three-member teams A and half of them B. The A group should not know who the members of the teams are in the B group, and vice versa. Each team sketches the football field on graph paper with appropriate compass directions and then marks the origin (the southwest corner of the field, for example) and three non-collinear points on the field. These points will be the endpoints of three vectors.
- 6. The team members then assign vectors connecting the points. The first vector is from the origin to the first point. The second vector is from the first point to the second, and the third vector is from the second point to the third. Team members rewrite each vector in terms of its components (for example, 15 yd east and 12 yd north).
- 7. The members of the teams then write down the starting point and the components of the three vectors on three slips of paper. The team makes a copy of the first slip, folds it, marks it A or B on the outside, and places it in a bowl. One team member takes each of the other three slips.
- 8. Each A team chooses a B beginning vector from the bowl, and each B team chooses an A vector.

Outdoors

- 9. The members of all the A teams then position themselves on the field at the coordinate points they have marked on their diagrams in the classroom.
- 10. The B teams begin at the origin and each team follows the directions on its slip of paper to the first point on the field. When a B team gives the correct coordinates to a member of an A team, the A member gives a vector slip to the B team. If the coordinates are incorrect, the A team member does not hand over the slip. Hints are not allowed.
- 11. After all B teams have their second vectors (which will probably take a few minutes), they proceed to the second point, where each team gives coordinates to the A member, and collects its third vector.



- 12. Finally, B teams proceed to the third point. Any team that cannot give the correct coordinates for one of its points is eliminated.
- 13. When the B teams have finished walking through their vectors, they take up their positions on the field, and the A teams begin walking through the exercise.
- 14. A team that is eliminated for locating a point incorrectly should check its calculations with the team that supplied the vectors. If the mistake was in writing the directions rather than following them, the team writing the directions is eliminated and the team following directions gets credit for completing the activity.

Indoors

15. If time is available after the exercise, each team should return to the classroom and write down the resultant for the sum of the three vectors from the walk-through (for example, 50 yd east and 29 yd north). The team should then convert the rectangular coordinates to polar coordinates.

Follow-up and Extension

- 16. When the teams have finished their investigation, follow up with this three-dimensional problem: A skydiver jumps out of a plane traveling north at 44 m/s. She jumps eastward with a speed of 7 m/s. She then falls under the influence of gravity. What is her resultant velocity after 2 seconds of free fall? Choose a team to present a solution of the problem to the class.
- 17. Encourage interested students to research how vectors are used in some GPS tracking systems. See Additional Resources for a starting point.

Additional Resources:

- http://phet.colorado.edu/en/simulation/vector-addition
- http://www.cut-the-knot.org/Games/Vectors.shtml
- http://www.intmath.com/vectors/4-adding-vectors-2-dimensions.php
- http://prettygoodphysics.wikispaces.com/PGP+Vectors
- http://www.auburn.edu/academic/cosam/departments/physics/intro-courses/ugrad-lab/physics1500/activities/vector-addition.htm
- http://scign.jpl.nasa.gov/learn/gpsact.htm
- http://www.insidegnss.com/node/1458
- http://gpslessonslhsc.pbworks.com/w/page/7233421/FrontPage

Student Worksheet for Vectors

Wear safety goggles for all lab work.

Experiment Titl	e:		Date:	Name:	
Student Hypoth	esis:				
Materials:	- - - -	safety goggles measuring tape graph paper pencils scientific calculat	or		
Procedure:					

2:51 3:15

Appendix B Resources for Thematic Lessons in Core Content Ares



Dete	1 Ob	
Data	and Obs	servations:
Analy	sis of D	ata
Concl	usion:	
SCIE	NCE OF	GOLF: Evolution of the Golf Ball - STEM Lesson Plan
Video	& Sour	rce available at: http://nbclearn.com/science-of-golf
Objec	tive:	
Stude	nts will	investigate questions about the design of golf balls and how the design impacts play.
Introd	uction l	Notes:
Evolu STEM	tion of t Lesson	F GOLF he Golf Ball n Plan produced by the National Science Teachers Association.
Backg	round a	nd Planning Information
This v product Senior aspect physic of the	cing op Resear s of bal s and e benefits	deo scusses the history and physics of golf balls, along with ongoing research and development aimed at timal distance and spin properties. It features Steve Quintavalla, Ph.D. (Mechanical Engineering), ich Engineer for the United States Golf Association (USGA). The video focuses on two important design: the aerodynamic benefits of dimples, and the tailoring of spin properties. It shows the role ngineering have played in improving both distance and spin control. Also, the story of the discovery sof dimples shows how serendipity and simple experience over time have suggested improvements, a could then later explain and help optimize.
	Timeli	
0:00 0:16 0:36 0:57 1:08	0:15 0:35 0:57 1:07 1:32	Series opening Overview of changes in golf balls over time Introducing Steve Quintavalla, who begins a timeline of golf ball evolution Featheries Gutties
1:33 2:13 2:32	2:12 2:31 2:50	Discovering that dimples allow longer flight, and the reason for this Haskell balls and beginning of interior changes Describing interior of modern golf balls

Materials and manufacturing of modern golf balls



3:16	3:54	Explaining the importance of spin, especially regarding its influence on lift
3:55	4:21	Detailing manufacturing standards for golf balls, to ensure consistent play
4:22	4:54	Testing of golf balls
4:55	5:11	Summary
5:12	5:31	Closing credits

Language Support: To aid those with limited English proficiency or others who need help focusing on the video, click the Transcript tab on the side of the video window, then copy and paste the text into a document for student reference.

Next Generation Science Standards

Consider the investigation described in Facilitate SCIENCE Inquiry section as part of a summative assessment for the following performance expectations. Refer to a NGSS document for connected Common Core State Standards for ELA/Literacy and Mathematics.

Motion and Stability: Forces and Interactions

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

Promote STEM with Video

Connect to Science

Science concepts illustrated in this video include aerodynamics and the effect of rough surfaces and spin on drag and lift. Students may find the idea that rougher surfaces can actually reduce drag to be counterintuitive: the phenomenon of reduced drag due to early onset of turbulent flow is a rather complex one, and requires rather high speed (such as that commonly reached by golf balls) relative to the air to become effective. Students may be assured that many things in nature do fit "common sense," but that there are, in fact, some interesting surprises such as this one. Also, the video shows that the discovery of benefits of dimples was made serendipitously; many other scientific discoveries were made in unplanned ways as well.

Related Science Concepts

- aerodynamics
- drag
- friction
- turbulent airflow
- mass
- force
- acceleration
- Newton's Second and Third Laws

Take Action with Students

Use the video as a springboard to start students brainstorming examples of facts or concepts they have learned in science that "made sense" to them right away, and also examples of things that seemed to defy common sense, and were even hard to believe. Ask students where they get their idea of "common sense" and why some things that are true seem at first as if they couldn't be. You might also ask students to think of examples of scientific discoveries that were made by accident (such as the effect of dimples, discovery of penicillin, and composition of nonstick coatings), only to be explained after the fact (if at all). Connect this idea to students' own experiences. Ask if they have ever figured something out or noticed a better way to do something by accident. Students can also be reminded that scientific thinking involves "shopping around" for explanations that work. Explain that "common sense" ideas often are developed first and are a necessary first step.



Connect to Technology

Modern technology – such as devices to shoot golf balls at high speed and monitor their position, speed, and rotation in flight – is needed to analyze data and develop new designs. The USGA uses robotic golfers and a ball launcher (similar to some baseball pitching machines) to collect such data.

Take Action with Students

- Show the portion of the video, starting at about 4:21, which shows the USGA's Indoor Test Range. Have students discuss what types of data this facility can gather and what advantages it might have over outdoor testing or how it can be used in conjunction with outdoor testing.
- Have students research this test facility on the Internet. One revealing document is at http://www.usga.org/uploadedFiles/USGAHome/equipment/testing/protocols/Overall_Distance_TPX3006.pdf, which shows how carefully scientific testing must be done—with great attention to detail—in order to gather reliable data.

Connect to Engineering

The engineering design process involves all of the above, plus the human ingenuity and creativity – and sometimes even simple luck – needed to bring all these facets together to produce ever-better golf balls. The history of the golf ball is a good illustration of how engineering consists not only of creating a product, but continuing to improve it as new technological and mathematical tools become available.

Take Action with Students

- Have students choose another product that has a modern version, and yet has existed in some form for decades (such as video games or performance fabrics), or centuries (such as pen and ink), and outline that product's history of development. Then have them compare this product's evolutionary development to that of the golf ball, pointing out ways in which the development was similar, and ways in which it was different.
- Have students do research to identify other uses of gutta percha (i.e., filling root canals) and polybutadiene (i.e., tires). Ask them to explain what required properties candidate substances must have for each of these applications, and how gutta percha and polybutadiene meet these criteria.
- Have students suggest other applications of dimples that would enhance a feature of a product in existence.

Connect to Math

Math, while not discussed in detail in this video, is essential for modeling what happens to the ball during impact with the club, and what the resulting flight of the ball will be. The physical laws that describe or govern what happens when a ball is struck by a club, and how the ball interacts with the air during flight, are expressed as mathematical equations, and can be solved by humans – or, more efficiently, in computer simulations.

High school students who have had algebra will likely have encountered the shape called a parabola, and the general equation that defines it. They may have also done problems in math or physics class in which they calculated the parabolic trajectory of a projectile. As a first approximation, a golf ball's path "should" be a parabola, but the drag and lift forces acting on the ball can change this rather dramatically.

Take Action with Students

Have students interact with online projectile simulators such that found as at http://phet.colorado.edu/sims/projectile-motion/projectile-motion_en.html. This one includes drag forces but not the Magnus force (such as lift, due to spinning). Ask students if the flight paths when drag is included are parabolas, and if not, how they can tell (lack of symmetry). Ask students to sketch what they think the trajectory would look like with extreme backspin (temporarily curved upward).

Facilitate SCIENCE Inquiry

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on grade level, prior knowledge, and creativity. Use the prompts



liberally to encourage thought and discussion. Student Copy Masters begin on page 11.

Explore Understanding

Give students a few balls to observe – including golf balls, ping pong balls, and superbounce balls – and ask them to compare and contrast them and their purpose. Students might think that golf ball dimples are simply a design feature with no other purpose. Use these or similar prompts to spark a discussion about the role of dimples in the design and manufacture of golf balls.

- The purpose of each ball is to....
- Features of each ball that make it good for its intended purpose are....
- Some characteristics golfers would want in an ideal golf ball are....
- Because the dimples appear to be deliberate, their purpose(s) could be to....
- Thinking of atmospheric conditions on the moon, the dimples would....
- In order to see the effect of dimples, we must compare....

Show the video "Science of Golf: Evolution of the Golf Ball." Continue the discussion of golf ball design and manufacture, with prompts such as the following:

- When I watched the video, I thought about....
- According to the video, the advantages of dimpling golf balls were discovered when....
- According to the video, the two purposes of dimples are....
- The expert in the video used a "golf ball launcher" instead of a human golfer because....
- Other important golf ball characteristics mentioned in the video are....
- The properties of air that might influence a golf ball's flight include....
- The golf ball might behave differently on a course in Miami versus a course in Denver because.....

Ask Beginning Questions

Stimulate small-group discussion with the prompt: This video makes me think about these questions.... Then have groups list questions they have about the challenges that must be surmounted in order to create golf balls that maximize either distance or accuracy. Ask groups to choose one question and phrase it in such a way as to be researchable and/or testable. The following are some examples.

- What is the primary advantage of dimpling a golf ball?
- How do dimples reduce aerodynamic drag force?
- What force is created by the rotation of the ball as it travels through the air?
- What advantage does a force of lift provide?
- What disadvantages might forces due to the ball's rotation create?
- How can we demonstrate a reduction in drag force due to dimpling?

Design Investigations

Choose one of the following options based on your students' knowledge, creativity, and ability level and your available materials. Actual materials needed would vary greatly based on these factors as well.

Possible Materials: Allow time for students to examine and manipulate the materials you have available, or allow them to brainstorm what materials they might need. Doing so often aids students in refining their questions or prompts new ones that should be recorded for future investigation. In this inquiry, students might use materials such as dimpled foam practice golf balls (readily available in sporting goods sections of stores), ping pong balls, and a slingshot (such as those found at http://www.marksman.com/slingshots.php). A fairly sensitive scale, such as a triple-beam balance or a digital electronic scale, may be needed.

NOTE: The aerodynamic effects of dimples become apparent only at rather high relative air speeds (on the order of 50 miles per hour), so that many reasonable-sounding attempts to demonstrate the effect will have a null result (dimpled ball indistinguishable from smooth ball). Leaf blowers might create such wind speed, while hair dryers and most fans do not. Also, the Magnus force (responsible for the lift force discussed in the video) exists even for smooth balls and is only enhanced by the dimpling, so demonstrations of this—while interesting and informative—do not necessarily justify the use of dimples. For more information, see http://www.titleist.com/technology/details.asp?id=20 or http://www.grc.nasa.gov/WWW/k-12/airplane/dragsphere.html. Instead, students might investigateother variables such as material, size, and mass



by constructing their own golf balls and comparing results.

Safety Considerations: To augment your own safety procedures, see NSTA's Safety Portal at http://www.nsta.org/portals/safety.aspx. The Focused Inquiry described below uses a slingshot. While only ping pong balls and foam golf balls are being launched here, close faculty supervision is essential to ensure proper use, and to prevent students from launching more dangerous projectiles such as rocks or real golf balls. If leaf-blowers are used, students may need to wear ear plugs, protective headphones, or other safety devices to protect their hearing.

Open Choice Approach (Copy Master page 11)

Groups might come together to agree on one question for which they will explore an answer, or each group might explore something different. Students should brainstorm to form a plan they would have to follow in order to answer the question, which might include researching background information. Work with students to develop safe procedures that control variables and enable them to gather valid data. Encourage students with prompts such as the following:

- Information we need to understand before we can start our investigation is....
- The variables in construction of a golf ball are....
- The potential variable(s) we want to hold constant is (are)....
- To measure the effects of different golf ball designs on the path of the golf ball, we will....
- To conduct the investigation safely, we will....

Focused Approach (Copy Master pages 12–13)

Note to teachers: The two main hurdles to overcome in this inquiry are the need to control for mass and cross-sectional area, and the need for a great enough air speed to make the effect of the dimples apparent. The ping pong ball is nearly the same size as the practice golf ball, but

has less than one third of the practice golf ball's mass, so the mass of the ping pong ball needs to be equalized by adding mass (in the form of water or sand, perhaps) to the inside of the ping pong ball through a small hole. The initial experiment of dropping the balls will likely yield a null result, as the speed reached is too slow for turbulent flow to be induced by the dimples. The second part, in which students use a rather powerful slingshot to launch the balls, should provide enough speed to show the effect, assuming the golf balls are able to travel about 30 meters or more in the air. If the slingshot pouch is much smaller than the ball, it may be helpful to enlarge it, perhaps using duct tape. Students might also use a strong wind source such as a leaf blower to observe the effect. Finally, note that the practice ball must have dimples, NOT holes as in a Wiffle—style ball. The holes are likely to increase drag rather than decrease it, or at least behave much differently than dimples.

The following exemplifies how students could detect and measure the effects of reduced aerodynamic drag due to dimples, after controlling for cross-sectional area and mass.

- 1. After students examine the materials you have available to detect or measure the effect of dimpling on aerodynamic drag force, ask them questions such as the following to help them envision their investigation.
- What aspects of the ball, other than dimpling might affect drag force?
- How do the size and mass of the ping pong ball and practice golf ball compare?
- How will we equalize the two balls if they are different?
- How will we know which ball, if either, had more drag force on it?
- What are some sources of error in measuring the size and mass of the balls?
- 2. Students might first simultaneously drop two dense objects of very different mass, such as a medicine ball and a real golf ball, from the same height (of at least several feet). Then students might drop a real golf ball, a foam practice golf ball, and a ping pong ball from a height of at least several feet, simultaneously, in pairs.
- The pairs of objects strike the ground....
- Drag forces seem to have great/little effect on pairs of objects because....
- The variable changed in pairs of objects is _____, which causes....
- Drag forces might be observable between some pairs and not others because....



- 3. Students might carefully increase the mass of the ping pong ball by adding some material, such as water or sand, to the inside of it until it has the same mass as the foam practice golf ball. The hole should be as small as practicable and may be carefully made with just about any sharp object. Ideally, it should be sealed with a minimal amount of tape or glue to keep the material inside and yet maintain a smooth exterior. Once more, students could drop the equal-mass balls from a height of several feet to see that they will strike at the same time. Encourage students to use video cameras or smart phones to capture the action for observation. Use prompts such as the following to guide students.
- The balls struck the ground at the same/different time(s) because....
- We did/did not detect any difference in drag force due to the dimples because....
- We believe the slight size difference (does/does not) matter, because....
- A difference between this situation and a real golf ball struck by a club is....
- 4. Students might now take the practice golf balls, mass-equalized ping pong balls, and slingshots either outdoors (if it is not too windy), to a large gym (at least 30 meters long, with a high ceiling), or a long hallway (though a low ceiling can be difficult to work with). One student can be the shooter; another can watch the shooter to instruct him/her regarding keeping a consistent launch angle and pull-back distance; another can spot the landing point of the ball; and another might measure the distance travelled with a tape measure (or simple qualitative differences can be observed without formal measurement, using pieces of tape or flags to mark the landing spots). The two types of balls can be launched at an angle found by practice to yield the greatest distance (unless a low ceiling interferes), and any differences in distance travelled can be observed. If (as is recommended) multiple shots are made, the mass-equalized ping pong ball should be inspected to ensure it is not losing its contents.
- We will ensure consistent launch speed by....
- We will ensure consistent launch angle by....
- We will determine the distance travelled by....
- Sources of error in this part of the investigation include....
- To minimize the influence of these sources of error, we will....
- To conduct the investigation safely, we will....
- 5. Students can then return to the classroom to discuss the results.
- We believe the dimples (increased/decreased/did not affect) drag force because....
- A difference between firing the balls with the slingshot versus dropping them was....
- Other factors that may make our results questionable include....
- 6. Some students might want to extend their investigation by shooting empty ping pong balls, ping pong balls with somewhat more mass than the practice golf ball, and perhaps Wiffle—style practice golf balls (with holes) to observe any differences and form hypotheses to explain such differences. Encourage students to write down their beginning questions even if time does not allow investigation.

Media Research Option

Groups might have questions that are best explored using print media and online resources. Students should brainstorm to form a list of key words and phrases they could use in Internet search engines that might result in resources that will help them answer the question. Review how to safely browse the Web, how to evaluate information on the Internet for accuracy, and how to correctly cite the information found. Suggest students make note of any interesting tangents they find in their research effort for future inquiry. Encourage students with prompts such as the following:

- Words and phrases associated with our question are....
- The reliability of our sources was established by....
- The science and math concepts that underpin a possible solution are....
- Our research might feed into an engineering design solution such as....
- To conduct the investigation safely, we will....

Make a Claim Backed by Evidence

Students should analyze their data and then make one or more claims based on the evidence their data shows. Encourage students with this prompt: As evidenced by... we claim... because....

An example claim might be: As evidenced by the greater distance travelled by the dimpled ball, as compared



with the smooth one when shot with the slingshot—and contrasted with the simultaneous landing when just dropped—we claim that dimples reduce drag force only if speed is sufficient, because turbulence "kicks in" only beyond a certain threshold speed.

Compare Findings

Encourage students to compare their ideas with others, such as classmates who investigated a similar (or different) question or system, or to compare their ideas with material they found on the Internet or in their textbooks, or heard from an expert they chose to interview. Remind students to credit their original sources in their comparisons. Elicit comparisons from students with prompts such as:

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Students might make comparisons like the following:

My ideas are similar to those discussed by researchers, published on the Internet, who have done detailed studies of aerodynamic effects on dimpled versus smooth balls. I found that dimples cause laminar flow to break into turbulence at a lower speed, thus making a narrower "wake" behind the ball and less drag force.

Reflect on Learning

Students should reflect on their understanding, thinking about how their ideas have changed or what they know now that they didn't know before. Encourage reflection, using prompts such as the following:

- The claim made by the expert in the video is....
- I support or refute the expert's claim because in my investigation....
- I am surprised by our findings because....
- My initial "common sense" thinking changed because....
- When thinking about the expert's claims, I am confused as to why....
- Another investigation I would like to explore is....

Inquiry Assessment

See the rubric included in the student Copy Masters on page 14.

Incorporate Video into Your Lesson Plan

Integrate Video in Instruction

Visualize Concepts: Show the portions of the video from 1:42–1:56 and 3:33–3:48, pausing it to allow students to carefully inspect the air flow diagrams. Have students look closely for any difference between the position of the streamlines ahead of and behind the ball. Ask students to explain how this difference could explain lift.

Note to teachers: Because a thorough explanation is beyond the scope of the video, the point to be made is that the air underneath the ball is deflected downward, and, via Newton's Third Law, it exerts an equal and opposite (i.e., upward) force on the ball: the lift force shown.

Homework: Have students individually (or as part of small teams) research aerodynamic effects – such as the Magnus force – used in various other sports, like baseball (various pitches), tennis (top spin), and ping pong (many effects). A topic of discussion could be whether anything like dimpling is used for these balls.

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these Es:

Explore: Use the Design Investigations section of the Facilitate Inquiry to support your lessons on the relationship among mass, force, and acceleration (that is, Newton's Second Law). The main topic could be how the ball's flight is altered by the forces acting on its mass to produce acceleration (any change in velocity, including slowing down or changing direction).

Elaborate: Air flow around objects is an important field of study, with applications in many design and engineering problems. Have students do Internet searches on applications in which air flow must be considered. Excellent examples include aerodynamics of cars to maximize fuel efficiency and (perhaps obviously) how



airplanes fly. Note that many web sites address the issue of lift on airplane wings, and some are more authoritative than others. Lift is a complex and multi-faceted issue, and opinions differ about how best to explain lift on airplane wings.

Connect to ... Language Arts

Although not used in the video, the word serendipity accurately describes the fortunate, accidental way in which dimpling of golf balls was found to be useful. The word is difficult to translate into other languages and its origins can take students on a foray into literature, history, and geography. Have students research the definition, history, and uses of the word. Conclude by asking students if the word applies well to the discovery of golf ball dimples, or if they can think of other, better examples—even in their own lives.

Connect to ... Social Studies and Geography

As the video shows, golf is a very old game. Have students research the origin of the game – something like it was played in China long before it appeared in Europe, for example – and where it spread, and why it might have become more popular in some places than others.

Use Video as a Writing Prompt

Explain to students that they will use the concepts from the video to explain what kind of standards golf balls are subject to, and what the point of establishing such standards is. Project the video segment discussing these concepts (3:57–4:54), showing it at least twice, or allow students to access the video on their own to replay as often as needed. Have the students write a paragraph identifying these standards, and explaining how the game would be different if there was not enforcement of or compliance with these standards.

COPY MASTER: Open Choice Inquiry Guide for Students

Science of Golf: Evolution of the Golf Ball

Use this guide to investigate a question about the design of golf balls. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

Design Investigations

Choose one question. How can you answer it? Brainstorm with your teammates. Write a procedure that controls variables and makes accurate measurements. Look up information as needed. Add safety precautions.

- Information we need to understand before we can start our investigation is....
- The aspect of golf ball design we will be working on is....
- This aspect of golf ball design is important because....
- The variables we will be working with are....
- We will evaluate our design by....
- To conduct the investigation safely, we will....

Record Data and Observations

Record your observations. Organize your data in tables or graphs as appropriate.

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data show. Make sure that the claim goes beyond summarizing the relationship between the variables.

My Evidence My Claim My Reason



Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- The claim made by the expert in the video is....
- I support or refute the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- Another investigation I would like to explore is....

COPY MASTER: Focused Inquiry Guide for Students

Science of Golf: Evolution of the Golf Ball

Use this guide to investigate a question about the design of golf balls. Write your lab report in your science notebook.

Ask Beginning Questions

Why are dimples an important consideration in the design of golf balls?

Design Investigations

Brainstorm with your teammates about how to answer the question. Write a procedure that controls variables and allows you to gather valid data. Add safety precautions as needed. Use these prompts to help you design your investigation.

- The supposed effect of dimples that we will be considering is....
- Other aspects or properties of the ball that might confuse our results are....
- We will hold the size of the ball constant by....
- We will hold the mass of the ball constant by....
- We will detect or measure any differences in drag force on the ball by....
- We predict that the dimpled ball will experience (more/less) drag than the smooth ball....
- To conduct the investigation safely, I need to....

Record Data and Observations

Organize your observations. This inquiry has multiple parts, as you methodically go about the process of controlling for variables such as size, mass, and speed.

Results of Actions Taken

Action Observation and measurements Comments Tentative conclusion

Dropped two dense objects of very different mass

Dropped three low-density balls of same size but different mass

Dropped two balls of same mass and size, but one smooth and one dimpled

Shot smooth and dimpled balls of same mass at same speed and angle

Ideas for Analyzing Data

- How did mass affect the fall of two dense objects of very different mass? Can you explain what you saw (perhaps in terms of something you have learned in a physical science class)? Did these results surprise you?
- How did mass affect the fall of three balls of approximately equal size? Should drag force have been the



same on these three balls, or at least on two of them? Why might the same drag force affect these balls differently?

- How did a dimpled versus smooth surface affect the fall of two roughly equal size and equal mass balls? Is the result what you expected based on first viewing the video?
- How did a dimpled versus smooth surface affect the distance travelled for two roughly equal size and equal mass balls, shot with a slingshot? Is the result what you expected based on first viewing the video? If it is different from the results for the same balls being dropped, why would that be? What other variable seems to matter here?
- What sources of error might remain in this experiment, other than those for which we carefully controlled? How might you address these issues in a follow-up experiment?

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data show. Make sure that the claim goes beyond summarizing the relationship between the variables.

My Evidence My Claim My Reason

Compare Findings

Review the video and then discuss your results with classmates who did the investigation using the same or a similar system or with those who did the investigation using a different system. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- The claim made by the expert in the video is....
- I support (or refute) the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- Another investigation I would like to explore is....

COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria 1 point 2 points 3 points

Initial question Question had a yes/no answer, was off topic, or otherwise was not researchable or testable. Question was researchable or testable but too broad or not answerable by the chosen investigation. Question clearly stated, researchable or testable, and showed direct relationship to investigation.

Investigation design The design of the investigation did not support a response to the initial question. While the design supported the initial question, the procedure used to collect data (e.g., number of trials, control of variables) was not sufficient. Variables were clearly identified and controlled as needed with steps and trials that resulted in data that could be used to answer the question.

Variables Either the dependent or independent variable was not identified. While the dependent and independent variables were identified, no controls were present. Variables identified and controlled in a way that results in data that can be analyzed and compared.

Safety procedures Basic laboratory safety procedures were followed, but practices specific to the activity were



not identified. Some, but not all, of the safety equipment was used and only some safe practices needed for this investigation were followed. Appropriate safety equipment used and safe practices adhered to.

Observations and data Observations were not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what actually took place during the investigation. Observations were made, but were not very detailed, or data appear invalid or were not recorded appropriately. Detailed observations were made and properly recorded and data are plausible and recorded appropriately.

Claim No claim was made or the claim had no relationship to the evidence used to support it. Claim was marginally related to evidence from investigation. Claim was backed by investigative or research evidence. Findings comparison Comparison of findings was limited to a description of the initial question.

Comparison of findings was not supported by the data collected. Comparison of findings included both methodology and data collected by at least one other entity.

Reflection Student reflections were limited to a description of the procedure used. Student reflections were not related to the initial question. Student reflections described at least one impact on thinking.

SCIENCE OF GOLF: Evolution of the Golf Club - STEM Lesson Plan

Video & Source available at: http://nbclearn.com/science-of-golf

Objective:

Students will investigate questions about golf club design and its relationship to functionality, as well as the role of rotational inertia in golf club design.

Introduction Notes:

SCIENCE OF GOLF Evolution of the Golf Club STEM Lesson Plan

Lesson plans produced by the National Science Teachers Association. Video produced by NBC Learn in partnership with the USGA and Chevron.

Background and Planning Information

About the Video

This video discusses the history and physics of golf clubs, along with ongoing research and development aimed at producing progressively better clubs. After an introduction centered on the Merion Golf Club (host of the 2013 U.S. Open) in Pennsylvania, it features Matt Pringle, Ph.D. (Mechanical Engineering), senior research engineer for the United States Golf Association (USGA). The video focuses on two important aspects of club design: maximization of rotational inertia of the club head; and energy return due to the spring quality of the club face. It shows the role physics and engineering have played in improving both distance and ball control for golf clubs over the years, and also points out the role of novel materials, such as titanium and carbon fiber, in this ongoing development.

Video Timeline

0:00 0:14 Series or	pening

- 0:15 1:02 Introducing the Merion Golf Club
- 1:03 1:25 Discussing the history of golf clubs and the materials used to make them
- 1:26 1:35 Discussing the role of club head mass in imparting energy to the golf ball



1:36	1:59	Introducing Matt Pringle who discusses the role of club head mass
2:00	2:28	Explaining the role of rotational inertia reducing club rotation and energy loss
2:29	3:04	Testing wood clubs at the USGA Research and Test Center
3:05	3:28	Explaining how the club head's spring quality returns stored energy to the ball
3:29	4:01	Describing the evolution of wood to metal club heads
4:02	4:59	Describing how modern materials influence ball-striking
5:00	5:27	Describing the ideal club of today
5:28	5:47	Describing how these changes will be showcased by the U.S. Open at Merion
5:48	6:04	Closing credits

Language Support: To aid those with limited English proficiency or others who need help focusing on the video, click the Transcript tab on the side of the video window, then copy and paste the text into a document for student reference.

Next Generation Science Standards

Consider the investigation described in Facilitate SCIENCE Inquiry section as part of a summative assessment for the following performance expectations. Refer to a NGSS document for connected Common Core State Standards for ELA/Literacy and Mathematics.

Motion and Stability: Forces and Interactions

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on macroscopic objects, their mass, and acceleration.

HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

Promote STEM with Video

Connect to Science

The science knowledge underlying the video includes an understanding of the storage of potential energy and release as kinetic energy in a collision. Also, the physics concept of rotational inertia (often called moment of inertia) is needed to understand how the mass distribution of a club head affects both the flight distance and the direction of the ball after impact. Finally, materials science is needed to identify metals and other substances that meet requirements such as strength, low density, and spring quality.

Related Science Concepts

- potential energy
- kinetic energy
- rotational inertia (moment of inertia)
- material properties

Take Action with Students

- Using the Design Investigations section of Facilitate SCIENCE Inquiry as a guide, encourage students to design and build a "golf club" that demonstrates how different amounts of rotational inertia affect the direction of a struck golf ball.
- Use the video as a springboard to start students talking about various aspects of sports and recreation that are heavily influenced by the activities of scientists and engineers. Play the video with the sound muted and ask volunteers for their thoughts about the lab environment they see (2:28–2:46), what types career fields they think might be involved in the design and manufacture of golf clubs, what they think the working environment might be like, and so on. Encourage students to point out specific people and jobs being done and comment on what kind of science knowledge, technical abilities, or other expertise individuals might need to work there.



Connect to Technology

Modern **technology**, such as computers and golf-club-swinging robots, is needed to analyze data and develop new designs. In addition, high-speed photography enables us to see just what happens during the tiny fraction of a second in which the club and the ball are in contact and interacting.

Take Action with Students

- Show those portions of the video that use high-speed photography to show action in "slow motion," such as 3:24–3:29, 3:44–3:55, and 4:26–4:44. Have students discuss how this technology helps researchers design clubs, and also what other uses such photography might have.
- Have students listen to the narrator at about 2:15 in the video, when he says, "engineers test golf clubs to make sure that technology isn't more important than skill in golf." Have students discuss or debate the topic of what human "skills" may mean in a world where technology makes things easier.

Cue discussion with prompts such as the following:

- o The evidence in the video that supports how engineers are trying to ensure that technology does not take the place of skill in golf includes....
- Examples of technological advances in other aspects of daily life that reduce the need for human skills are....
- Examples of technological advances in other aspects of daily life that increase the need for human skills are....

Connect to Engineering

The **engineering** design process involves many aspects of science and technology, plus the human ingenuity and creativity needed to bring all these facets together to produce ever-better golf clubs. The history of the golf club is a good illustration of how engineering consists not only of creating a product, but continuing to improve it as new technological and mathematical tools become available.

Take Action with Students

- Students might compare and contrast various modern "driver" golf clubs, along with the supporting research on how a given driver design is expected to improve distance or accuracy of the drive. Students could go on to design their own oddly-shaped drivers that conform to USGA standards as described in Appendix II of the Rules of Golf, and hold a class competition to determine the best design. Download the USGA standards at: http://www.usga.org/Rule-Books/Rules-of-Golf/Appendix-II/
- Have students identify or research products other than golf clubs that are made from titanium, magnesium, tungsten, or carbon fiber—all of which are mentioned in the video as materials used in golf clubs. Elicit the advantages of such materials in these applications.

Connect to Math

Math, while not discussed in detail in this video, is essential for modeling what happens to the ball and club during impact, and predicting what the resulting flight of the ball will be. The physical laws that govern what happens when a ball is struck by a club, for example, are expressed as mathematical equations, and can be solved by humans or, more efficiently, programmed into computer simulations.

High school students who have had two years of algebra can make a specific connection to power laws, in which one quantity is proportional to another quantity raised to some power. Moment of inertia is directly proportional to an object's mass, and generally proportional to the square of the length of an object. It can be easily calculated for objects of simple shapes – for example, the moment of inertia of a uniform stick or rod, rotated about one end, is 1/3 of the mass times the square of the rod's length. If an object's mass is doubled, its moment of inertia is doubled, but if its length is doubled (even while holding mass constant), its moment of inertia is quadrupled.

Take Action with Students

• Have students calculate the moments of inertia of rods of the same length but different masses, and of rods of the same mass but different lengths. Have the students make graphs of moment of inertia versus mass (makes a straight line), and of moment of inertia versus length (makes an upward curve—the parabola).



Facilitate SCIENCE Inquiry

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student *Copy Masters* begin on page 11.

Explore Understanding

Encourage students to think about the factors involved in designing and manufacturing a golf club that maximizes distance and accuracy. In order to create optimal golf clubs, researchers analyze the forces involved during the impact between a club and a ball. Have students discuss the effects of large versus small rotational inertia (or resistance to rotation) of a club head, and how and when these effects are important (mainly for off-center hits). Also, have students discuss how wood is different from metals such as titanium. Use these or similar prompts to spark a discussion about the role of physics and materials science in the design and manufacture of golf clubs.

- An off-center hit with a club with a small rotational inertia results in....
- Metals are now the material of choice for golf clubs because....
- Newer golf clubs may allow lower scores for professional golfers because....
- Newer golf clubs may allow lower scores for average or poor golfers because....
- In order to increase the rotational inertia while holding mass constant, I would....

Show the video "Science of Golf: Evolution of the Golf Club." Continue the discussion of golf club design and manufacture, with prompts such as the following:

- When I watched the video, I thought about....
- The expert in the video was inspired to create better golf clubs because....
- The expert in the video used a robotic "golfer" instead of a human golfer because....
- The mass of the golf club impacts the swing or shot by....
- The rotational inertia of the golf club impacts the swing or shot by....
- The "spring quality" of the club head impacts the swing or shot by....

Ask Beginning Questions

Stimulate small-group discussions with the prompt: *This video makes me think about these questions....* Then have groups list questions they have about the challenges that must be surmounted to create golf clubs that maximize both distance and accuracy. Ask groups to choose one question and phrase it in such a way as to be researchable and/or testable. The following are some examples.

- What factors determine the ideal mass of the club head?
- What factors determine the rotational inertia of the club head?
- What factors determine the spring quality of the club head?
- What advantages do metals have over wood in the manufacture of golf clubs?
- Do these technologies make golf clubs more, or less, expensive than the older designs?
- How might golf clubs be tested?
- What regulations exist regarding the size, shape, mass, and other properties of golf clubs?

Design Investigations

Choose one of the following options based on your students' knowledge, creativity, and ability level and your available materials. Actual materials needed would vary greatly based on these factors as well.

Possible Materials: Allow time for students to examine and manipulate the materials you have available. Doing so often aids students in refining their questions or prompts new ones that should be recorded for future investigation. In this inquiry, students might use materials such as wood blocks, nails or screws, and wooden dowels, as well as a golf ball. More convenient substitutes, such as clay sticks/bricks or craft foam and hard rubber balls, might be used as well.

Safety Considerations: To augment your own safety procedures, see NSTA's Safety Portal at



http://www.nsta.org/portals/safety.aspx.

Open Choice Approach (Copy Master page 11)

Groups might agree on one question for which they will all explore an answer, or each group might explore something different. Students should brainstorm to form a plan they would have to follow in order to answer the question, which might include researching background information. Work with students to develop safe procedures that control variables and enable them to gather valid data. Encourage students with prompts such as the following:

- Information we need to understand before we can start our investigation is....
- The variables in construction of a golf club head are....
- The potential variable(s) we will hold constant is (are)....
- To measure the effects of different clubs on the path of the golf ball, we will....
- To conduct the investigation safely, we will....

Focused Approach for High School (Copy Master pages 12–13)

The following exemplifies how students could design and assemble golf clubs with heads of equal mass but different moments of inertia (amounts of rotational inertia), and investigate any differences in the behavior of a golf ball struck somewhat off-center by the various clubs.

- 1. After students examine the materials you have available to construct golf clubs, ask them questions such as the following to help them envision their investigation.
- What are the variables that affect the rotational inertia of the club head?
- What must we hold constant to investigate the effects of different rotational inertia?
- How will we strike the ball so that differences between these clubs become apparent?
- How will we measure the path of the ball after being struck?
- What are some sources of error in measuring the path of the ball?
- 2. Students might make two club heads of equal mass, but different length, as follows: a long (high-rotational inertia) club head can be a single block of wood or dense craft foam, while a short (low-rotational inertia) club head can consist of two blocks, each one-half the length of the long one (perhaps made by cutting one long block in half), stacked vertically and fastened together with glue or tape. In each case, a hole could be drilled or otherwise punched vertically through the exact center of the block(s). These club heads can then swivel on a nail or screw that students simply hold between their fingers with their arm functioning as the club shaft. They might be nailed or screwed into the end of a wooden dowel or a mop, broom, or rake handle, or attached with a string to form a pendulum.
- 3. Once students have assembled their golf clubs, explain that by allowing the club head to freely swivel (instead of being fastened to the shaft as is done with a real club) the effect of the gentle golf stroke that can be performed in the classroom can be magnified for better observation. Use prompts such as the following to help students understand the cause and effect relationship.
- A real golf club can rotate somewhat upon contact with the ball because....
- Our golf club can rotate similarly, but more freely because....
- We are allowing freer rotation than a real golf club in order to....
- Of our two golf clubs, the one that should rotate the most is....
- The reason this club rotates more is because its mass is concentrated....
- 4. Ensure that students brainstorm to decide how they will actually use their clubs to put a ball towards a target, and how they will measure the accuracy. Students might devise procedures involving multiple putts by different group members. Use prompts such as the following to help students envision their procedure.
- The surface that we will be putting across is....
- The target of our putts will be....
- We will measure and record distance to and direction from the target by....
- We will reduce the effect of random human errors in our putts by....
- To conduct the investigation safely, we will....
- 5. Students might control the variable of how far off-center the ball will be struck by making marks on each club head—one in the center of the club face and the other a certain distance (the same for both clubs) off



center. Note that such marks will be further from the end of the club head in the case of the longer club head. Also note that if craft foam is used instead of wood, the marks need to be closer to the center, because craft foam is less dense than wood and will rotate much more. Ask students to predict the effect of off-center putts, and how the degree of this effect should vary with the club that is being used. Use prompts such as the following.

- We will ensure centered putts by....
- We will control the amount of de-centering by....
- Putts made off-center are likely to miss the target to the (right/left)....
- Putts made using the longer club face should miss (more/less) than with the other club....
- 6. Students can then use their agreed-upon procedure to make a large number of putts, and average, for each club, the distances by which the putts miss. Use prompts such as the following.
- The centered putts missed by
- The off-center putts made by the low-rotational inertia club missed by....
- The off-center putts made by the high-rotational inertia club missed by
- To minimize the problems of off-center strokes, golf club designers should....
- 7. Some students might wish to extend their investigation by making centered and off-center putts with a real putter, to see if there is a measurable difference in where the ball goes.

Adapt for Middle School Students(Copy Master pages 14–15)

The video concentrates on rotational inertia, which may not be part of your middle school physical science curriculum. As a related substitute, students might investigate simple (linear) inertia instead, related to Newton's First and Second Laws of Motion. The video points out that a more massive club head will produce a greater ball speed. The more massive club head has

more inertia, or resistance to acceleration, so that the ball goes forward farther, instead of the club head bouncing backward significantly off the ball. The following exemplifies how students could design and assemble golf clubs with heads of different mass, but that will be swung at the same speed, and investigate any differences in the behavior of a golf ball struck by these different clubs.

- 1. After students examine the materials you have available to construct golf clubs, ask them questions such as the following to help them envision their investigation.
- What are the variables that affect the speed of the golf ball after it is struck?
- How will we vary the mass of the club?
- How will we control the speed of the club head?
- What can we measure that will be directly related to how hard the ball was struck?
- What are some sources of error in measuring how hard the ball was struck?
- To conduct the investigation safely, we will....
- 2. Students might use a balsa wood stick as a club shaft, with two wooden blocks (one twice the mass of the other) interchangeably taped to one end to serve as club heads. A pin or small nail can be pressed or driven through the other end of the shaft to serve as a pivot point for rotation. One student can hold this nail at a given height, perhaps by resting his or her arm on a pile of books, while another group member pulls it back to level with the pivot point and then releases it from rest so that it swings down to strike a real golf ball placed (perhaps on a tee) at the end of a table. A third group member can then carefully mark where the golf ball strikes the floor and measure the horizontal distance it travelled from the edge of the table. Use example prompts such as the following.
- We released the club head from a set height in order to....
- We maintained a set height by ...
- We released the club head from rest (instead of pushing it) in order to....
- The horizontal distance travelled by the ball is a measure of ball speed because....
- Students might repeat the previous action, this time releasing the club head from a position almost directly
 above the pivot point, so that it falls about twice as far before hitting the ball. Use prompts such as the
 following.
- We released the club head from a greater height in order to....
- The distance the ball travelled was (greater/less) than before because....
- 4. Students might repeat the previous actions, but with a more massive club head. Use prompts such as the following to suggest a change in variables.
- We changed the mass of the club head in order to....



- The distance the ball travelled was (greater/less) than with the smaller mass because....
- The combination of mass and starting height that hit the ball the farthest was....
- The distance the ball travelled with the large mass/small height combination was (greater/less than/the same as) the distance travelled with the small mass/large height combination because....

Media Research Option

Groups might have questions that are best explored using print media and online resources. Students should brainstorm to form a list of key words and phrases they could use in Internet search engines that might result in resources that will help them answer the question. Review how to safely browse the Web, how to evaluate information on the Internet for accuracy, and how to correctly cite the information found. Suggest students make note of any interesting tangents they find in their research effort for future inquiry. Encourage students with prompts such as the following:

- Words and phrases associated with our question are....
- The reliability of our sources was established by....
- The science and math concepts that underpin a possible solution are....
- Our research might feed into an engineering design solution such as....
- To conduct the investigation safely, we will....

Make a Claim Backed by Evidence

Students should analyze their data and then make one or more claims based on the evidence their data shows. Encourage students with this prompt: As evidenced by ... we claim ... because

An example claim might be:

As evidenced by the greater distance that the putts missed the target by when using the club with the shorter club face, we claim that club face rotation during impact with the ball changes the path of the ball, because the ball can more easily twist the club with the lower rotational inertia.

Compare Findings

Encourage students to compare their ideas with others, such as classmates who investigated a similar – or different – question or system, or to compare their ideas with material they found on the Internet or in their textbooks or heard from an expert they chose to interview. Remind students to credit their original sources in their comparisons. Elicit comparisons from students with prompts such as:

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Students might make comparisons like the following:

My ideas are similar to those discussed by researchers, published on the Internet, who have done detailed studies of club head design. I found that a club head with its mass spread out closer to its edges has higher rotational inertia and will twist less during an off-center impact with the ball.

Reflect on Learning

Students should reflect on their understanding, thinking about how their ideas have changed or what they know now that they didn't know before. Encourage reflection, using prompts such as the following:

- The claim made by the expert in the video is....
- I support (or refute) the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- To improve my investigation, I wish I had spent more time on....
- Another investigation I would like to explore is....

Inquiry Assessment

See the rubric included in the student Copy Masters on page 16.

Incorporate Video into Your Lesson Plan



Integrate Video in Instruction

Visualize Concepts: Use the video to support a discussion on the meaning of the word *mass*. Have students focus on the portion of the video from 1:10–1:32 and then discuss how they might decide that one of two objects is more massive. Be sure to distinguish mass from the two other concepts with which it is most often confused: volume and weight.

Homework: Have students individually (or as part of small teams) research the standard masses of implements used in various sports, such as golf (clubs), baseball (bats), or tennis (rackets), and the masses of the balls used in these sports. Have them share their findings with the class the next day. A topic of discussion could be how the masses of the balls compare to the masses of the implements used to hit them. In particular, the masses of the implements must be considerably more than the masses of the balls being struck with them, so that the ball's velocity will change much more than that of the implement. However, if the implement is too massive, it will be hard for the player to swing, thus reducing the ball's velocity. Generally, the implements have been engineered to maximize ball speed.

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these Es:

Explore: Use the Design Investigations section of Facilitate Inquiry to support your lessons on mass, force, and acceleration, or (for more advanced classes) rotational inertia, torque, and angular acceleration.

Elaborate: Rotational inertia (moment of inertia) is an important consideration in many design and engineering problems. Have students do an Internet search on *moment of inertia* along with *design* or *engineering* to see what types of applications appear. Have students explain why moment of inertia is important for each application. For example, spin-stabilized satellites are most stable when rotating about the axis that has the highest moment of inertia, so that the satellite's shape (and hence distribution of mass) is a critical part of the design process.

Connect to ... Language Arts

Many physics terms—such as *energy*, *work*, *power*, and *momentum*—are used frequently in everyday language. *Inertia*—used in this video both in the rotational sense and in the simpler sense of mass—is such a term. Have students use a thesaurus or dictionary to find synonyms or definitions for inertia outside the realm of physics (an example is *laziness*). Discuss ways in which non-physics uses of the word are similar to, or different from, the way it is used in physics. To take this idea further, have students brainstorm to think of other science or specific physics terms or words that have uses outside their official subject area.

Use Video as a Writing Prompt

Explain to students that they will use the concepts from the video to define mass and rotational inertia. Project the video segment discussing these concepts (1:10–2:13), showing it at least twice. Have the students write a paragraph discussing what these two terms mean and describing at least one example each of how mass and rotational inertia are relevant and can be experienced in everyday life.

COPY MASTER: Open Choice Inquiry Guide for Students

The Science of Golf: Evolution of the Golf Club

Use this guide to investigate a question about the design of golf clubs and how the design is related to its functionality. Write your lab report in your science notebook.

Ask Beginning Questions

 ${\it The \ video \ makes \ me \ think \ about \ these \ questions....}$

Design Investigations

Choose one question. How can you answer it? Brainstorm with your teammates. Write a procedure that controls variables and makes accurate measurements. Look up information as needed. Add safety precautions.

- Information we need to understand before we can start our investigation is....
- The aspect of golf club design we will be working on is....



- This aspect of golf club design is important because....
- The variables we will be working with are....
- We will evaluate our design by
- To conduct the investigation safely, we will....

Record Data and Observations

Record your observations. Organize your data in tables or graphs as appropriate.

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data show. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- The claim made by the expert in the video is....
- I support (or refute) the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- To improve my investigation, I wish I had spent more time on
- Another investigation I would like to explore is....

COPY MASTER: Focused Inquiry Guide for Students (High School)

The Science of Golf: Evolution of the Golf Club

Use this guide to investigate the role of rotational inertia in the design of golf clubs. Write your lab report in your science notebook.

Ask Beginning Questions

Why is rotational inertia an important consideration in the design of golf clubs?

Design Investigations

Brainstorm with your teammates about how to answer the question. Write a procedure that controls variables and allows you to gather valid data. Add safety precautions as needed. Use these prompts to help you design your investigation.

- The golf club we will be designing or using will be....
- We will vary the rotational inertia of the club head by....
- We will hold the mass of the club head constant by....
- We will hold the off-center distance of the impact constant by....
- We will measure the deviation of the ball from its intended path by....
- We predict that the most deviation will occur with the (low/high) rotational inertia club....
- To conduct the investigation safely, I need to....

An Idea for Investigative Design

You might do this by having group members take turns putting a golf ball towards a target (such as the 50 centimeter mark of a meter stick) perhaps two meters away, and recording the centimeter mark the ball actually



hits. Do this for each club using the center of the club face, and again using off-center (by perhaps 4 centimeters) marks for the point of contact of the ball and the club.

Record Data and Observations

Organize your observations using a chart similar to the one below.

Centimeter Mark Struck by Ball (Target = X cm)

Club rotation al inertia		Strike point on target meter stick: Group member 1	_	 -
Low	0			
Low	4			
High	0			
High	4			

Ideas for Analyzing Data

- How far from the target was the average strike point for each club and impact point? What can you conclude about how rotational inertia affects accuracy for off-center putts?
- What was the average *difference* between the impact points and the average for that club/strike-point combination? How large is this value compared to the differences *between* the average values for the different club/strike-point combinations? How does this affect the certainty of your conclusion about how rotational inertia affects accuracy for off-center putts?

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data show. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who did the investigation using the same or a similar system or with those who did the investigation using a different system. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- The claim made by the expert in the video is....
- I support (or refute) the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- To improve my investigation, I wish I had spent more time on....
- Another investigation I would like to explore is....

COPY MASTER: Focused Inquiry Guide for Students (Middle School)

The Science of Golf: Evolution of the Golf Club

Use this guide to investigate how the mass and size of a golf club face affect the motion of a golf ball. Write your



lab report in your science notebook.

Ask Beginning Questions

Why is mass an important consideration in the design of golf clubs?

Design Investigations

Brainstorm with your teammates about how to answer the question. Write a procedure that controls variables and allows you to gather valid data. Add safety precautions as needed. Use these prompts to help you design your investigation.

- The golf club we will be designing or using will be....
- We will control the mass of the club head by....
- We will control the speed of the club head by....
- We will measure the distance the ball travels by....
- We predict that the greatest distance will occur with....
- To conduct the investigation safely, I need to....

An Idea for Investigative Design

You might have one group member hold the pivot, another release the club head, and another mark the landing point and measure horizontal distance travelled. Do this for each of the four combinations of club head mass and release height.

Record Data and Observations

Organize your procedure and observations.

Distance Travelled by Ball

Club head mass (grams or	Club head release height (centimeters	Horizontal distance travelled
number of identical blocks)	above lowest point of swing)	

Ideas for Analyzing Data

For each release point, divide the distance travelled by the ball when struck by the high mass club by the distance travelled by the ball when struck by the low mass club. Repeat this using the higher release point. Next, divide the distance travelled using the high release point by the distance using the low release point, with the low club head mass. Repeat this for the high club head mass. Which, if either, affected the distance more—doubling the club head mass or doubling the release height?

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data show. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who did the investigation using the same or a similar system or with those who did the investigation using a different system. Or do research on the Internet or



talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- The claim made by the expert in the video is....
- I support (or refute) the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- To improve my investigation, I wish I had spent more time on....
- Another investigation I would like to explore is....

COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria	1 point	2 points	3 points
Initial question	Question had a yes/no answer, was off topic, or otherwise was not researchable or testable.	Question was researchable or testable but too broad or not answerable by the chosen investigation.	Question clearly stated, researchable or testable, and showed direct relationship to investigation.
Investigation design	The design of the investigation did not support a response to the initial question.	While the design supported the initial question, the procedure used to collect data (e.g., number of trials, control of variables) was not sufficient.	Variables were clearly identified and controlled as needed with steps and trials that resulted in data that could be used to answer the question.
Variables	Either the dependent or independent variable was not identified.	While the dependent and independent variables were identified, no controls were present.	Variables identified and controlled in a way that resulted in data that can be analyzed and compared.
Safety procedures	Basic laboratory safety procedures were followed, but practices specific to the activity were not identified.	Some, but not all, of the safety equipment was used and only some safe practices needed for this investigation were followed.	Appropriate safety equipment used and safe practices adhered to.
Observations and data	Observations were not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what actually took place during the investigation.	Observations were made, but were not very detailed, or data appeared invalid or were not recorded appropriately.	Detailed observations were made and properly recorded and data were plausible and recorded appropriately.
Claim	No claim was made or the claim had no relationship to the evidence used to support it.	Claim was marginally related to evidence from investigation.	Claim was backed by investigative or research evidence.
Findings comparison	Comparison of findings was limited to a description of the initial question.	Comparison of findings was not supported by the data collected.	Comparison of findings included both methodology and data collected by at least one other entity.
Reflection	Student reflections were limited to a description of the procedure used.	Student reflections were not related to the initial question.	Student reflections described at least one impact on thinking.



SCIENCE OF GOLF: Math of Golf Scoring - STEM Lesson Plan

Video & Source available at: http://nbclearn.com/science-of-golf

Objective:

Students will investigate questions about the mathematical processes involved in golf scoring and averaging data.

Introduction Notes:

SCIENCE OF GOLF Math of Golf Scoring STEM Lesson Plan

Lesson plans produced by the National Science Teachers Association.

Video produced by NBC Learn in partnership with the USGA and Chevron.

Background and Planning Information

About the Video

This video discusses how golf scores are tabulated and totaled, and introduces the concept of par. It also shows alternate methods of calculating scores, including that of adding up the differences relative to par, whether positive (over par) or negative (under par). The video features interviews with Ross Galarneault, of the United States Golf Association's (USGA's) Golf Handicap and Information Network, plus brief interviews with a few professional golfers.

Video Timeline

		·····
0:00	0:15	Series opening
0:16	0:30	Introducing the concept of scoring in golf
0:31	0:40	Introducing Ross Galarneault
0:41	1:34	Describing stroke play, handicap, and net score
1:35	2:00	Defining course par
2:01	2:20	Calculating score by comparing to par in terms of bogeys and birdies
2:21	3:23	Use of negative and positive numbers in scoring
3:24	4:07	Discussing use of score relative to par on leaderboards, and aggregate score
4:08	4:46	Discussing cuts at tournaments and extrapolating partial scores
4:47	5:19	Discussing use of statistics to improve play
5:20	5:27	Summary
5:28	5:44	Closing credits

Language Support: To aid those with limited English proficiency or others who need help focusing on the video, click the Transcript tab on the side of the video window, then copy and paste the text into a document for student reference.

Next Generation Science Standards

The investigation described in Facilitate MATH Inquiry supports Practices for K–12 Science Classrooms. Science and Engineering Practices

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for
evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable
measurements, and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time),



and refine the design accordingly.

- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
- Develop a model to predict and/or describe phenomena.
- Use mathematical representations of phenomena to describe explanations.
- Construct and interpret graphical displays of data to identify linear and nonlinear relationships.

Common Core Standards for Mathematics

The investigation described in Facilitate MATH Inquiry supports mathematics instruction. The complete text for the following standards can be accessed at: http://www.corestandards.org.

CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.

CCSS.Math.Practice.MP5 Use appropriate tools strategically.

CCSS.Math.Practice.MP6 Attend to precision.

CCSS.Math.Practice.MP8 Look for and express regularity in repeated reasoning.

CCSS.Math.Content.6.NS.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values...; use positive and negative numbers to represent quantities in real-world contexts....

CCSS.Math.Content.6.NS.6a. Understand a rational number as a point on the number line... Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line....

CCSS.Math.Content.6.NS.6b. Understand a rational number as a point on the number line... Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane....

CCSS.Math.Content.6.NS.6c. Understand a rational number as a point on the number line... Find and position integers and other rational numbers on a horizontal or vertical number line diagram....

CCSS.Math.Content.6.SP. 3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

CCSS.Math.Content.HS.S-IC.2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

Promote STEM with Video

Connect to Science

Statistics – including various types of scores, and reference to some standard (like golf's par) – are very important in **science**. A frequent problem in science is how to decide whether or not a particular hypothesis can account for the observations. Usually, the answer is not clear-cut, but a decision can be made based on statistical tests (essentially scores), which must rise to a certain level (like par) in order for a hypothesis to be accepted or the null hypothesis to be rejected. The golf score also can be related to error analysis. If par is the accepted value, then the score (+1, -1, etc.) represents the positive or negative error in the process. This is typically expressed as percent error, but could be absolute error as well.

Take Action with Students

- Have students brainstorm to think of scientific problems in which statistics might be employed to decide whether or not a certain hypothesis should be accepted. Examples might include studies in which a new medicine is tested against a placebo, to see if the medicine has any benefit. The first step would be to reject the null hypothesis: that the medicine and the placebo produce the same results. Ask students to state what level of certainty they would expect before being willing to claim that the medicine is effective (for example, a less-than 5% chance that the null hypothesis is correct).
- Have students do Internet searches to find examples of the use of statistical significance in science, and then share these findings with the class.

Connect to Technology

As with almost every other sport, hobby, or area of interest, **technology** provides new ways to accomplish old tasks. Golf scoring is no exception. At one time, people interested in how to use their scores to improve their games were excited that hand-held calculators became affordable. Today, entering their scores on a mobile phone app gives them data to discuss with their coach or other players immediately after the round. Scoreboard



technology has changed as well—from hand-drawn signs to interchangeable panels to digital displays. Today, tournament players can find it very difficult to avoid seeing their standings during the round.

Take Action with Students

- Have students do an Internet search on combinations of words such as golf, score, technology, and apps.
 They will likely find many applications for computers or mobile devices, to help golfers keep or analyze
 scores. Optionally, students might obtain free or perhaps purchase low-cost apps, and try them out. Ask
 students whether or not the applications they found are truly useful, and what advantages or disadvantages
 they might have, compared with traditional score cards.
- Encourage students to explore how golf scoreboard technology has evolved. They might begin their Internet searches at sites such as the following:

http://www.mrscoreboards.com.au/Other-Sports/Digital-Scorers/Digital-Scorers.asp http://www.golfconversations.com/2011/01/17/mike-kutcher-keeper-of-the-scoreboard/

Connect to Engineering

In **engineering**, a product is expected to meet certain criteria. These may be rather standard expectations for an entire class of products, or may be novel goals set by the designer for especially innovative products. The idea of meeting a standard or benchmark is very similar to the golf concept of par, presented in the video. Like most engineering criteria, par is a challenging but attainable goal, which varies somewhat with the situation (i.e., different holes have different par values, much as different products may be designed to different standards). In the case of golf, par is a sort of maximum value, so that lower scores (under par) are good. In other cases, minimum values are the criteria (e.g., the battery must last at *least* nine hours while powering a standard flashlight). Finally, sometimes a *range* is specified (e.g., the drill bit must be more than some minimum diameter, and less than some maximum diameter).

Take Action with Students

- Ask students to brainstorm to think of common products (e.g., cars, washing machines, electric drills, eyeglasses) and then think of what types of criteria they might be expected to meet. Then, have them do research to find actual design criteria for such products, and compare any that match the students' types to see if the official criteria are close to students' expectations.
- Students might research the development of and need for engineering standards set forth by organizations such as Society of Automobile Engineers (SAE) International (http://www.sae.org) and the International Organization for Standardization (ISO) (http://www.iso.org/iso/home.html).

Connect to Math

Inmath, number lines, which are featured in the video, are often used to represent relationships among different quantities, and can be used to illustrate the meaning of positive and negative numbers. Number lines also allow students to visualize adding (as moving to the right on a number line) and subtracting (moving to the left on the number line).

Take Action with Students

- Have students brainstorm to think of applications of number lines. Examples might include time lines for historical events, mile markers on interstate highways, and thermometers (when represented vertically).
- Ask students to brainstorm applications of simultaneous use of multiple number lines. Examples might include the two crossed number lines of a Cartesian coordinate plane, the crossed lines of the imaginary and real axes of a complex plane, or latitude and longitude (to which a third line elevation can be added). Suggest to students that the need for multiple number lines implies higher dimensions, so that a dimension is basically something for which a number line is needed.

Facilitate MATH Inquiry

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student *Copy Masters* begin on page 11.



Explore Understanding

Ask students to consider the question of how the order of mathematical operations might make calculations more or less convenient, and how to determine which particular types of data are most useful for a given exercise. Use prompts such as the following.

- The associative property of addition states that....
- When mentally adding large sets of numbers, I....
- The average (or arithmetic mean) of a set of numbers is....
- A shortcut for finding the average of a set of numbers might be....
- The term par generally refers to....

Show the video *Science of Golf: Scoring*. Again, ask students how the order of mathematical operations might make calculations more or less convenient. Continue the discussion of the mathematics of scoring with prompts such as the following.

- When I watched the video, I thought about....
- Ways to keep score in golf include....
- An advantage of the relative-to-par method is....
- The relative-to-par method might be misleading for predicting a final score depending on exactly how many and which holes have been played because....
- Other areas besides golf, where such a choice of statistical methods might exist, include....

Ask Beginning Questions

Stimulate small-group discussion with the prompt: *This video makes me think about these questions....* Then have groups list questions they have about the challenges of calculating totals or averages for large sets of numbers. Ask groups to choose one question and phrase it in such a way as to be researchable and/or testable. The following are some examples.

- When adding many numbers, is it better to do the whole computation at once, or in parts?
- Are there any advantages or disadvantages to knowing an incomplete score?
- How are standards (such as par, the size of a baseball diamond) determined?

Design Investigations

Choose one of the following options based on your students' knowledge, creativity, and ability level and your available materials. Actual materials needed would vary greatly based on these factors as well.

Possible Materials: Allow time for students to examine and manipulate the materials you have available. Doing so often aids students in refining their questions, or prompts new ones that should be recorded for future investigation. In this inquiry, students might generate their own data set or use any source of large amounts of data, especially for which totals or averages are meaningful. Data can be found in books or on the Internet, or collected by students using any measurement that can be repeated many times, with somewhat varying results. See an example in the Focused Approach section.

Safety Considerations To augment your own safety procedures, see NSTA's Safety Portal at http://www.nsta.org/portals/safety.aspx.

Open Choice Approach (Copy Master page 11)

Groups might come together to agree on one question for which they will explore an answer, or each group might explore something different. Students should brainstorm to form a plan they would have to follow in order to answer the question, which might include researching background information. Work with students to develop safe procedures that control variables and enable them to gather valid data. Encourage students with prompts such as the following:

- Information we need to understand before we can start our investigation is....
- We might find data from online or other sources by....
- We might generate our own data by....
- We will calculate totals or averages of our data by....
- We might test our method by....



• To conduct the investigation safely, we will....

Focused Approach (Copy Master pages 12–13)

The following exemplifies how students might obtain and use data to explore different methods for computing totals or averages. The particular subject suggested here is weather data, readily available online at http://www.nws.noaa.gov/climate/, where students can click on any location. Clicking on this page should bring up a page with an option called Preliminary Monthly Climate Data (CF6). You may then choose the nearest listed city and retrieve data for the current month, or a past month. For each day, the maximum, minimum, average [defined as (max+min)/2, and rounded off], and departure of this average from the normal (over the period 1981–2010) are listed. Averages for the maximum and minimum temperatures, as well as the overall average and its departure from normal, are listed after the last day of the month, computed for all the days listed. Additional interesting data are given, but will not be discussed here. You may want to crop off the totals and averages at the bottom, as the students will be calculating these themselves and comparing them.

- 1. After students examine the monthly climate data you have made available, ask them to determine the normal average temperature (par, by analogy with golf) for the month.
- How can we use the average temperature and its departure from normal to find the daily normal temperature?
- Is the normal temperature the same for each day? Why or why not?
- By how much do the daily temperatures differ from normal?
 - 2. Students might find the average of the actual daily average temperatures and the average of the normal values for each day, and then compare these two results.
- To find the average of all the daily average temperatures I would....
- To find the average of all the daily normal temperatures I would....
- I know the departure from normal for the month is +/- because....
 - 3. Students might now find the average of all the values (some likely positive and some likely negative) in the departure column, by finding their sum and dividing by the number of days. They might then add this to the average normal temperature for the month so far (found earlier) to get the actual average temperature for the month.
- I could also find the departure from normal for the month by....
- I calculated the actual average temperature for the month by _____, which compares to our previous departure calculation by....
- These results do/do not agree with our previous method in that....
 - 4. Suggest to students that they scan through the daily values for maximum temperatures, and estimate a whole number (perhaps even a multiple of 5 or 10) that seems to be close to the average of the values. They then might go through the list, using how much above or below this value each day's temperature was, and perhaps mentally tallying a total of these differences perhaps by imagining a number line like the one in the video. (This is very similar to what a golfer might do, keeping track of how much under or over par he or she is). Students can then divide this total by the number of days, and add it to the rounded-off initial estimate, to get an average. Students might repeat this procedure for the minimum temperatures.
- I used the rounded off estimate of _____for the average maximum (or minimum) temperature because....
- I calculated the total difference between the actual daily values and my estimate as +/- by....
- I calculated the average difference between the actual daily values and my estimate as +/-____ by....
- I determined the average maximum (or minimum) temperature for the month to be _____ by....
- I calculated the monthly average temperature to be by....
- The value I calculated for the average temperature for the month compares to other ways I calculated the value by....
- The method of comparing values to a rough estimate is easier/harder for me than the method of adding all the numbers up and dividing by how many there are because....
 - 5. You might now reveal to students the average values at the bottom of the table of data, which they can compare to their own.
- My values (are/are not) exactly the same as the ones in the table because....
- The purpose of the whole number sums (SM) listed above the averages might be to....
 - 6. More advanced students might be encouraged to do a further analysis, especially if there are several days left in the month or if they are provided incomplete data from a previous month. In particular, they might try to predict the final average temperature (for any or all of maximum, minimum, and daily average) for the



month when it is complete. This may involve looking at trends in the daily normal temperatures, and deciding whether any above- or below-normal trends are likely to persist, or if some law of averages will try to correct them. (Note: this is a commonly held impression, but is not statistically valid in the sense of some force trying to make things average out.) Students may either wait until the end of the month, or be given the final values from a previous month, against which to compare their predictions.

- I think the normal temperatures for the rest of the month will be because....
- I think the departure from normal for the rest of the month will be because....
- I will predict the month's final average temperature by....
- The difference between my predicted value and the actual one is _ because....
- The assumption I made that caused the most error was....
 - 7. As an additional or alternative exercise, advanced students might research the definitions of heating and cooling degree days (HDD and CDD in the table), and confirm that they get the same values as shown in the table. They might brainstorm to see if there is any way to determine these values from the overall monthly average temperature, or if it is necessary to use the sum of the daily values.
- The purpose of heating/cooling degree days is....
- Heating/cooling degree days are calculated by....
- We can/cannot compute these values using the overall monthly averages because....

Media Research Option

Groups might have questions that are best explored using print media and online resources. Students should brainstorm to form a list of key words and phrases they could use in Internet search engines that might result in resources to help them answer the question. Review how to safely browse the Web, how to evaluate information on the Internet for accuracy, and how to correctly cite the information found. Suggest students make note of any interesting tangents they find in their research effort for future inquiry. Encourage students with prompts such as the following:

- Words and phrases associated with our question are....
- The reliability of our sources was established by....
- The science and math concepts that underpin a possible solution are....
- Our research might feed into an engineering design solution such as....
- To conduct the investigation safely, we will....

Make a Claim Backed by Evidence

Students should analyze their data and then make one or more claims based on the evidence their data shows. Encourage students with this prompt: As evidenced by ... we claim ... because

An example claim might be: As evidenced by the fact that got the same answer for our temperature averages using both methods, we claim that these methods are equally valid, because the associative property of addition says that we can group numbers in any way while adding them.

Compare Findings

Encourage students to compare their ideas with others, such as classmates who investigated a similar (or different) question or system, or to compare their ideas with material they found on the Internet or in their textbooks, or heard from an expert they chose to interview. Remind students to credit their original sources in their comparisons. Elicit comparisons from students with prompts such as:

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Students might make comparisons like the following:

Our method for calculating monthly average temperature is similar to the one shown in the video for tallying golf scores, because the normal daily mean temperatures against which we compared the actual daily averages were closely analogous to the par value for each hole.

Reflect on Learning



Students should reflect on their understanding, thinking about how their ideas have changed or what they know now that they didn't know before. Encourage reflection, using prompts such as the following:

- The claim made by the expert in the video is....
- I support or refute the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- Another investigation I would like to explore is....

Inquiry Assessment

See the rubric included in the student Copy Masters on page 14.

Incorporate Video into Your Lesson Plan

Integrate Video in Instruction

Real World Connections: People often need to add and/or average lists of numbers, such as one's average grade from a number of test scores or an average monthly electric bill. With calculators available, the usual method would be to compute these values directly. The mental trick of *guessing* an average (like a par value), and tallying the differences can be quick and effective, and also reinforces one's ability to estimate averages of numbers at a glance. For example, have students generate a series of test scores such as 87, 92, 85, 93, and 91. Encourage them to find the average using a calculator, which will result in an average score of 89.8. Then have students compare each score to a quick guess of 90 and tally the ups and downs, which yields -1, so that the average is under 90 by 1/5, or 0.2, yielding the same 89.8 while dealing with only small numbers.

Homework: Have students find some type of data that needs averaging or totaling, and lends itself to the alternate approaches discussed in the video and illustrated in the Focused Inquiry. Generally, this should be a list of numbers (preferably whole numbers) that do not vary too widely. Examples might include lists of games won each year by a certain major league baseball pitcher or by a team, or the number of days it rained each month in a given year. Have students compute the averages, and then bring the data to class to swap with other students' data, to confirm the results.

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these Es:

Explore: Have students brainstorm to think of ways they do mental math, and then share these with the class. If, as may be the case in this age of electronic calculators, they have little to suggest, ask them to do some mental math on the spot and then enquire as to how they did it. You might look at the associative, distributive, and commutative properties, and perhaps books or web sites that discuss quick tricks for doing mental math. Share some of these with students if they do not generate their own ideas. Additionally or alternatively, put lists of numbers on the board and ask students to quickly estimate sums and/or averages. Then, find exact values (by either method discussed in the Focused Inquiry) to see how close the students' estimates were.

Evaluate: After watching the video and completing the inquiry, give students lists of numbers (golf scores or weather data, for example) for which to compute sums or averages, with or without the aid of a calculator. Grade for accuracy and/or time.

Connect to ... Language Arts

The word "par" has a specific meaning in golf, but is also used in similar ways elsewhere in English (e.g., "I'm not feeling up to par"). Its golf usage, at least, suggests the existence of a standard, criterion, or benchmark – words that are very nearly synonyms, but may have subtly different connotations. Elicit from students sentences that clearly convey the distinctions.

Connect to ... Physical Education

There are many types of scoring systems in sports. Many of them use points, sometimes awarded in varying amounts (e.g., in football and basketball), though some use times (e.g., swimming, running). Golf is unusual but not unique in having the lowest number win. (Another example is cross-country running.) Have students brainstorm to come up with specific scoring systems used in different sports. Also, ask them to discuss the pros and cons of different systems.



Use Video as a Writing Prompt

Have students watch the video, and then try to explain in writing the differences between the two scoring methods: adding strokes on each hole, versus tallying differences from par. Ask that they be as specific, clear, and concise as possible. This may be a somewhat challenging task, as it is inherently a mathematical idea, required here to be expressed verbally.

COPY MASTER: Open Choice Inquiry Guide for Students

Science of Golf: Scoring

Use this guide to investigate a question about how one might compare different mathematical methods of scoring or averaging data. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

Design Investigations

Choose one question. How can you answer it? Brainstorm with your teammates. Write a procedure that controls variables and makes accurate measurements. Look up information as needed. Add safety precautions.

- Information we need to understand before we can start our investigation is....
- The data we will use are....
- The variables we will be studying are....
- The calculations we will make are....
- *The methods we will compare are....*
- We will evaluate our methods by....
- To conduct the investigation safely, we will....

Record Data and Observations

Record your observations. Organize your data in tables or graphs as appropriate.

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data show. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- The claim made by the expert in the video is....
- I support or refute the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- Another investigation I would like to explore is....

COPY MASTER: Focused Inquiry Guide for Students



Science of Golf: Scoring

Use this guide to investigate a question about how one might compare different mathematical methods of scoring or averaging data. Write your lab report in your science notebook.

Ask Beginning Questions

When adding many numbers, is it better to do the whole computation at once, or in parts?

Design Investigations

Brainstorm with your teammates about how to answer the question. Write a procedure that controls variables and allows you to gather valid data. Add safety precautions as needed. Use these prompts to help you design your investigation.

- We will get our data from....
- We will first compute monthly average temperature by....
- We will next compute monthly average temperature by....
- We will also compute....
- We will evaluate our methods by....
- To conduct the investigation safely, I need to....

Record Data and Observations

Organize your findings in tables or graphs as appropriate. Use the following guide to collect your data. N represents the number of days in the month.

Data	Value	Hint
Normal average temperature for the month		sum of normals/N
Actual average temperature for the month		sum of daily averages/N
Departure from normal for month		
Average of departures from normal		sum of departures from normal/N
Actual average temperature for the month		compare to the actual average temperature for the month
Estimated average of daily maximum temperatures		use a whole number
Total departure of actual maximum temps from estimate		
Average departure of actual maximum temps from estimate		total departure of actual max temps from estimate / N
Average daily maximum temperature for month		
Estimated average of daily minimum temperatures		use a whole number
Total departure of actual minimum temps from estimate		
Average departure of actual minimum temps from estimate		total departure of actual minimum temps from estimate / N
Average daily minimum temperature for month		
Actual average temperature for the month		
Departure from normal for month		compare the departure from normal for the month to the average of departures from normal
Actual average daily maximum temperature for the month		compare to the average daily maximum temperature and the average daily minimum temperature for the month

Ideas for AnalyzingData

- For each of the items where you were asked to compare to an earlier calculation, did you get exactly the same result? Why or why not?
- Which method do you believe would be easier to use when using a calculator or spreadsheet?
- Which method do you believe would be easier to use when doing mental (in your head) math?
- What is a possible reason for including the sums (on the SM line) for maximum and minimum temperatures, in addition to reporting the averages?
- What are some sources of error in our methods?



Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data show. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who did the investigation using the same or a similar system or with those who did the investigation using a different system. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- The claim made by the expert in the video is....
- I support (or refute) the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- Another investigation I would like to explore is....

COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria	1 point	2 points	3 points
Initial question	Question had a yes/no answer, was off topic, or otherwise was not researchable or testable.	Question was researchable or testable but too broad or not answerable by the chosen investigation.	Question clearly stated, researchable or testable, and showed direct relationship to investigation.
Investigation design	The design of the investigation did not support a response to the initial question.	While the design supported the initial question, the procedure used to collect data (e.g., number of trials, control of variables) was not sufficient.	Variables were clearly identified and controlled as needed with steps and trials that resulted in data that could be used to answer the question.
Variables	Either the dependent or independent variable was not identified.	While the dependent and independent variables were identified, no controls were present.	Variables identified and controlled in a way that results in data that can be analyzed and compared.
Safety procedures	Basic laboratory safety procedures were followed, but practices specific to the activity were not identified.	Some, but not all, of the safety equipment was used and only some safe practices needed for this investigation were followed.	Appropriate safety equipment used and safe practices adhered to.
Observations and data	Observations were not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what actually took place during the investigation.	Observations were made, but were not very detailed, or data appear invalid or were not recorded appropriately.	Detailed observations were made and properly recorded and data are plausible and recorded appropriately.
Claim	No claim was made or the claim	Claim was marginally related	Claim was backed by



	had no relationship to the evidence used to support it.	to evidence from investigation.	investigative or research evidence.
Findings comparison	Comparison of findings was limited to a description of the initial question.	Comparison of findings was not supported by the data collected.	Comparison of findings included both methodology and data collected by at least one other entity.
Reflection	Student reflections were limited to a description of the procedure used.	Student reflections were not related to the initial question.	Student reflections described at least one impact on thinking.

SCIENCE OF GOLF: Volume, Displacement & Buoyancy - STEM Lesson Plan

Video & Source available at: http://nbclearn.com/science-of-golf

Objective:

Students will investigate questions about how to determine the volume of a golf club or other irregularly-shaped object.

Introduction Notes:

SCIENCE OF GOLF Volume, Displacement & Buoyancy

STEM Lesson Plan

Lesson plans produced by the National Science Teachers Association. Video produced by NBC Learn in partnership with the USGA and Chevron.

Background and Planning Information

About the Video

This video discusses how an ancient principle, discovered by the Greek scientist Archimedes more than two millennia ago, is used to find and regulate the volume of golf club heads. It features Carter Rich, Manager of Equipment Standards for the United States Golf Association (USGA) and John Spitzer, Assistant Technical Director of the USGA's Test Center. The video describes Archimedes' principle, and how it is applied to the problem of finding the volume of irregularly shaped club heads via the buoyancy force on them when submerged in water. The video also explains why the volume of golf club heads matters: a larger volume could have a higher rotational inertia, causing less club head twist on bad shots, and giving the user an unfair advantage over players using club heads with less volume.

Video Timeline

0:00	0:15	Series opening
0:16	0:28	Introduces how clubs can vary in size and shape
0:29	0:56	Introduces Carter Rich, who explains the history of volume regulations
0:57	1:29	Introduces John Spitzer, who outlines how Archimedes' ideas apply to volume
1:30	2:02	Discusses the story of Archimedes and his solution to the gold crown problem
2:03	2:52	Describes Archimedes' principle and the $d = m/v$ formula
2:53	3:14	Defines buoyancy and details how it is used to find the volume of a club head
3:15	3:24	Shows the experimental method of determining volume



	3:25	3:43	Discusses moment of inertia as the reason for regulating club head volume	;
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3:44 4:32 Describes the influence of the moment of inertia on the swing

4:33 4:56 Summary

4:57 5:12 Closing credits

Language Support: To aid those with limited English proficiency or others who need help focusing on the video, click the Transcript tab on the side of the video window, then copy and paste the text into a document for student reference.

Next Generation Science Standards

Consider the investigation described in Facilitate ENGINEERING Inquiry section as part of a summative assessment for the following performance expectations. Refer to a NGSS document for connected Common Core State Standards for ELA/Literacy and Mathematics. The investigation also supports Practices for K–12 Science Classrooms.

Engineering Design

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Science and Engineering Practices

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for
 evidence, and in the design: decide on types, how much, and accuracy of
 data needed to produce reliable measurements and consider limitations on the precision of the data (e.g.,
 number of trials, cost, risk, time), and refine the design accordingly.
- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
- Use mathematical representations of phenomena to describe explanations.
- Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects.

Promote STEM with Video

Connect to Science

Displacement is related to buoyancy, and is the physical principle used to find the volume of golf club heads. Archimedes discovered the **science** principle applied here more than two thousand years ago, showing that some very ancient ideas remain valuable even in our modern world. A greater volume allows for a wider range of locations for a club head's moment of inertia, which is what the USGA is really trying to control, indirectly, by setting limits on volume.

Related Science Concepts

- volume
- mass
- displacement
- weight
- density

Take Action with Students

- Have students describe the process of determining the volume of irregularly shaped objects by water displacement in a graduated cylinder. If students haven't carried out this procedure, supply them with graduated cylinders, water, and irregularly shaped objects to allow them to discover this approach.
- Have students research how weighing a person underwater can be used to find body density and body fat
 percentage. Ask them to explain how this uses the concepts discussed in the video and the definition of
 density.
- One application of the principle of buoyancy is constructing boats that float. While the idea of the buoyant



force being equal to the weight of the displaced water is simple, it is much more complicated to determine what shape of a hull will maximize the load a boat can carry without sinking, given a certain amount of material from which to make the boat. While this is a rather complex mathematical problem, a simple look at the shapes of boats might suggest that near optimal shapes have been arrived at empirically (by trial and error).

However, a "V" shaped hull, for instance, might have other purposes, such as reducing drag in the water. Have students research this issue, to find what shapes are best for boats, and suggest how this might have been determined. As an inquiry, students might be given a fixed amount of aluminum foil from which to make a boat, and experiment to see what design can support the most weight (such as the number of pennies or counting cubes that can be loaded into the boat before it sinks).

Connect to Technology

While the volume-measuring process described in the video is not particularly complex, it does rely on the **technology** of measuring force (i.e., weight – although note that mass is *not* being directly measured here, as one might infer from the video at 3:00). An electronic digital scale is being used in the video, while the cartoon of Archimedes at 2:34 shows him using a sort of balance.

Take Action with Students

- Have students brainstorm methods that exist (or new ones they might think of) for weighing objects, or for
 measuring force in general. After this, have them research existing methods. They might start with a
 resource such as http://www.perryscale.com/evolution-of-weighing-scales.htm. Students might try to make
 a scale from simple materials using a method they have found or devised themselves.
- Ask students to define the terms *mass* and *weight* to ensure that they understand the difference. Weight is often measured as a surrogate for mass, which works because this is almost always done at Earth's surface, where the acceleration due to gravity is dependably 9.8 m/s/s. Have students do research or brainstorm to find methods of measuring mass that do *not* involve measuring weight, and which would therefore work in weightless or free-fall (i.e., in orbit) conditions.

Connect to Engineering

The **engineering** design process involves identifying problems and finding solutions, usually as part of an ongoing cycle of innovation. The method for finding club head volume discussed in the video has its origins in the distant past, and yet has been engineered to work with modern materials and methods. Archimedes had different background and materials to work with and engineered his own solution at the time. Also, Archimedes is credited with a number of other inventions, which presented their own engineering challenges.

Take Action with Students

- Have students do research to determine a likely way Archimedes might have actually done his experiment.
 Note that some debate exists about how he may have done this, as it is not detailed in any surviving works
 of his. Have them replicate the experiment using available materials, applied to irregularly shaped objects
 of unknown materials.
- Have students research and present reports on other inventions by Archimedes, describing the engineering challenges these presented.
- Challenge students to create an apparatus for measuring mass without measuring weight. For example, students might test how an object vibrates back and forth on a spring or some other elastic holder, and determine the mass based on the period of oscillation.

Connect to Math

Math, in the form of elementary algebra, is involved in the use of the equation d = m/v (density equals mass divided by volume). This simple equation can be rearranged to solve for one of the three variables. Middle school students without an algebra background might have learned some non-algebraic ways to "get a letter by itself." (One of these involves a triangle divided into the sections, each containing one of the three variables).

Also, there are various mathematical formulae for finding volumes of particular shapes, such as cubes, spheres, and cones. None of these is likely to be a good model for an irregularly shaped object such as a golf club head, but it can be an interesting exercise to try to approximate the volume of an irregular object, compared to the



volume of one for which a formula is known.

Take Action with Students

- If students have had algebra, have them rearrange d = m/v to arrive at m = dv and v = m/d. Have students without an algebra background brainstorm ways to determine how to solve for one of the variables. Examples might include trying different size numbers for the variables to see if the answer varies in a reasonable way, or perhaps the "triangle" method mentioned above. Have them discuss the pros and cons of non-algebraic methods.
- Have students brainstorm to think of other relationships among three variables that are of the form x = y/z. Examples might include speed = distance/time or unit price = total cost/amount of item. In each case, discuss the importance of properly rearranging to solve for the variable we want to calculate.
- Have students examine a club head and estimate the dimensions of a cube, parallelepiped, cone, or some
 other standard object that might have the same volume. Students should work in separate groups to arrive
 at their estimates using volume formulae for their chosen figures. Have them compare the results, and
 record them for use in the Engineering Inquiry.
- Students might use the concepts from the video to do various calculations. For example, show the segment of the video from 0:48 to 1:00, where 460 cubic centimeters is equated to 28.1 cubic inches. Have students confirm this, given the number of centimeters in an inch (2.54), or alternatively, have them determine the number of centimeters in an inch from the data. Have students calculate the volume in cubic inches of a second example, shown at 3:16 to 3:23

Facilitate ENGINEERING Inquiry

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student *Copy Masters* begin on page 10.

Explore Understanding

Students will certainly be familiar with the phenomenon of floating, but might not have thought about the fact that a buoyant force must exist to hold an object up against the force of gravity, and that this force is supplied by the surrounding fluid, and is equal to the weight of the displaced fluid. If needed, look at sites such as the following for more background:

- http://www.seaperch.org/article?article_id=313
- http://www.pbs.org/wgbh/nova/lasalle/buoybasics.html

The method shown in the video for measuring club head volume exploits the concept cleverly but simply. Understanding this method helps students understand Archimedes' principle itself. Use prompts such as the following to explore what students already know.

- We know a buoyant force must exist on a floating object because....
- This buoyant force is actually exerted by....
- The strength of this buoyant force is equal to....

Show the video "Science of Golf: Volume and Displacement." Continue the discussion of Archimedes' principle and how the method in the video employs it using prompts such as:

- When I watched the video, I thought about....
- The equal and opposite reaction force to the water pushing up on the club head is....
- In the video, the buoyant force is measured by....
- In order to determine the volume, in addition to the buoyant force, we must know....
- Some possible difficulties or sources of error in determining the volume are....
- It is important to be able todetermineclub head volume because....

Ask Beginning Questions

Stimulate small-group discussion with the prompt: *This video makes me think about these questions....* Then have groups list questions they have about the challenges that must be surmounted to develop a consistent way to measure club head volume. Ask groups to choose one question and phrase it in such a way as to be researchable and/or testable. The following are some examples.



- Why is water displacement used rather than other methods of determining volume?
- How can we determine the weight of the water that is displaced by the club head?
- What is the density of water, what does "density" mean, and could other fluids be used to determine the club head's volume?
- *How is mass related to weight?*
- How do we calculate the volume of the club head from actually measured data?
- Are there different methods that would accomplish the same goals?

Design Investigations

Choose one of the following options based on your students' knowledge, creativity, and ability level and your available materials. Actual materials needed would vary greatly based on these factors as well.

Possible Materials: Allow time for students to examine and manipulate the materials you have available. Doing so often aids students in refining their questions, or prompts new ones that should be recorded for future investigation. In this inquiry, students might use materials such as a container of water, a weighing scale of some sort, and an irregularly shaped object (such as a golf club head) whose volume is to be determined.

Safety Considerations: To augment your own safety procedures, see NSTA's Safety Portal at http://www.nsta.org/portals/safety.aspx.

Open Choice Approach (Copy Master page 10)

Groups might come together to agree on one question for which they will explore an answer, or each group might explore something different. Students should brainstorm to form a plan they would have to follow in order to answer the question, which might include researching background information. Work with students to develop safe procedures that control variables and enable them to gather valid data. Encourage students with prompts such as the following:

- Information we need to understand before we can start our investigation is....
- We might create a method for determining club head volume by....
- The variables used in developing our method might be....
- We might test our method by....
- To conduct the investigation safely, we will....

Focused Approach (Copy Master pages 11–12)

The following exemplifies how students might design a device for determining the volume of an irregularly shaped object such as a golf club head, and use it to determine the volume of one or more such objects.

- 1. After students examine the materials you have available for making a volume-measuring device, ask them questions such as the following to help them envision their investigation.
- How will we decide how much water to put in the container?
- How will we weigh the container with water in it?
- How will we ensure that only the object itself is submerged, and not other parts of the object or apparatus?
- How will we calculate the volume from our measurements?
- On what objects might we use our apparatus?
- What are some other ways we might determine volume that would give us comparative values?
- 2. Students might now use the apparatus to determine the volumes of the given objects, using the inferred buoyant force, the mass implied by this, and the density of water.
- We will determine the buoyant force from the before and after submerging weights by....
- The units we will use are _____ because....
- To adjust our scale's units, we will....
- We need to determine the mass of the displaced water from its weight because....
- The density of the water is _____ and it depends on room conditions such as....
- Volume differs from mass and density in that....
- 3. Students might make comparisons among the values they determined, values available from other methods, or values they find in product documentation or specifications. Help them analyze their data using prompts such as the following.
- The percent error between previous volume estimates to those we determined from water displacement was



- This method is more/less accurate than using water displacement in a graduated beaker or cylinder because....
- 4. More advanced students might repeat the experiment with more complex shapes or by using other fluids. They might also try objects with cavities that present challenges, such as the existence of air bubbles inside, or compressible objects that change volume under the pressure of water.
- The objects whose volumes we are determining are more challenging because....
- We will attempt to surmount these challenges by....
- Our initial volume estimates are more/less accurate than before because....
- We could improve our methods by....
- To conduct the investigation safely, we will....

Media Research Option

Groups might have questions that are best explored using print media and online resources. Students should brainstorm to form a list of key words and phrases they could use in Internet search engines that might result in resources that will help them answer the question. Review how to safely browse the Web, how to evaluate information on the Internet for accuracy, and how to correctly cite the information found. Suggest students make note of any interesting tangents they find in their research effort for future inquiry. Encourage students with prompts such as the following:

- Words and phrases associated with our question are....
- The reliability of our sources was established by....
- The science and math concepts that underpin a possible solution are....
- Our research might feed into an engineering design solution such as....
- To conduct the investigation safely, we will....

Make a Claim Backed by Evidence

Students should analyze their data and then make one or more claims based on the evidence their data shows. Encourage students with this prompt: As evidenced by... we claim... because....

An example claim might be: <u>As evidenced by how much closer the measurement of our volume displacement method was to the technical specifications than the geometric method we tried, we claim that our volume displacement method is superior to our geometrically-based methods, because it is likely that superior equipment and expertise on the part of the operators make the values in technical specifications more accurate and reliable than any of our methods.</u>

Compare Findings

Encourage students to compare their ideas with others, such as classmates who investigated a similar (or different) question or system, or to compare their ideas with material they found on the Internet or in their textbooks, or heard from an expert they chose to interview. Remind students to credit their original sources in their comparisons. Elicit comparisons from students with prompts such as:

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Students might make comparisons like the following:

My ideas about what constitutes a good system for measuring club head volume are similar to those discussed by presenters in the video and practiced by the USGA. However, I found sources of error not mentioned in the video, such as the dependence of the density of water on temperature.

Reflect on Learning

Students should reflect on their understanding, thinking about how their ideas have changed or what they know now that they didn't know before. Encourage reflection, using prompts such as the following:

- The claim made by the expert in the video is....
- I support or refute the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- Another investigation I would like to explore is....

The Sall Connection

Inquiry Assessment

See the rubric included in the student Copy Masters on page 13.

Incorporate Video into Your Lesson Plan

Integrate Video in Instruction

Bellringer: Show the video with the sound muted as students are getting settled, on a day when the class will explore the relationship among mass, density, and volume. Replay as needed. Have students respond to the following prompt: *This video describes how to....*

Homework: The video showcases Archimedes, who is one of the greatest scientists, mathematicians, or engineers of the ancient world. Have students research and do reports on other great scientists of antiquity, with a focus on how their achievements have contributed to our world even now.

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these Es:

Explain: Many slow-motion views of club heads striking balls are shown in the video – for example, at 1:06, 3:25, 3:34, and 3:58. These club heads behave in a variety of ways after striking the ball – some twisting right, some twisting left, and some twisting hardly at all. Have students explain what causes these different results, and also explain what the whole issue of measuring club head volume has to do with this. Advanced physics students might be able to use measurements made on the paused video segments to do some degree of quantitative analysis of these events, using the concepts of center of mass, torque, and rotational or moment of inertia.

Elaborate: Use the "Eureka" story in the video to start a discussion among students about scientific discoveries made suddenly in unusual circumstances. Ask students to find information about such moments online. This may require some creativity regarding search phrases such as *sudden scientific discoveries*. Have students debate the extent to which these events are due to chance or luck, or whether they really have background stories involving a lot of preparation and hard work.

Connect to ... History

Archimedes' scientific contributions are best understood in the context of his time. Have students research historical questions related to Archimedes, his world, and how it affects ours. Some examples: Why might certain kings have been suspicious of those providing their crowns? Does the fact that people took baths mean that homes had running water piped into them? A look at Archimedes' inventions shows that many of them were weapons – where did he live, who was his country fighting, and why? Archimedes died an untimely death – how and why, and what might have been different if he had lived? We know some things about Archimedes, but not as much as we wish. How was information about it recorded, who saved it, and how was any of it lost? Why is there a city in California called "Eureka"?

Use Video in as a Writing Prompt

Show the part of the video around 2:36, where the cartoon figure of Archimedes is shown dipping a crown and a piece of gold into two containers of water while these objects hang from a balance, and appear to become unbalanced in the water. Then have students write a short paragraph describing how this action led Archimedes to his revelation.

COPY MASTER: Open Choice Inquiry Guide for Students

Science of Golf: Volume and Displacement

Use this guide to design an apparatus for determining the volume of a golf club head or another irregularly shaped object. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

How can we design a volume-measuring device to measure irregularly shaped objects?

Design Investigations



Choose one question. How can you answer it? Brainstorm with your teammates. Write a procedure that controls variables and makes accurate measurements. Look up information as needed. Add safety precautions.

- Information we need to understand before we can start our investigation is
- The principle on which our system will be based it....
- We will construct any equipment needed by....
- The procedure to be used with our equipment is....
- We will evaluate or test our system by....
- To conduct the investigation safely, we will....

Record Data and Observations

Record your observations. Organize your data in tables or graphs as appropriate.

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data show. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- The claim made by the expert in the video is....
- I support or refute the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- Another investigation I would like to explore is....

COPY MASTER: Focused Inquiry Guide for Students

Science of Golf: Volume and Displacement

Use this guide to determine how to design an apparatus that determines the volume of a golf club or other irregularly-shaped object. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

Design Investigations

Brainstorm with your teammates about how to answer the question. Write a procedure that controls variables and allows you to gather valid data. Add safety precautions as needed. Use these prompts to help you design your investigation.

- Factors we should take into account in developing a system for determining volume are....
- Archimedes' principle is _____, and we will use it to....
- We will standardize use of the device by....
- The calculations that are necessary to use the device are....
- The objects whose volumes we will determine are....
- Other methods for measuring, calculating, or otherwise determining volume include....
- To conduct the investigation safely, I need to....



Record Data and Observations

Organize your observations using a table such as the following.

Determining the Volume of _____

Initial estimated volume using method	
Volume found by water displacement	
Volume according to product specifications	
Percent "error" (initial estimate compared to water displacement)	
Percent "error" (initial estimate compared to product specifications)	
Percent "error" (water displacement compared to product specifications)	

Ideas for Analyzing Data

- How did the initial, geometrically estimated volumes compare to the ones determined by water displacement?
- If you tried objects with known volume based on product specifications, how did the volumes found by geometrical and water displacement methods compare to the known ones? Which of your two methods was more accurate?
- What are some sources of error in our methods, and how could your accuracy be improved?

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence shown by your data. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who did the investigation using the same or a similar system or with those who did the investigation using a different system. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in the video in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- The claim made by the expert in the video is....
- I support (or refute) the expert's claim because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- Another investigation I would like to explore is....

COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria	1 point	2 points	3 points
Initial question	Question had a yes/no answer, was off topic, or otherwise was not researchable or testable.	testable but too broad or not	,



Investigation design	The design of the investigation did not support a response to the initial question.	While the design supported the initial question, the procedure used to collect data (e.g., number of trials, control of variables) was not sufficient.	Variables were clearly identified and controlled as needed with steps and trials that resulted in data that could be used to answer the question.
Variables	Either the dependent or independent variable was not identified.	While the dependent and independent variables were identified, no controls were present.	Variables identified and controlled in a way that results in data that can be analyzed and compared.
Safety procedures	Basic laboratory safety procedures were followed, but practices specific to the activity were not identified.	Some, but not all, of the safety equipment was used and only some safe practices needed for this investigation were followed.	Appropriate safety equipment used and safe practices adhered to.
Observations and data	Observations were not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what actually took place during the investigation.	Observations were made, but were not very detailed, or data appear invalid or were not recorded appropriately.	Detailed observations were made and properly recorded and data are plausible and recorded appropriately.
Claim	No claim was made or the claim had no relationship to the evidence used to support it.	Claim was marginally related to evidence from investigation.	Claim was backed by investigative or research evidence.
Findings comparison	Comparison of findings was limited to a description of the initial question.	Comparison of findings was not supported by the data collected.	Comparison of findings included both methodology and data collected by at least one other entity.
Reflection	Student reflections were limited to a description of the procedure used.	Student reflections were not related to the initial question.	Student reflections described at least one impact on thinking.

SCIENCE OF THE SUMMER OLYMPICS: The Strength and Flexibility of Oscar Pistorius - A Science Perspective

Video & Source available at: http://nbclearn.com/portal/site/learn/scienceof-the-summer-olympics

Objective:

Framework for K–12 Science Education: PS2.A: Forces and Motion, PS2.B: Stability and Instability in Physical Systems, ETS1.A: Defining and Delimiting Engineering Problems, ETS1.C: Optimizing the Design Solution, ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

Introduction Notes:

SCIENCE OF THE SUMMER OLYMPICS
The Strength and Flexibility of Oscar Pistorius
A Science Perspective



Lesson plans produced by the National Science Teachers Association. Video produced by NBC Learn in collaboration with the National Science Foundation.

Background and Planning Information

About the Video

This video features Oscar Pistorius, a Paralympics Gold Medalist, who qualified to sprint in the 2012 Summer Olympics. Various researchers, including biomechanical engineer Rory Cooper and physical therapist Justin Laferrier at the University of Pittsburgh, explain the physics involved in using prosthetics designed especially for sprinting, as well as the biomechanics involved to compensate for the loss of active body components. Also briefly discussed in this video is whether or not Oscar's prosthetics give him a competitive advantage over other sprinters.

0:00	0:12	Series opening
0:13	1:23	Introducing Oscar Pistorius
1:24	1:42	Cooper explaining Oscar's use of his prosthetics
1:43	1:56	Introduction to athletic prostheses
1:57	2:05	Cooper explaining Oscar's prostheses
2:06	2:39	Discussion of how Oscar's prosthetics might confer a competitive advantage
2:40	3:32	The physics of Oscar's flex-feet
3:33	5:03	How Oscar and other amputees change coordination and timing
5:04	5:10	Closing Credits

Language Support

To aid those with limited English proficiency or others who need help focusing on the video, make transcript of the video available. Click the Transcript tab on the side of the video window, then copy and paste into a document for student reference.

Connect to Science Framework for K-12 Science Education		
PS2.A: Forces and Motion		
PS2.B: Stability and Instability in Physical Systems		
Related Science Concepts		
Forces		
☐ Motion		
☐ Potential energy		
□ Speed		
Stride		
☐ Flexibility		
□ Impact		
Balance		
(page 1)		

Muscles

Composite materials

Anatomic core

Framework for K-12 Science Education

- ETS1.A: Defining and Delimiting Engineering Problems
- ETS1.C: Optimizing the Design Solution
- ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

Engineering in Action

The engineering solution discussed in Science of the Summer Olympics (SOTSO): The Strength and Flexibility of Oscar Pistorius is a prosthetic limb, commonly called a flex-foot, which is used by Oscar and many other elite



amputee athletes. Biomechanical engineers liken the flexible carbon fiber prosthesis to a spring that stores and releases energy. When the wearer runs, the flex-foot first makes contact with the ground at the toe. The curved part of the prosthetic, which mimics an ankle, causes the foot part of the device to slightly flex, thereby capturing some of the energy of the impact. Then, as the flex-foot leaves the ground, it returns to its original shape, releasing that potential energy, helping to propel the wearer forward.

Take Action with Students

Help students brainstorm to form a list of some of the constraints within which engineers have to work to design prosthetic devices that mimic the various motions and structures of the human body. Use the list to initiate a discussion about how mechanical prosthetics cannot truly mimic the motions of active components of the body because of their lack of physiological components – such as muscles, bones, nerves, and a brain that sends and receives signals necessary to carry out specific functions. Extend the discussion to include engineering design problems associated with the design, testing, and actual use of any artificial body parts.

Inquiry Outline for Teachers

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on their grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student Copy Masters begin on page 6.

Ask students who jog or run for pleasure, or students who are members of the track team, to talk about their

Explore Understanding

running styles. When students have finished, use prompts such as these to find out what students might already know about the physics and biomechanics involved in running, sprinting, or jogging. Gait describes the way a person or another animal.... Speed and gait are related because.... When my foot strikes or moves on the ground while I run, it.... The impact from a rear-foot strike differs from that of a fore-foot strike in that.... The energy of either type of impact is absorbed by.... As your foot leaves the ground, your foot... and.... As you jog or run, your arms.... (page 2) Other muscles you use when running or jogging are.... The running surface affects your gait or speed by.... The muscles in your legs work in pairs by.... Show the video SOTSO: The Strength and Flexibility of Oscar Pistorius. Continue the discussion of the mechanics of running, using prompts such as the following: When I watched the video, I thought about.... Biomechanical engineer Rory Cooper explains that.... Engineer Hugh Herr likens the prosthetic flex-feet to.... Physical therapist Justin Laferrier claims that.... Oscar can't stop moving when he wears his flex-feet because.... Oscar's coordination and timing differs from runners without flex-feet in that.... **Ask Beginning Questions**

Stimulate small-group discussion with the prompt: This video makes me think about these questions.... Then have groups list questions they have about how Oscar's sprinting might be different from that of other sprinters. Ask groups to choose one question and phrase it in such a way as to be researchable and/or testable. The following are some examples.

How might sprinting on tiptoes affect a sprinter's gait?
How might sprinting on tiptoes affect a sprinter's speed
How might arm swing affect a sprinter's gait?
How might arm swing affect a sprinter's speed?



	How might running on a springy surface affect a sprinter's gait? How might running on a springy surface affect a sprinter's speed?
	n Investigations e one of these two options based on your students' knowledge, creativity, and ability level.
Small group in orde	Choice Approach (Copy Master pages 6-7) groups might join together to agree on one question for which they will explore the answer, or each small might explore something different. Students should brainstorm to form a plan they would have to follow er to answer the question. Work with students to develop safe procedures that control variables and enable to make accurate measurements. Encourage students with prompts such as the following: The variable we will test is The variables we will control are The steps we will follow are To conduct the investigation safely, we will
	ed Approach (Copy Master pages 7–9) bllowing exemplifies how students might investigate the question of how arm swing affects a sprinter's
2.	Ask students questions such as the following to spark their thinking: What is gait? How did the sprinters in the video move their arms as they ran? Did all of the sprinters have the same type of arm swing? Did all of the sprinters move their arms at the same speed? Students might choose to explore how arm swing affects gait by sprinting a certain distance, say 20–30 meters, with their arms by their sides, and timing how long it takes. After they have rested a while, they might sprint that same distance but move their arms as they run. Again, they would time how long the run takes. Or, students might choose to explore different types of arm swings or speeds to see how these motions affect gait. Remind students to rest completely between trials so as not to introduce another variable—fatigue—into their investigations.
3. (Once students have decided on how to conduct their tests, give them free rein in their procedures as long as the plans are carried out safely.
	Help students brainstorm to form a list of variables, and determine which can be controlled and which cannot. As needed, help them focus by using prompts such as the following: The materials we will use are The variable we will test is The variables we will control are We will make our measurements using We will determine an average time for each sprinter and each type of arm swing by To conduct the investigation safely, we will Students might continue their investigations by exploring how other variables, such as running surface or sprinting on tiptoes to simulate flex-feet, might affect a sprinter's gait and/or speed.

Make a Claim Backed by Evidence

As students carry out their investigations, ensure that they record their observations. In this investigation, videos made with their cell phones would be ideal. As needed, suggest ways students might organize their data using tables or graphs. Students should analyze their data and then make one or more claims based on the evidence their data shows. Encourage students with this prompt: *As evidenced by... I claim... because....*

An example claim relating arm swing to gait might be: As evidenced by the videos, <u>I claim</u> that arm swing makes a sprinter more stable and thus faster <u>because</u> everyone in our group took a longer time to sprint when their arms were at their sides than when they used some sort of arm swing.



Compare Findings

Encourage students to compare their ideas with others – such as classmates who investigated the same or a similar question; material they found on the Internet or in their science textbook; or an expert they chose to interview. Remind students to credit their original sources in their comparisons. Elicit comparisons from students with prompts such as the following:

	My ideas are similar to (or different from) those of the experts in that
	My ideas are similar to (or different from) those of my classmates in that
	My ideas are similar to (or different from) those that I found on the Internet in that
Studer	nts might make comparisons like the following:
My ide	eas are similar to those of my classmates in that the data from groups that researched the same question
had si	milar results: arm swing does affect a sprinter's gait and make him/her more stable and thus faster.
Reflec	et on Learning
Studer	nts should reflect on their understanding, thinking about how their ideas have changed or what they know

□ I claim that my ideas have changed from the beginning of this lesson because of this evidence...
 □ My ideas changed in the following ways....

now that they didn't before. Encourage reflection, using prompts such as the following:

One concept I still do not understand involves....

☐ One part of the investigation I am most proud of is....

Inquiry Assessment

See the rubric included in the student Copy Masters on page 10.

Incorporate Video into Your Lesson Plan

Integrate Video in Instruction

Bellringer: Show the video with the sound muted, perhaps twice, as students settle for class. Ask students to think about the following prompt as they watch. *Science can be applied through engineering design to improve peoples' lives by....* Use students' answers as a real-life lead-in to your lesson on body systems or mechanical advantage.

Visualize a Concept: Connect the video to a lesson on carbon chemistry. Explain that the flex-foot prostheses used by Oscar and other elite athletes are made from carbon fibers and that carbon is a nonmetallic element with unique properties. To give students a better idea of how these prostheses work, get some memory metal wire from an orthodontist, or a pair of eye glasses with memory metal frames, to show how these materials – like the carbon fibers in the flex-foot prosthetics – can change shape when forces are applied to them and then return to their original shapes when the applied forces are removed.

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these E's:

Explore: Use the Design Investigations section of the Inquiry Outline to support your lessons on forces, motion, and the human musculoskeletal system.

Elaborate: While this video focuses on Oscar's competing in the Olympic Games as the first double amputee, use the video to encourage students to learn more about the Paralympics and the athletes who compete in them. Have students identify the assistive technologies, research a few details about how the technologies work, and make claims supported by evidence of how applied science and engineering design improve peoples' lives.

Connect to ... Language Arts

Suggest students research more about Oscar Pistorius's background on the Internet, using newspaper interviews



	thought you knew? ☐ My ideas have	of found out. How does it fit with what changed from the beginning of this less ged in the following ways	t you already knew? How does it change what you son because of this evidence
	do research on the Into thers when you use the My ideas are so		y classmates in that
My Evidence		My Claim	My Reason
	Make a Claim Backe Analyze your data and claim goes beyond <i>sun</i>	ons. Organize your data in tables or grader by Evidence at then make one or more claims based an marizing the relationship between the	on the evidence your data show. Make sure that the variables.
	Design Investigations Choose one question. variables and makes a The variable w The variables The steps we w	S	rith your teammates. Write a procedure that controls autions as needed.
	Ask Beginning Quest		
			ibility of Oscar Pistorius at affects a sprinter's gait or speed. Write your lab
	COPY MASTER: Ope	en Choice Inquiry Guide for Students	
	sound off: 3:33 to 3:4 Explain how Oscar's	ly watch as you play, perhaps two or 0, 3:52 to 3:56, and 4:08 to 4:13. Provide	three times, the following video segments with the de students with the following instructions. pensate for the loss of his lower legs as he sprints. g, cyclic motion.
	2012.html http://www.tel	egraph.co.uk/sport/olympics/8708389/I	Built-for-speed-interview-with-Oscar-Pistorius.html m-oessur-colin-jackson-interviews-oscar-pistorius
	points include the following 100_n_1836813	owing: http://www.huffingtonpost.com/20 3.html	ne aspect or time period of his life. Some starting 012/08/28/paralympics-london-2012-oscar-pistorius-icle-2107821/Oscar-Pistorius-interviewLONDON-



	11	ie Conn	ection	
	One concept I still do not understa One part of the investigation I am			
COPY	MASTER: Focused Inquiry Guide	for Students		
Use th	ce of the Summer Olympics: The Summer olympics is guide to investigate a question a cience notebook.			Write your lab report in
Ask Beginning Questions How does arm swing affect a sprinter's gait?				
Brains	In Investigations Item with your teammates about hose you to make accurate measurement your investigation. The materials we will use are The variable we will test is The variables we will control are	nts. Add safety precaut		
	We will make our measurements u. We will determine an average time To conduct the investigation safely	e for each sprinter and e	each type of arm swing	<i>by</i>
Record Data and Observations Organize your observations and data in tables or graphs as appropriate. The table below is an example of sprinters' times with their arms at their sides and using arm swing.				
Analy	a Claim Backed by Evidence ze your data and then make one or a tim goes beyond summarizing the re			your data. Make sure that
Му Е	vidence	My Claim		My Reason
Compare Findings Review the video and then discuss your results with classmates who investigated the same or a similar question; do research on the Internet, or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons. My ideas are similar to (or different from) those of the experts in that My ideas are similar to (or different from) those of my classmates in that My ideas are similar to (or different from) those that I found on the Internet in that				
Think	et on Learning about what you found out. How do nt you knew? I claim that my ideas have changed My ideas changed in the following One concept I still do not understa One part of the investigation I am	d from the beginning of ways und involves	•	
COPY MASTER: Assessment Rubric for Inquiry Investigations				
Crito	io I noint	1.0	ointa	2 noints



Initial question	Question had a yes/no answer, was off topic, or otherwise was not researchable or testable.	Question was researchable or testable but too broad or not answerable by the chosen investigation.	Question clearly stated, researchable or testable, and showed direct relationship to investigation.
Investigation design	The design of the investigation did not support a response to the initial question.	While the design supported the initial question, the procedure used to collect data (e.g., number of trials, or control of variables) was not sufficient.	Variables were clearly identified and controlled as needed with steps and trials that resulted in data that could be used to answer the question.
Variables	Either the dependent or independent variable was not identified.	While the dependent and independent variables were identified, no controls were present.	Variables identified and controlled in a way that results in data that can be analyzed and compared.
Safety procedures	Basic laboratory safety procedures were followed, but practices specific to the activity were not identified.	Some, but not all, of the safety equipment was used and only some safe practices needed for this investigation were followed.	Appropriate safety equipment used and safe practices adhered to.
Observations and Data	Observations were not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what actually took place during the investigation.	Observations were made, but were not very detailed, or data appear invalid or were not recorded appropriately.	Detailed observations were made and properly recorded and data are plausible and recorded appropriately.
Claim	No claim was made or the claim had no relationship to the evidence used to support it.	Claim was marginally related to evidence from investigation.	Claim was backed by investigative or research evidence.
Findings comparison	Comparison of findings was limited to a description of the initial question.	Comparison of findings was not supported by the data collected.	Comparison of findings included both methodology and data collected by at least one other entity.
Reflection	Student reflections were limited to a description of the procedure used.	Student reflections were not related to the initial question.	Student reflections described at least one impact on thinking.

SCIENCE OF THE SUMMER OLYMPICS: The Biomechanics of Usain Bolt - A Science Perspective

Video & Source available at: http://nbclearn.com/portal/site/learn/scienceof-the-summer-olympics

Objective:

Framework for K–12 Science Education: PS2.A Forces and Motion, PS2.B: Types of Interactions, LS1.A: Structure and Function, ETS1.A: Defining and Delimiting Engineering Problems, ETS1.B: Developing Possible Solutions, ETS1.C: Optimizing the Design Solution

Introduction Notes:



SCIENCE OF THE SUMMER OLYMPICS

The Biomechanics of Usain Bolt

A Science Perspective

Lesson plans produced by the National Science Teachers Association.

Video produced by NBC Learn in collaboration with the National Science Foundation.

Background and Planning Information

About the Video

Mechanical engineers Dr. Anette Hosoi (Massachusetts Institute of Technology) and Samuel Hamner (Stanford University) study Usain Bolt's physical structure to help determine how he is able to run so fast. Their findings might enable them to develop solutions for people with movement disorders or to optimize the performance of athletes.

0:00	0:12	Series opening
0:13	0:59	Introducing Usain Bolt
1:00	1:23	Anette Hosoi describing the uniqueness of Usain's abilities
1:24	1:58	Usain's physical characteristics and stride length
1:59	2:17	Usain's physical characteristics and mass
2:18	2:41	Influence of muscle strength on force
2:42	3:23	Samuel Hamner's reasons for studying Usain
3:24	4:09	Running stance phase
4:10	4:27	Running flight phase
4:28	4:48	Electrical signals, and coordination
4:49	5:14	Everything coming together for Usain
5:15	5:24	Closing credits

Language Support

To aid those with limited English proficiency or others who need help focusing on the video, make transcript of the video available. Click the Transcript tab on the side of the video window, then copy and paste into a document for student reference.

Connect to Science

Framework for K-12 Science Education PS2.A Forces and Motion

PS2.B: Types of Interactions LS1.A: Structure and Function

Related Science Concepts

Force and the resultant pressure on a surface
Action and reaction forces (running on a track)
Speed and acceleration of an object (a human body)
Motion and how human movements result in motion
Relationship of weight and mass
Muscular system and how it moves the human body
Reaction time
Gene expression due to heredity and environment

Connect to Engineering

Framework for K-12 Science Education

ETS1.A: Defining and Delimiting Engineering Problems

ETS1.B: Developing Possible Solutions

ETS1.C: Optimizing the Design Solution



Engineering in Action

Mechanical engineers create and build mechanical devices, while biomechanical engineers blend traditional engineering techniques with biological science and medicine. Today, many mechanical engineers are lending their expertise to the analysis of living systems. The development of a prosthetic tail for Winter, a dolphin at the Clearwater (Florida) Marine Aquarium, is just one example. Biomimicry – such as modeling the nosecone of a Japanese bullet train after a kingfisher's beak, so the train is quieter as it emerges from tunnels – is a growing field as well.

Given a problem, engineers begin the search for a solution by analyzing what they have to work with. In the case of Usain Bolt, Samuel Hamner analyzes the physical attributes of Usain's body as well as how various parts of his body work together to accomplish his goals. Without being able to observe Usain's motion—how his bones and muscles move—it would be impossible to improve his motion through an engineering process. Unlike physical mechanical engineering solutions, which can be arrived at through manipulating physical factors, biological engineering problems begin with the genetics of the individual (human or other organism) that is the focus of the problem. While other constraints can influence the solution, first and foremost the engineering solution has to work within the genetic constraints.

Take Action with Students

With students, choose a simple action – such as throwing a ball, moving from a standing to a sitting position, or snapping fingers. Have students analyze the motion through descriptions or sketches. Students with smartphones might take a series of photographs or video they can replay in slow motion. Then elicit from students how the motion might change if the person was taller, more massive, or older and suffered from arthritic joints. How would they redesign the action to enable that person to do it?

Inquiry Outline for Teachers

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student Copy Masters begin on page 6.

Explore Understanding

Do an Internet search for the phrase "animals in motion" or "running motion of animals" and share images with students. Elicit from students how these animals are able to move—to run fast, lumber along, or hop. Use prompts such as the following to start students talking.

These animals are all alike in that....

These animals are all alike in that
The body systems involved in movement of these animals are
Bones are connected to one another by
Bones move at because
Muscles move bones by

Show the video SOTSO: The Biomechanics of Usain Bolt.

Focus the discussion on how Usain's bones and muscles work together, at the behest of his nervous system, to allow him to sprint as quickly as he can. Encourage students to jot down points about Usain's motion as they watch the video, and then discuss the video using prompts such as the following:

When I watched the video, I thought about
The expert in the video claimed that because
Usain is not expected to run so fast because
Because Usain is bigger, he has to compensate by
The stance phase in running differs from the flight phase by
I would like to know more about
I would do research to find out more about

Ask Beginning Questions

Stimulate small-group discussion with the prompt: *The video makes me think about these questions*.... Then have students work in small groups to list questions they have about how humans or other animals move—quickly, in



predictable ways, and so on. Then groups should choose one question and phrase it in such a way as to be researchable and/or testable. Some examples include the following: How does stride length impact a runner's speed? How does the running action of other animals compare to that of humans? Is the number of muscles or the strength of muscles the more important factor? Does the height off the ground during the flight phase make a difference? How does leg length impact the running action? Is Usain just quicker off the starting blocks than other runners? Could Usain be just as fast if he did not start the race in starting blocks?
Design Investigations Choose one of these two options based on your students' knowledge, creativity, and ability level.
Open Choice Approach (Copy Master pages 6-7) Small groups might join together to agree on one question for which they will explore the answer, or each small group might explore something different. Students should brainstorm what they would have to do to answer the selected question. Then work with students to develop safe procedures that control variables and make accurate measurements. Encourage students with prompts such as the following: The variable I will test is The variables I will control are The steps I will follow are To conduct the investigation safely I will
Focused Approach (Copy Master pages 7–9) The following exemplifies how students might investigate a question about how the strength of muscles impacts an action, such as: How does the strength of a muscle change the way a bone moves? 1. Ask students questions such as the following to spark their thinking. How are Usain's leg muscles involved in his running? How does Usain maintain his strength? How do the muscles cause bones to move? How might you model the bones in the leg or arm?
 How are bones involved in movement joined together? Students might choose to create a model of two bones connected at a joint and show how the bones move under the pull of model muscles. If so, give them free rein in deciding how to build their models and demonstrate the actions. Some might use various thicknesses of rubber bands as muscles to move bones constructed of craft sticks, rulers, or cardboard tubes. Examining this hinge model might help students refine their questions or lead to new questions that they should record for later exploration.
3. Ensure that students brainstorm variables and determine which can be controlled and which cannot. Students should be aware that "bones" of different lengths, and the positions at which the "muscles" are placed, changes the mechanical advantage of the levers they've constructed. As needed, help them focus on their chosen variable in each trial. Use prompts such as the following: I am testing variables by
 I am controlling variables by Students should determine a method by which they can measure the resultant force created by muscles of different sizes. For example, students might pull apart the model bones to a predetermined distance that stretches the rubber band, and then let go. They might qualitatively observe what happens and make comparisons. Students could also allow the moving bone to strike a bal,l and measure how far that ball moves for quantitative data. They could also use a force sensor to measure the applied force. Use prompts with students such as: I will create our bones and joint models from
I will pull the bones apart centimeters because the rubber bands I will measure the force imparted by different strengths of muscles by I predict that if I follow these steps



\Box To α	conduct th	he investig	gation saf	el	ly, I	will	!

5. Students might continue their investigation by focusing on how the number of muscles involved in an action impacts the result, or another related question of their own.

Make a Claim Backed by Evidence

As students carry out their investigations, ensure that they record their observations. As needed, suggest ways they might organize their data using tables or graphs. Students should analyze their data and then make one or more claims based on the evidence their data shows. Encourage students with this prompt: As evidenced by... I claim... because....

An example regarding the effect of muscle size on force generated might be the following:

As evidenced by a thicker rubber band moving a ball further than a thinner one of the same diameter, <u>I claim</u> that stronger muscles enable bones to move more forcefully than weaker ones <u>because</u> muscles can only contract, and the thicker rubber band contracts more forcefully, moving the bone more forcefully.

Compare Findings

Encourage students to compare their ideas with those of others—such as classmates who investigated the same or a similar question, material they found on the Internet, an expert they chose to interview, or their textbook. Remind students to credit original sources in their comparisons. Elicit comparisons from students with prompts such as the following:

My ideas are similar to (or different from) those of the experts in that
My ideas are similar to (or different from) those of my classmates in that
My ideas are similar to (or different from) those that I found on the Internet in that

Students might make comparisons like the following.

My ideas are similar to those of the other groups. Although different groups used different materials and measured the resultant force differently, we all found that the stronger muscle made the bone move more forcefully or quickly.

Reflect on Learning

Students should reflect on their understanding, thinking about how their ideas have changed or about what they know now that they didn't before. Have students respond to one of the prompts in writing and then ask volunteers to share with the class, or have partners exchange responses and ask questions of each other. Encourage reflection using prompts such as the following:

My ideas have changed from the beginning of this lesson because of this evidence
My ideas changed in the following ways
The advantages and limitations of my model are
As I worked on this project, I wish I had spent more time on
If I would have changed, my investigation would have been more

Inquiry Assessment

See the rubric included in the student Copy Masters on page 10.

Incorporate Video into Your Lesson Plan

Integrate Video in Instruction

Visualize a Concept: A 25-second segment beginning at approximately 1:59 relates the components of an action-reaction force between Usain and the track. Use this as a practical application of the concept during a discussion of Newton's three laws of motion.

Homework: The night before a class discussion on body systems or speed, acceleration, and action-reaction, instruct students to watch the video at least twice and make notes about aspects that interest them. In small groups, students might use their notes to generate questions for inquiry activities.



Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these E's:

Explain: Use the video to explain to students how the body systems interact to perform complex movements very quickly. Point out how not only the muscular and skeletal systems are involved, but also the nervous system, which supplies the signal for muscle fibers to contract; the respiratory and circulatory systems, which supply the oxygen and will clean away waste products of anaerobic respiration in the muscle cells; and the digestive system, which supplies the fuel.

Elaborate: Use the video to extend understanding about the interaction of heredity and environment in humans. Students can hypothesize how Usain and other athletes or celebrities with specific physical attributes – such as large muscles or flexible limbs – are impacted by training regimes and nutrition.

Connect to ... Social Studies

Geography and Economics of Jamaica: One of 204 countries participating in the 2012 London games, this small country, about twice the size of the state of Delaware, sits about 900 kilometers (560 miles) southeast of Miami. Tourism is a major part of Jamaica's economy. Encourage interested students to find out more about Jamaica. Suggest they create a travel brochure, webquest, or other presentation from Usain Bolt's perspective.

Use Video in Assessment

To assess student understanding of the science behind Usain's sprinting prowess, show the video segment beginning at 4:49 through Usain's quote: "I mean, for me it's my strength and the length of my stride – everything comes together, which makes it look so superb." Then give the following instructions: Write a few sentences that explain what creates Usain's strength and stride that enable him to excel in sprinting.

COPY MASTER: Open Choice Inquiry Guide for Students

Science of the Summer Olympics: The Biomechanics of Usain Bolt

Use this guide to investigate a question about Usain Bolt, or how a movement might be improved, or how bones and muscles work together. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

Design Investigations

Choose one question. How can you answer it? Brainstorm with your teammates. Write a procedure that controls variables and makes accurate measurements. Add safety precautions as needed.

variable	es and makes accurate measurements. Add safety precautions as needed.
	The constraints I will work within are
	The variable I will test is
	The variables I will control are
	The steps I will follow are
	To conduct the investigation safely I will

Record Data and Observations

Record your observations. Organize your data in tables or graphs as appropriate.

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data shows. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question;



others when you use their find	dings in your comparisons. to (or different from) those of the to (or different from) those of m	o your findings compare? Be the experts in that try classmates in that I found on the Internet in that.	•
thought you knew? My ideas have change My ideas changed in t The advantages and li As I worked on this pr	ed from the beginning of this le		
COPY MASTER: Focused In	equiry Guide for Students		
	mpics: The Biomechanics of U	U sain Bolt le strength impacts an action. V	Vrite your lab report in
Ask Beginning Questions How does the strength of a m	uscle change the way a bone m	oves?	
enable you to meet the consti		with your teammates. Write as needed. For example, you ver that?	
\Box The variables I will te	ce imparted by different streng. w these steps	th muscles by	
Record Data and Observati Organize your data in tables of	ons or graphs as appropriate. Exam	ples are shown below.	
Muscle Strength and Bone I			
	Distance Ball Moved		
Muscle Thickness	Trial 1	Trial 2	Trial 3



	Muscle Str	rength an <mark>d Bone Movement</mark>
Distance Ball Moved		
		Muscle Thickness
Make a Claim Backed by Evid Analyze your data and then mak claim goes beyond <i>summarizing</i>	ce one or more claims based on	n the evidence your data shows. Make sure that th ariables.
My Evidence	My Claim	My Reason
do research on the Internet or tal when you use their findings in y My ideas are similar to (My ideas are similar to (lk with an expert. How do your	classmates in that
Reflect on Learning Think about what you found outhought you knew?	at. How does it fit with what y	you already knew? How does it change what you

My ideas have changed from the beginning of this lesson because of this evidence....

As I worked on this project, I wish I had spent more time on....

If I would have changed _____, my investigation would have been more....

My ideas changed in the following ways....
The advantages and limitations of my model are....



COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria	1 point	2 points	3 points
Initial question	Question had a yes/no answer, was off topic, or otherwise was not researchable or testable.	Question was researchable or testable but too broad or not answerable by the chosen investigation.	Question clearly stated, researchable or testable, and showed direct relationship to investigation.
Investigation design	The design of the investigation did not support a response to the initial question.	While the design supported the initial question, the procedure used to collect data (e.g., number of trials, control of variables) was not sufficient.	Variables were clearly identified and controlled as needed with steps and trials that resulted in data that could be used to answer the question.
Variables	Either the dependent or independent variable was not identified.	While the dependent and independent variables were identified, no controls were present.	Variables identified and controlled in a way that results in data that can be analyzed and compared.
Safety procedures	Basic laboratory safety procedures were followed, but practices specific to the activity were not identified.	Some, but not all, of the safety equipment was used and only some safe practices needed for this investigation were followed.	Appropriate safety equipment used and safe practices adhered to.
Observations and Data	Observations were not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what actually took place during the investigation.	Observations were made, but were not very detailed, or data appear invalid or were not recorded appropriately.	Detailed observations were made and properly recorded and data are plausible and recorded appropriately.
Claim	No claim was made or the claim had no relationship to the evidence used to support it.	Claim was marginally related to evidence from investigation.	Claim was backed by investigative or research evidence.
Findings comparison	Comparison of findings was limited to a description of the initial question.	Comparison of findings was not supported by the data collected.	Comparison of findings included both methodology and data collected by at least one other entity.
Reflection	Student reflection was limited to a description of the procedure used.	Student reflections were not related to the initial question.	Student reflections described at least one impact on thinking.

SCIENCE OF THE SUMMER OLYMPICS: Maximizing the Long Jump of Bryan Clay - A Science Perspective

Video & Source available at: http://nbclearn.com/portal/site/learn/scienceof-the-summer-olympics

Objective:

Framework for K–12 Science Education: PS2.A: Forces and Motion, PS2.B: Stability and Instability in Physical Systems, ETS1.A: Defining and Delimiting Engineering Problems, ETS1.C: Optimizing the Design Solution, ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World



Introduction Notes:

SCIENCE OF THE SUMMER OLYMPICS

Maximizing the Long Jump of Bryan Clay

A Science Perspective

Lesson plans produced by the National Science Teachers Association.

Video produced by NBC Learn in collaboration with the National Science Foundation.

Background and Planning Information

About the Video

This video features Bryan Clay, an Olympic Gold medalist in the decathlon, and focuses on the technology used to study his form and movement as he carries out the most technologically complex event of the decathlon: the long jump. A stereoscopic, or 3D, camera provided by BMW is used to track Clay's every movement during a jump. Clay, his coach, and engineer and biomechanist Melvin Ramey then analyze the videos to help Clay try to improve his speed as he approaches the take-off board, and thus his jumping distance.

0:00	0:12	Series Opening
0:13	0:46	Introducing Bryan Clay and the Decathlon
0:47	1:11	Bryan performing and explaining the long jump
1:12	1:50	Projectile motion as it applies to the long jump
1:51	2:17	Melvin Ramey discussing take-off angles
2:18	3:26	Using BMW's stereoscopic, or 3D, camera to record Bryan's long jumps
3:27	4:10	How the 3D camera might be used on cars
4:11	5:01	Bryan and Ramey analyzing and discussing the images
5:02	5:25	Bryan summarizing the usefulness of the feedback
5:26	5:38	Closing Credits

Language Support

To aid those with limited English proficiency or others who need help focusing on the video, make transcript of the video available. Click the Transcript tab on the side of the video window, then copy and paste into a document for student reference.

Connect to Science

Framework for K-12 Science Education PS2.A: Forces and Motion

PS2.B: Stability and Instability in Physical Systems

Related Science Concepts

- Projectile motion
- Trajectory
- Velocity
- Speed
- Run-up, Take off, Flight, Landing
- Measurement
- Musculoskeletal system
- Biomechanics

Connect to Engineering

Framework for K-12 Science Education

- ETS1.A: Defining and Delimiting Engineering Problems
- ETS1.C: Optimizing the Design Solution
- ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

Engineering in Action

The problem addressed in Science of the Summer Olympics (SOTSO): Maximizing the Long Jump of Bryan Clay



is how to optimize an athlete's technique to enable a long jump of the longest possible length. Using a stereoscopic camera, Bryan, his coach and a variety of engineers, including Melvin Ramey, are able to measure Bryan's velocity in both the horizontal direction and in the vertical direction. By analyzing these measurements, it's possible for Bryan to modify his take-off angle in order to maximize the length of his jump. This type of research involves several engineering knowledge-generating activities, including *transfer from science*, *experimental engineering research*, and *direct trial*.

In designing a process or object, many variables come into play. The engineer's task is to create the best product possible with the available resources. Optimizing the design involves reviewing how the product performs, and making modifications to the design to enable it to perform "better" – which could mean higher efficiency, lower cost, or within certain established constraints, among others. The optimization of Bryan Clay's jump involves identifying the variables and designing the jump to take advantage of the variables that will enable the best result. Optimization can be accomplished by reviewing the "stats" or numerical data associated with the product, or in this case, the jump. Computers can do this rapidly, allowing for modifications "on the fly."

Take Action with Students

Brainstorm with students a list of products or processes for which they might optimize the design. These could include lockers, backpacks, parking areas, cafeteria lines, and so on. Students could take measurements showing how quickly they can get their lockers open, exchange books, then close the lockers. Then they might make suggestions for optimizing the design of the locker to decrease the time, perhaps by ten percent.

Inquiry Outline for Teachers

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student *Copy Masters* begin on page 7.

Explore Understanding

Explain that most movements that take place in a person's day-to-day life are fairly *linear*, meaning that the motions are in only one direction, often the horizontal direction. Walking, running, swimming, and biking for pleasure are examples of such motions. Other motions, particularly in sports, involve *projectile* motion, or motion in two directions—horizontal <u>and</u> vertical. Use the following or similar prompts to spark a discussion about projectile motion.

- When a player kicks a football, the ball travels....
- When a basketball player shoots from mid-court, the ball....
- When running the hurdles, the hurdler....
- When an archer shoots an arrow, the arrow....

Show the video SOTSO: Maximizing the Long Jump of Bryan Clay.

Continue the discussion of projectile motion as it applies to the long jump, using prompts such as the following:

- When I watched the video, I thought about....
- *In a long jump, the athlete moves....*
- Melvin Ramey, one of the experts in the video, claimed that _____ because....
- A projectile is....
- The path followed by any projectile is called a _____
- Bryan, his coach and Ramey use the images made by the 3D camera to....

Ask Beginning Questions

Stimulate small-group discussion with the prompt: *This video makes me think about these questions*.... Have small groups list questions they have about how they can study projectile motion and apply their results to the long jump. Ask groups to choose one question and phrase it in such a way as to be researchable and/or testable. The following are some examples.

- How does an object's mass affect its trajectory?
- How does an object's shape affect its trajectory?



- How does force affect an object's trajectory?
- How long does an object spend moving upward in a trajectory?
- How long does an object spend moving downward in a trajectory?
- How does the angle at which the object is launched impact its trajectory?

Design Investigations

Choose one of these two options based on your students' knowledge, creativity, and ability level.

Open Choice Approach (Copy Master pages 7-8)

Small groups might join together to agree on one question for which they will explore the answer, or each small group might explore something different. Allow students time to examine the materials, which often aids students in refining their questions or prompting new ones that should be recorded for future investigation. Students should brainstorm to form a plan they would have to follow in order to answer the question. Work with students to develop safe procedures that control variables and enable them to gather valid data. Encourage students with prompts such as the following:

- The materials we will use are....
- The variable we will test is....
- The variables we will control are....
- The steps we will follow are....
- The data we will collect are....
- To conduct the investigation safely, we will....

Focused Approach (Copy Master pages 8–10)

The following exemplifies how students might investigate the effect of the propelling force on the trajectory of an object.

- 1. Allow time for students to examine the materials you have available, which might include balls with different sizes but the same masses, or balls with different masses but the same size; sports equipment such as bats, golf clubs, and rackets that can be used to launch the balls; a variety of toy rockets and their launchers, protractors; and meter sticks. Examining the materials often aids students in refining their questions, or prompts new ones that should be recorded for future investigation. Ask students questions such as the following to help them envision their investigation.
- What force could you use to move the projectile?
- How can you change the amount of force used to propel the projectile?
- How will you make sure that the projectile is launched in exactly the same way each time?
- 2. Guide students to choose a tool that allows them to change the amount of force propelling the rocket. Allow students time to examine their tools and work with them a little, and then choose different ones if desired. Caution: On the basis of the launchers and projectiles used, determine if this investigation is best done outdoors or in a large, open room, such as the gym instead of your classroom. Also, make sure you and your students wear safety goggles throughout the investigations and stress that students do NOT aim any of the projectiles toward one another at any time.
- 3. Once students have decided on their launchers and projectiles, give them free rein in determining how they will explore the relationship of force to the trajectory of a projectile. Ensure that students brainstorm to form a list of variables involved in this experiment, and determine which must be controlled and which will vary. As needed, help them focus on their proposed procedures by using prompts such as the following:
- The materials we will use are....
- The variable we will test is....
- To change this variable, we will....
- The variables we will control, or keep the same, are....
- The data we will collect are....
- To make sure that the controls are the same, we will....
- We will compare trajectories by
- To conduct the investigation safely, we....
- 4. Depending on the force generated by the launchers, students can either use meter sticks to measure the apex of the trajectories, or use their cell phones to record the various trajectories making sure to include



something in the videos as a point of reference, to determine how much farther greater forces propelled the projectile than weaker forces. Or, students might use stopwatches to time both the upward and downward motions of the projectile during each launch.

- 5. As needed, suggest ways students might organize their data using tables or graphs. Explain, if necessary, how to graph multiple trajectories on the same graph.
- 6. Make sure students understand how this investigation relates to the physics of the long jump, using these or similar prompts:
- The projectile in our investigation can be compared to....
- The point at which the projectile left the ground is similar to Bryan's in that....
- The path, or trajectory, of the projectile is similar to Bryan's in that....
- The projectile's trajectory is different from Bryan's in that....
- 7. Remind students of the two velocities demonstrated in the video, and prompt students to think about how these might be changed given their launcher of choice. Then students might continue their investigation by exploring how a take-off angle similar to those of elite long jumpers—between about 180 and 220, according to Ramey—affects the shape of the rocket's trajectory, and make conjectures as to why this angle is optimal.

Make a Claim Backed by Evidence

Students should analyze their data and observations and then make one or more claims based on the evidence their data shows. Encourage students with this prompt: *As evidenced by... we claim... because...*.

An example claim might be:

As evidenced byour measurements taken with a constant launch angle, we claim that more force caused the rocket to reach a higher elevation because the arcs increased in height as we increased the force exerted by the rocket launcher. More force results in greater acceleration so the upward movement would be greater before gravity's force began to result in negative acceleration.

Compare Findings

Encourage students to compare their ideas with others, such as: classmates who investigated a similar question or with those who investigated a different question or a different object; material they found on the Internet; an expert they chose to interview; or their textbooks. Remind students to credit their original sources in their comparisons. Elicit comparisons from students with prompts such as:

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Students might make comparisons like the following:

My ideas are similar to those of classmates who simply tossed a tennis ball into the air using different amounts of upward force. As with the rocket, the greater the upward force on the tennis ball, the higher the apex of its projectile.

Reflect on Learning

Students should reflect on their understanding, thinking about how their ideas have changed or what they know now that they didn't before. Encourage reflection, using prompts such as the following:

- The claims made by the expert in the video include....
- I support or refute these claims because, in my investigation,
- When thinking about the expert's claims, I am confused as to why....
- Another investigation about projectile motions I would like to explore is....

Inquiry Assessment

See the rubric included in the student Copy Masters on page 11.

Incorporate Video into Your Lesson Plan



Integrate Video in Instruction

Compare and Contrast: Replay, multiple times, if needed, the video segment from 0:15 through 0:29, and have students describe the different projectiles – the discus, the shot put, the javelin, and even Bryan himself – and their motions. Challenge students to identify the factors they think are affecting the projectiles' trajectories.

Visualize a Concept: Obtain a pair of stereoscopic glasses or a stereoscope and a pair of photos made for this purpose. Have students take turns aligning the photos so that when viewing through the lens, they are able to see one photo in 3D. Use a drawing to explain the process of triangulation to students.

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these E's:

Explain: Use the Design Investigations section of the Inquiry Outline to support your lessons on measurements, motion, speed, and velocity.

Elaborate: Use the video as a springboard to encourage students to learn more about projectile motion involved in different types of sports, including golf, tennis, football, basketball, baseball, and so on. While Bryan uses his body as the projectile, other sports use additional tools to effect projectile motion, such as golf clubs, bats, and ramps. Have students make comparisons of the projectile motion of Bryan and athletes in other sports such as Aaron Fotheringham's wheelchair ramp jumping.

Connect to ... Technology

Help students relate BMW's stereoscopic, or 3D, technology with that used in their everyday lives, such as the 3D glasses worn at movie theaters, IMAX films, holograms, 3D videos and televisions, and virtual reality glasses, among others. Some students might also know that such technology is used to make many of the movies shown on today's screens, as well as in medicine and in many types of industries that study materials at the microscopic level or produce models of fossil animals or features deep beneath Earth's surface. For example, three-dimensional scanners are commonly used in dentistry, tunnel construction, and anthropological research. Geologists and engineers in the oil and gas industry use 3D modeling software to determine the size of underground reservoirs. Another use of 3D technology is in 3D printers, which receive data they convert into layers and layers of material that form an actual object. These printers have even been used to create an artificial titanium bone that was implanted into a woman in Belgium. Have students create Internet "tours" that other students can follow to show examples.

Use Video in Assessment

Play a segment showing Bryan moving through the air, such as 1:38–1:48, with the sound muted. Then provide students with the following instructions. Play the segment multiple times as needed.

Explain the science concepts behind what is happening. Use the terms acceleration, vertical, horizontal, force, and gravity in your response.

COPY MASTER: Open Choice Inquiry Guide for Students

Science of the Summer Olympics: Maximizing the Long Jump of Bryan Clay

Use this guide to investigate a question about one of the factors that affects the motion of a projectile. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

Design Investigations

Choose one question. How can you answer it? Brainstorm with your teammates. Write a procedure that controls variables and makes accurate measurements. Add safety precautions as needed.



- The materials I will use are....
- The variable I will test is....
- The variables I will control are....
- The steps I will follow are....
- The data I will collect are....
- To conduct the investigation safely, I will....

Record Data and Observations

Record your observations. Organize your data in tables or graphs as appropriate.

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data show. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question, or with students who investigated a different question. Or do research on the Internet or talk with an expert. How do your findings compare? How do they differ? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- The claims made by the experts in the video are....
- I support or refute these experts' claims because in my investigation....
- When thinking about the experts' claims, I am confused as to why....

COPY MASTER: Focused Inquiry Guide for Students

Science of the Summer Olympics: Maximizing the Long Jump of Bryan Clay

Use this guide to investigate a question about a projectile's trajectory. Write your lab report in your science notebook.

Ask Beginning Questions

How does force affect the trajectory of a projectile?

Design Investigations

Brainstorm with your teammates about how to answer the question. Write a procedure that controls variables and allows you to gather valid data. Add safety precautions as needed. Use these prompts to help you design your investigation.

- The materials I will use are....
- The variable I will test is....
- To change this variable, I will....
- The variables I will control, or keep the same, are....
- To make sure that the controls are the same, I will....
- I will compare trajectories by
- To conduct the investigation safely, I will....

Record Data and Observations



Organize your observations and data in a table. The table below is one example for testing how force affects a toy rocket's trajectory. Also, make a graph using colored pencils to show the different trajectories. Make a key to show which trajectory is which.

Launch Number/Force of the Launcher	Time (seconds) l Motion	Projectile Is in	Motion Upward	Motion/Downward
		·		

Projectile's Trajectories

Time (s)			

Launch Number Key

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence shown by your data. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who explored the same question or a different one. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....



Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- The claims made by the expert in the video include....
- I support or refute these claims because in my investigation....
- When thinking about the expert's claims, I am confused as to why....
- Another investigation about projectile motions I would like to explore is....

COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria	1 point	2 points	3 points
Initial question	Question had a yes/no answer, was off topic, or otherwise was not researchable or testable.	Question was researchable or testable but too broad or not answerable by the chosen investigation.	Question clearly stated, researchable or testable, and showed direct relationship to investigation.
Investigation design	The design of the investigation did not support a response to the initial question.	While the design supported the initial question, the procedure used to collect data (e.g., number of trials, control of variables) was not sufficient.	Variables were clearly identified and controlled as needed with steps and trials that resulted in data that could be used to answer the question.
Variables	Either the dependent or independent variable was not identified.	While the dependent and independent variables were identified, no controls were present.	Variables identified and controlled in a way that results in data that can be analyzed and compared.
Safety procedures	Basic laboratory safety procedures were followed, but practices specific to the activity were not identified.	Some, but not all, of the safety equipment was used and only some safe practices needed for this investigation were followed.	Appropriate safety equipment used and safe practices adhered to.
Observations and Data	Observations were not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what actually took place during the investigation.	Observations were made, but were not very detailed, or data appear invalid or were not recorded appropriately.	Detailed observations were made and properly recorded and data are plausible and recorded appropriately.
Claim	No claim was made or the claim had no relationship to the evidence used to support it.	Claim was marginally related to evidence from investigation.	Claim was backed by investigative or research evidence.
Findings comparison	Comparison of findings was limited to a description of the initial question.	Comparison of findings was not supported by the data collected.	Comparison of findings included both methodology and data collected by at least one other entity.
Reflection	Student reflections were limited to a description of the procedure used.	Student reflections were not related to the initial question.	Student reflections described at least one impact on thinking.

SCIENCE OF THE SUMMER OLYMPICS: Designing Safety Helmets - A Science Perspective

Video & Source available at: http://nbclearn.com/portal/site/learn/scienceof-the-summer-olympics



Objective:

Framework for K–12 Science Education: PS1.A Structure and Properties of Matter, PS2.B: Types of Interactions, PS3.C: Relationship Between Energy and Forces, LS1.A: Structure and Function, ETS1.A: Defining and Delimiting Engineering Problems, ETS2.A: Interdependence of Science, Engineering, and Technology

Introduction Notes:

SCIENCE OF THE SUMMER OLYMPICS Designing Safety Helmets

A Science Perspective

Lesson plans produced by the National Science Teachers Association.

Video produced by NBC Learn in collaboration with the National Science Foundation.

Background and Planning Information

About the Video

Dr. Nikhil Gupta, a professor of mechanical and aerospace engineering at the Polytechnic Institute of New York University, explains the challenges associated with designing safety helmets used by different types of athletes. In his lab, he and other members of his team use specialized equipment, including cameras and microscopes, to test and analyze how the various materials used in helmets withstand impact. Dr. Gupta also discusses the importance of the comfort and fit of a helmet, as well as how this critical piece of safety equipment actually holds up under real-world conditions.

0:00	0:12	Series opening
0:13	0:43	Introduction of the importance of safety helmets in sports
0:44	1:14	Nikhil Gupta and the parameters considered in safety helmet design
1:15	1:24	Description of a typical safety helmet
1:25	1:37	Equestrian Beezie Madden and safety needs of her sport
1:38	2:02	Gupta showing an equestrian's helmet and the purpose of each layer
2:03	2:53	Drop-impact testing and analysis of material used in a helmet's outer shell
2:54	3:05	Cyclist Sarah Hammer and safety needs of her sport
3:06	3:22	Gupta showing a cyclist's helmet and the purpose of each layer
3:23	4:09	Compression testing and analysis of material used in a helmet's middle layer
4:10	4:24	Explanation of how helmets are designed to withstand one or multiple impacts
4:25	4:30	Gupta showing a boxer's helmet and the purpose of the dense foam layer
4:31	4:49	Boxer Queen Underwood and safety needs of her sport
4:50	5:10	Gupta discussing the importance of field testing of helmets
5:11	5:23	Summary
5:24	5:35	Closing credits

Language Support

To aid those with limited English proficiency or others who need help focusing on the video, make transcript of the video available. Click the Transcript tab on the side of the video window, then copy and paste into a document for student reference.

Connect to Science

Framework for K-12 Science Education PS1.A Structure and Properties of Matter

PS2.B: Types of Interactions

PS3.C: Relationship Between Energy and Forces

LS1.A: Structure and Function



Related Science Concepts

- Relationship of force and mass
- Impact forces
- Physical properties
- Energy transfer
- Skeletal system
- Interaction of body systems

Connect to Engineering

Framework for K-12 Science Education

ETS1.A: Defining and Delimiting Engineering Problems

ETS2.A: Interdependence of Science, Engineering, and Technology

Engineering in Action

One goal of engineering is to design a system, component, or process to meet desired needs within realistic constraints—in this case, the safety of the user without compromising his or her performance. Engineers often describe the factors that impact design using flowchart graphics that resemble a concept map. Some of the factors are related to or dependent on one another (shown with connecting lines), while others might be freestanding, but no less important. Students will likely state that protecting the wearer's head should be the utmost concern in the design of any type of helmet. Other constraints might include the nature of the sport; the speed of the athlete when involved in the sport; the typical motions and potential dangers of the sport; the surface on which the sport typically takes place; the size and age range of the participants; and accommodations for eyeglasses or other aids, among others. Identifying the range of constraints is part of the engineering knowledge-generating activity design practice.

Take Action with Students Duplicate engineering brainstorming methods by eliciting from students factors associated with developing safety helmets and constraints that might impact the solution. Display the factors and constraints in individual circles. Then have students suggest which are dependent on one another, or have to be considered in tandem as a solution is developed.

Inquiry Outline for Teachers

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student Copy Masters begin on page 7.

Explore Understanding

In preparation, ask students to bring in helmets from sports, or other activities in which they participate, as prompts for discussion. In class, elicit from students how the body systems are involved in sports and all other activities. Point the discussion in a direction that allows students to conclude that the brain is one of the most important organs of the body, and how important it is for the brain to be protected from injuries.

Ask a few students, using their helmets as examples, to share experiences about activities or sports in which they participate, and explain how the helmet is involved. Then use prompts such as the following to engage all of your students in a discussion about the function of safety helmets and protective headgear:

- A football player's helmet protects a player from....
- A skateboarder's or mountain biker's helmet protects the wearer from....
- A wrestler's headgear protects the athlete from....
- Not wearing a safety helmet could result in....
- A damaged or ill-fitting safety helmet is not useful because....
- One helmet contrasts with another in the following ways....

Show the video Science of the Summer Olympics (SOTSO): Designing Safety Helmets.

Have students discuss what they saw. Use the following prompts to elicit from students the general purpose of any safety helmet, and why the materials from which they are made may vary. Then extend students' thinking to



other protective devices used in sports and related activities.

- When I watched the video I thought about....
- The expert in the video claimed that because....
- Most safety helmets have layers because....
- Dr. Gupta and his team test helmet materials by....
- Some athletes wear mouth guards because....
- Football players wear various types of pads to....
- Skateboarders wear _____ to protect their....
- Shin guards protect a soccer player by....

Ask Beginning Questions

Stimulate small-group discussion with the prompt: *The video makes me think about these questions....* Have small groups list questions they have about how the materials of a safety helmet are selected and tested. Groups should choose one question and phrase it in such a way as to be researchable and/or testable. Some examples are:

- How do different materials react to the same impact force?
- How do different amounts of force affect the same material?
- How does the distance an object falls affect its impact?
- How does the thickness of a material affect the way it reacts to a force?
- How does a material's resilience affect the way it reacts to a force?
- How does the number of impacts affect the effectiveness of a helmet?

Design Investigations

Choose one of these two options based on your students' knowledge, creativity, and ability level.

Open Choice Approach (Copy Master page 7)

Small groups might join together to agree on one question for which they will explore the answer, or each small group might explore something different. Students should brainstorm to

come up with a procedure they would carry out to answer their question. As they develop their procedures, work with them so that they implement safe procedures that control variables, and use appropriate instruments to make accurate measurements. Encourage students with prompts such as the following:

- The variable we will test is....
- The variables we will control are....
- The steps we will follow are....
- The data we will collect include....
- To conduct the investigation safely, we will....
- We will use to make measurements of....

Focused Approach (Copy Master pages 8–9)

The following exemplifies how students might investigate the question of determining how different materials react to the same impact force.

- 1. Ask students questions such as the following to spark their thinking:
- What were the safety helmets in the video?
- Of what kind of materials were the safety helmets mainly constructed?
- How does a boxer's helmet differ from a bicyclist's?
- 2. Students might choose to explore how well different kinds of foam react to the same force. Give them free rein in determining which kinds of materials they will use, and how they will exert and measure the force. Examining a range of materials might help students refine their question or lead to new questions that they should record for later exploration.
- 3. Ensure that students brainstorm variables and determine which can be controlled and which cannot. As needed, help them focus on their chosen variable in each trial. Use prompts such as the following:
- The variable we are testing is....
- The variables we are controlling, or keeping the same, are....
- 4. Students should determine a way to exert the same amount of force on each of the test materials they choose. For example, they might use a rigid plastic, rough polystyrene; smooth polystyrene; and dense,



flexible craft or "cheesecake" foam; they might drop a 100-gram mass from a height of 2 meters onto the same thickness of each test material, and measure the depth, in millimeters, of the indentation—if any—that was created in each material. Use prompts with students such as the following:

- We will create the same amount of force on each material by....
- We will measure how the force affected the material by....
- To make sure that we are generating valid data, we will repeat each test....
- To conduct the investigation safely, we will....
- 5. Students could also test how each material reacts to compressional force by squeezing the same thickness of each material between their forefingers and thumbs with as much force as possible, and observing and measuring the compressed thicknesses of each material. For a more quantitative data set, students might place an object in the center of the foam samples, and use varying numbers of their individual textbooks to create the force.
- 6. Students might extend their investigation by exploring how the surface area of an object influences the way the force is distributed. For example, students might use wood blocks of various length and width but the same height, exert force on them, and observe the differences in the impressions on the foam. Parlay their results into a discussion on why, for example, a baseball helmet needs to be harder than a bike helmet. Guide students to understand that a baseball is a small amount of force, but concentrated into a small surface area; whereas when hitting the road surface, a cyclist is experiencing a larger force spread out over a larger area.

Make a Claim Backed by Evidence

As students carry out their investigations, remind them to record their observations and measurements. As needed, suggest ways they might organize their data using appropriate graphic organizers. Students should analyze their group's data and then make one or more claims based on the evidence shown by the data. Encourage students with this prompt: *As evidenced by... we claim... because...*.

An example regarding the impact of a force on different kinds of foam might be:

As evidenced bydropping the same mass from the same distance onto four different types of materials, we claim that the craft foam has the highest compressibility <u>because</u> the mass made the deepest dent in this type of foam.

Compare Findings

Encourage students to compare their ideas with those of others—such as classmates who investigated the same or similar question, material they found on the Internet, an expert they chose to interview, or their textbooks. Remind students to credit original sources in their comparisons. Elicit comparisons from students with prompts such as the following:

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that we found on the Internet in that....

Students might make comparisons like the following:

My ideas are similar to those stated by Dr. Gupta on the video. We found that some materials will compress when forces are applied to them, while other materials shatter or break when the same forces are applied.

Reflect on Learning

Students should reflect on their understanding, thinking about how their ideas have changed or what they know now that they didn't before. Have students respond to one of the prompts in writing and then ask volunteers to share with the class or have partners exchange responses and ask questions of each other. Encourage reflection using prompts such as the following:

- My ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- When thinking about the claims made by the expert, I am confused about....
- One part of the investigation I am most proud of is....

Inquiry Assessment

See the rubric included in the student Copy Masters on page 10.



Incorporate Video into Your Lesson Plan

Integrate Video in Instruction

Bellringer: Play the video as students get settled for class, perhaps twice. Write this prompt on the board for students to consider as they watch: *List two ways that each helmet protects the athlete and one way the helmets enhance performance.*

Visualize a Concept: Use the segments of this video that show the helmets worn by equestrian Beezie Madden and cyclist Sarah Hammer to discuss how their helmets are similar yet different. Use these prompts to guide the discussion:

- How are the helmets worn by Beezie and Sarah similar?
- How are the helmets worn by these two athletes different?
- How do the surfaces on which these athletes compete influence the types of helmet they wear?

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these E's:

Explore: Use the focused inquiry idea to support your lessons on force and mass, and physical properties of matter.

Elaborate: Use the video to extend students' understanding of the need for safety helmets and other safety equipment, in both organized sports as well as similar recreational activities. Suggest students research the different types of helmets and other safety equipment used in at least five different sports or sporting activities. Have students use their findings to create a visual, explaining the purpose of each type of equipment.

Connect to ... Health

Encourage students to research the kinds of head or other injuries, such as concussions, commonly sustained in certain sports. Have them create posters that show the affected area(s), describe symptoms of the injury, show preventative measures, and list typical treatments. Collaborate with your health or physical education colleagues to have the posters displayed in the gym and locker rooms.

Use Video in Assessment

Ask students to use the concepts from the video to explain why most safety helmets are made of three different types of materials, as well as why the materials are layered the way they are. You might make the video transcript available to those with limited English proficiency. Click the Transcript tab on the side of the video, then copy and paste into a document for student reference.

COPY MASTER: Open Choice Inquiry Guide for Students

Science of the Summer Olympics: Designing Safety Helmets

Use this guide to investigate a question about safety helmet construction, materials used in the helmets, or how forces affect the materials. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

Design Investigations

Choose one question. How can you answer it? Brainstorm with your teammates. Write a procedure that controls variables and makes accurate measurements. Add safety precautions as needed.

- The variable I will test is....
- The variables I will control are....
- The steps I will follow are....
- To conduct the investigation safely I will....



Record Data and Observations

Record your observations. Organize your data in tables or graphs as appropriate.

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data shows. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- My ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- One concept I still do not understand involves....
- One part of the investigation I am most proud of is....

COPY MASTER: Focused Inquiry Guide for Students

Science of the Summer Olympics: Designing Safety Helmets

Use this guide to investigate a question about how different materials react to the same impact force. Write your lab report in your science notebook.

Ask Beginning Questions

How do different materials react to the same amount of force?

Design Investigations

How can you answer your question? Brainstorm a list of ideas with your teammates. Write a procedure that controls variables and makes accurate measurements. Add safety precautions as needed. For example, you might use a mass, and the same thickness of four different materials, similar to those used in safety helmets, to test how the same force affects each material. How could you do that?

- The variable I am testing is....
- The thickness of each type of material will be....
- I will exert the same amount of force on each material by....
- I will measure the impact force by....
- To make sure we are generating valid data, I will repeat each test _____times and find an average.
- To be safe, I need to....

Record Data and Observations

Organize your data as appropriate. The table and graph below are examples for recording how each material reacts to the same impact force.

Impact of the Same Force on Different Materials



	dropped from a dista	nce of			
	Depth of Inde	ntation (mm)			
Material	Trial 1	Trial 2	Trial 3	Average	
Rigid plastic					
Rough polystyrene					
Smooth polystyrene					
Craft foam					

Impact of the Same Force on Different Materials

Average Depth of Indentation (mm) Rigid Rough Smooth Dense Polystyrene Polystyrene Foam

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data shows. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

• My ideas are similar to (or different from) those of the experts in that....



- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- My ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- When thinking about the claims made by the expert, I am confused about....
- One part of the investigation I am most proud of is....

COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria	1 point	2 points	3 points
Initial question	Question has yes/no answer, is off topic, or otherwise not testable.	Question is testable but too broad or not answerable by the chosen investigation.	Question clearly stated, testable, and shows direct relationship to investigation.
Investigation design	The design of the investigation did not support a response to the initial question.	While the design supported the initial question, the procedure used to collect data (e.g., number of trials, control of variables) was not sufficient.	Clearly identified variables that are controlled as needed with steps and trials that result in data that can be used to answer the question.
Variables	Either the dependent or independent variable was not identified.	While the dependent and independent variables were identified, no controls were present.	Variables identified and controlled in a way that results in data that can be analyzed and compared.
Safety procedures	Basic laboratory safety procedures were followed, but practices specific to the activity were not identified.	Some, but not all, of the safety equipment and safe practices needed for this investigation was followed.	Appropriate safety equipment used and safe practices adhered to.
Observations and Data	Observations are not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what actually took place during the investigation.	Observations are made, but are not very detailed, or data appear invalid or are not recorded appropriately.	Detailed observations are made and properly recorded and data are plausible and recorded appropriately.
Claim	No claim is made or claim has no relationship to the evidence used to support it.	Claim marginally related to evidence from investigation.	Claim is backed by investigative or research evidence.
Findings comparison	Comparison of findings was limited to a description of the initial question.	Comparison of findings was not supported by the data collected.	Comparison of findings included both methodology and data collected by at least one other entity.
Reflection	Student reflection was limited to a description of the procedure used.	Student reflections were not related to the initial question.	Student reflections described at least one impact on thinking.



SCIENCE OF THE SUMMER OLYMPICS: Designing a Fast Pool - A Science Perspective

Video & Source available at: http://nbclearn.com/portal/site/learn/scienceof-the-summer-olympics

Objective:

Framework for K–12 Science Education, PS3.A: Definitions of Energy, PS3.B: Conservation of Energy and Energy Transfer, PS4.A: Wave Properties, ETS1.A: Defining and Delimiting Engineering Problems, ETS1.B: Developing Possible Solutions, ETS2.A: Interdependence of Science, Engineering, and Technology

Introduction Notes:

SCIENCE OF THE SUMMER OLYMPICS

Designing a Fast Pool

A Science Perspective

Background and Planning Information

About the Video

Anette Hosoi, a mechanical engineer at the Massachusetts Institute of Technology, explains how the knowledge of waves and the energy they transfer is applied to designing competitive pools, such as those built at the London Aquatics Center for the 2012 Summer Olympics.

0:00	0:12	Opening Credits
0:13	0:37	Introducing the London Aquatics Center
0:38	1:07	Olympian Missy Franklin's opinions on pool design
1:08	1:29	Definition and examples of waves
1:30	1:46	Anette Hosoi: How swimmers generate waves
1:47	2:08	Comparison of Olympic pool designs
2:09	2:23	Hosoi: How competitive pools dissipate energy
2:24	2:40	Pool depth at the Aquatics Center
2:41	2:55	Anette Hosoi and Missy Franklin: Importance of pool depth
2:56	3:12	Dissipating wave energy with surfaces
3:13	3:27	Dissipating wave energy with size
3:28	3:46	Dissipating wave energy with lane lines
3:47	4:14	Importance of a swimmer's lane position
4:15	4:31	Summary of London Aquatics Center features
4:32	4:44	Closing Credits

Language Support

To aid those with limited English proficiency or others who need help focusing on the video, make transcript of the video available. Click the Transcript tab on the side of the video window, then copy and paste into a document for student reference.

Connect to Science

Framework for K-12 Science Education PS3.A: Definitions of Energy

PS3.B: Conservation of Energy and Energy Transfer

PS4.A: Wave Properties

Related Science Concepts

- Waves as a mechanical disturbance due to energy input
- Energy
- Energy transfer through waves
- Energy dissipation
- Turbulence in a fluid
- Wave propagation



- Absorption of energy
- Reflection
- Diffraction

Connect to Engineering

Framework for K-12 Science Education

ETS1.A: Defining and Delimiting Engineering Problems

ETS1.B: Developing Possible Solutions

ETS2.A: Interdependence of Science, Engineering, and Technology

Engineering in Action

The engineering problems addressed in *Science of the Summer Olympics (SOTSO): Designing a Fast Pool* include how to design a competitive pool so that the waves created by the swimmers' motions interfere as little as possible with their performance. To effectively dissipate the energy moving through the water, the main competitive pool at the London Aquatics Center includes an adjustable floor, side and end troughs that "swallow" water waves, and spinning lane lines that absorb energy rather than propagating swimmers' waves from lane to lane. Engineers of competitive swimming pools work to test and design materials and configurations within realistic constraints, including the practicality, cost, and function of the structures in the real world, as well as the health and safety of the athletes who train and compete in the pools.

Modeling is an important step in the evolution of engineering designs. Students should understand that models are not perfect representations of every aspect of the design simultaneously, but can give accurate data about certain aspects at any given time. Several different models might be required to accurately represent all aspects of a given system. The development of models and subsequent testing of the finished designs are part of the engineering knowledge-generating activities *experimental engineering research* and *direct trial*.

Take Action with Students

Help students brainstorm to form a list of some of the constraints within which engineers have to work to reduce turbulence in a competitive swimming pool. Use the list to initiate a discussion about how other types of waves – such as light waves, sound waves, radio waves, and earthquake waves – move through different types of media. Extend the discussion to include engineering design problems associated with objects such as sunglasses (stop certain wavelengths while still enabling enough transmission for sight); speakers (tensile strength of the material used to amplify the sound); and buildings (flexibility of materials used in earthquake-prone areas).

Inquiry Outline for Teachers

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on their grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student *Copy Masters* begin on page 6.

Explore Understanding

Ask students to draw pictures of what happens to the water in the pool before, during, and after someone dives in, to start students thinking about energy and water waves. Then begin a

discussion with students about what happens as a swimmer enters, then moves through the

water – as well as some of the factors that might affect the size of the waves that result from the swimmer's movements. Use prompts such as the following to spark discussion.

- When I enter a pool, I like to _____ because....
- A competitive swimmer dives into a pool at the start of a race rather than doing a cannon-ball jump because....
- To move forward in a pool, a swimmer must....
- As a swimmer moves through the water, the water....
- Swimming underwater creates ____turbulence in the water than swimming at the surface because....
- A swimmer doing the backstroke might cause _____ turbulence than a swimmer doing the _____ because....



Show the video *SOTSO*: Designing a Fast Pool.

Continue the discussion of some the effects of energy transfer through a fluid, using prompts such as the following:

- When I watched the video, I thought about....
- The expert in the video claimed that because....
- In the past, Olympic pools were....
- Pools at the London Aquatics Center were designed to minimize....
- Lowering the main competition pool's bottom is beneficial to swimmers because....
- Troughs along the sides of the main competition pool help swimmers by....
- The width of the pool lanes was designed so that....
- Some lanes are often left empty during competition because....

Ask Beginning Questions

Stimulate small-group discussion with the prompt: *This video makes me think about these questions*.... Have groups list questions they have about how a swimmer's mass or movements might affect the resulting waves. Then groups should choose one question and phrase it in such a way as to be researchable and/or testable. The following are some examples.

- How does a swimmer's mass affect the size of the waves he or she produces?
- How does a swimmer's speed affect the waves he or she produces?
- How does a swimmer's stroke affect the waves he or she produces?

Design Investigations

Choose one of these two options based on your students' knowledge, creativity, and ability level.

Open Choice Approach (Copy Master pages 6-7)

Small groups might join together to agree on one question for which they will explore the answer, or each small group might explore something different. Students should brainstorm to form a plan they would have to follow in order to answer the question. Work with students to develop safe procedures that control variables and enable them to make accurate measurements. Encourage students with prompts such as the following:

- The variable I will test is....
- The variables I will control are....
- The steps I will follow are....
- To conduct the investigation safely, I....

Focused Approach (Copy Master pages 8–9)

The following exemplifies how students might investigate the question of how a swimmer's mass could affect the size of the waves he or she produces.

- 1. Ask students questions such as the following to spark their thinking:
- What is mass?
- What factors affect an object's mass?
- What are some objects with similar sizes and shapes but different masses?
- What is a wave?
- How do swimmers produce waves?
 - 2. Students might choose to explore waves produced by moving objects with the same mass but different shapes. Or, they might explore how objects with the same shape and size but different masses create waves of different sizes. Give them free rein in determining how they will explore the effect of an object's mass as it moves through water. Examining a range of materials might help students refine their question or lead to new questions that they should record for later exploration.
 - 3. Ensure that students brainstorm a list of variables and determine which can be controlled and which cannot. As needed, help them focus on their chosen variable in each trial. Use prompts such as the following:



- The variable we will test is....
- The variables we will control are....
 - 4. Students might thread a table tennis ball, and a small foam ball of the same size that also floats, onto pieces of thin string and pull each at the same speed through a tub of shallow water to observe the waves created by each object. Students might gather quantitative data by actually measuring the heights of the waves produced as each ball moves through the water, or they might videotape the motions and do a qualitative analysis of the waves produced. Use prompts such as the following with students:
- The materials we will use are....
- We will gauge the speed of movement by....
- To conduct the investigation safely, we will....
 - 5. Students might continue their investigation by exploring how objects with the same mass but different shapes create waves as they move at the same speed through water.

Make a Claim Backed by Evidence

As students carry out their investigations, ensure they record their observations. As needed, suggest ways they might organize their data using tables and graphs or sketches and digital photos. Students should analyze their data and then make one or more claims based on the evidence their data shows. Encourage students with this prompt: *As evidenced by... I claim... because...*.

An example claim relating mass to the waves it creates might be:

As evidenced bythe waves created, <u>I claim</u> that objects with greater mass create larger waves than objects with lesser mass <u>because</u> the foam ball caused the water in the waves it created to be higher than those formed by the table tennis ball moving at the same speed, which shows that more energy was transferred from the motion of the more massive ball than from the motion of the less massive ball.

Compare Findings

Encourage students to compare their ideas with those of others—such as classmates who investigated the same or a similar question, material they found on the Internet, an expert they chose to interview, or their textbooks. Remind students to credit their original sources in their comparisons. El icit comparisons from students with prompts such as the following:

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Students might make comparisons like the following:

My ideas are similar to my classmates' in that the data from groups that researched the same question showed similar results—objects of the same size and shape but greater masses create larger waves than objects with smaller masses.

Reflect on Learning

Students should reflect on their understanding, thinking about how their ideas have changed or what they know now that they didn't before. Encourage reflection, using prompts such as the following:

- I claim that my ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- One concept I still do not understand involves....
- One part of the investigation I am most proud of is....

Inquiry Assessment

See the rubric included in the student Copy Masters on page 10.

Incorporate Video into Your Lesson Plan

Integrate Video in Instruction

Bellringer: Show the video with the sound muted, perhaps twice, as students settle for class. Have students



answer a question such as: What science and engineering concepts do you think this video is about? State three reasons that support why you think so. Use students' answers as a lead-in to your introduction of the waves created as these swimmers plow through the water.

Homework: Introduce elite swimmers Michael Phelps (0:29) and Ryan Lochte (0:30) to students. Inform students that when competing, Phelps typically weighs several pounds less than Lochte. Also tell students that Phelps is a few inches taller than Lochte. Instruct students to watch the video and consider if and how these small differences in weight and height might affect the waves generated in each swimmer's lane.

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these E's:

Explain: Show students a segment of several swimmers in adjacent lanes (1:01–1:04). Then provide students with a screen grab of the video at 1:02 and ask them to use the image to explain the importance of lane position, in terms of where a swimmer ideally wants to be during an event.

Elaborate: Use the video to elaborate on how different strokes create different disturbances in a swimming pool. Allow students who swim competitively or regularly to share personal experiences.

Connect to ... Social Studies / Engineering

Suggest students research recent Olympic venues – summer or winter – to find out how hosting the games impacted the economics of the area both at the time of the games and in the passing years. As a springboard, students might listen to a story aired on National Public Radio (NPR) about the 2008 Beijing games at http://www.npr.org/2012/07/10/156368611/chinas-post-olympic-woe-how-to-fill-an-empty-nest. Discuss with students how one factor that engineers are very concerned with as they design is https://www.npr.org/2012/07/10/156368611/chinas-post-olympic-woe-how-to-fill-an-empty-nest. Discuss with students how one factor that engineers are very concerned with as they design is https://www.npr.org/2012/07/10/156368611/chinas-post-olympic-woe-how-to-fill-an-empty-nest. Discuss with students how one factor that engineers are very concerned with as they design is https://www.npr.org/2012/07/10/156368611/chinas-post-olympic-woe-how-to-fill-an-empty-nest. Discuss with structure, design, or object to be viable, with positive impact on the environment and economy. In student reports or presentations, have them suggest how venues might have been designed to be more sustainable.

Use Video in Assessment

Play the segments of the video, with the sound muted, that show three types of technology—the moveable floor (2:29 to 2:36), the side troughs (2:55 to 3:03), and the rotating lane dividers (3:42 to 3:46)—used to reduce the effects of turbulence caused by swimmers competing in a fast pool. Give the following instructions:

Choose two of these technologies and explain, in detail, how each reduces wave propagation.

COPY MASTER: Open Choice Inquiry Guide for Students

Science of the Summer Olympics: Designing a Fast Pool

Use this guide to investigate a question about how a swimmer's mass, speed, or swim stroke affects the waves he or she generates moving through the water. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

Design Investigations

Choose one question. How can you answer it? Brainstorm with your teammates. Write a

procedure that controls variables and makes accurate measurements. Add safety precautions as needed.

- The variable I will test is....
- The variables I will control are....
- The steps I will follow are....
- To conduct the investigation safely, I will....

Record Data and Observations

Record your observations. Organize your data in tables or graphs as appropriate.



Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data shows. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- My ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- One concept I still do not understand involves....
- One part of the investigation I am most proud of is....

COPY MASTER: Focused Inquiry Guide for Students

Science of the Summer Olympics: Designing a Fast Pool

Use this guide to investigate a question about how the mass of a swimmer affects the waves that form as he or she moves through the water. Write your lab report in your science notebook.

Ask Beginning Questions

How does the mass of an object affect the waves it generates as it moves through water?

Design Investigations

Brainstorm with your teammates about how to answer the question. Write a procedure that controls variables and allows you to make accurate measurements. Add safety precautions as needed. Use these prompts to help you design your investigation.

- The objects I will use to model the swimmers are....
- I will create waves with the objects by....
- I will model the pool with....
- The steps I will follow to test my variable include....
- The variables I will control are....
- I will repeat each trial times to make sure....
- To be safe, I need to....

Record Data and Observations

Organize your observations and data in tables or graphs as appropriate. The table below is an example using similar balls with different masses moving at the same speed through water.

Mass and Wave Height

	Wave Height (mm)		
Ball	Trial 1	Trial 2	Trial 3
Table tennis ball			
Small foam ball			



Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence shown by your data. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- I claim that my ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- One concept I still do not understand involves....
- One part of the investigation I am most proud of is....

COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria	1 point	2 points	3 points	
Initial question	Question had a yes/no answer, was off topic, or otherwise was not researchable or testable.	Question was researchable or testable but too broad or not answerable by the chosen investigation.	Question clearly stated, researchable or testable, and showed direct relationship to investigation.	
Investigation design	The design of the investigation did not support a response to the initial question. While the design sup the initial question procedure used to data (e.g., number of control of variables) we sufficient.		Variables were clearly identified and controlled as needed with steps and trials that resulted in data that could be used to answer the question.	
Variables	Either the dependent or independent variable was not identified.	While the dependent and independent variables were identified, no controls were present.	Variables identified and controlled in a way that results in data that can be analyzed and compared.	
Safety procedures	Basic laboratory safety procedures were followed, but practices specific to the activity were not identified.	Some, but not all, of the safety equipment was used and only some safe practices needed for this investigation were followed.		
Observations and Data	Observations were not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what	Observations were made, but were not very detailed, or data appear invalid or were not recorded appropriately.	Detailed observations were made and properly recorded and data are plausible and recorded appropriately.	



	actually took place during the investigation.		
Claim	No claim was made or the claim had no relationship to the evidence used to support it.	Claim was marginally related to evidence from investigation.	Claim was backed by investigative or research evidence.
Findings comparison	Comparison of findings was limited to a description of the initial question.	Comparison of findings was not supported by the data collected.	Comparison of findings included both methodology and data collected by at least one other entity.
Reflection	Student reflection was limited to a description of the procedure used.	Student reflections were not related to the initial question.	Student reflections described at least one impact on thinking.

SCIENCE OF THE SUMMER OLYMPICS: Sarah Robles and the Mechanics of Weightlifting - A Science Perspective

Video & Source available at: http://nbclearn.com/portal/site/learn/scienceof-the-summer-olympics

Objective:

Framework for K–12 Science Education: PS2.A: Forces and Motion, PS2.B: Types of Interactions, PS2.B: Stability and Instability in Physical Systems, ETS1.A: Defining and Delimiting Engineering Problems, ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

Introduction Notes:

SCIENCE OF THE SUMMER OLYMPICS Sarah Robles and the Mechanics of Weightlifting A Science Perspective

Lesson plans produced by the National Science Teachers Association. Video produced by NBC Learn in collaboration with the National Science Foundation.

Background and Planning Information

About the Video

Brian Zenowich, a robotics engineer at Barrett Technology, Inc., explains how he and others working in the field of biomimetics use nature to help design and engineer a variety of devices, including some of those used in medicine. Zenowich discusses and demonstrates his company's Whole Arm Manipulator, or WAMTM Arm, and compares it to how Olympian weightlifter Sarah Robles' arms work. Zenowich also discusses some of the limitations of the robotic arm.

0:00	0:12	Series Opening
0:13	0:54	Introducing Sarah Robles
0:55	1:14	Zenowich's comments on Sarah's abilities
1:15	1:33	Field of biomimetics
1:34	1:46	Barrett Technology's WAM TM Arm
1:47	2:03	Comparison of the WAM™ Arm to Sarah's arms
2:04	2:20	Haptic nature of the WAM™ Arm
2:21	2:32	How biomimetics robots are designed for different uses



2:33	3:07	Sarah's lifts being filmed with a high-speed camera
3:08	3:31	Zenowich analyzing the lifts
3:32	3:38	Sarah explaining the mechanics of lifting
3:39	4:32	Using the WAM TM Arm to try to mimic Sarah's movements
4:33	4:42	Constraints of using the WAM™ Arm
4:43	5:02	Sarah explaining technique
5:03	5:22	Summary
5:23	5:35	Closing Credits

Language Support

To aid those with limited English proficiency or others who need help focusing on the video, make transcript of the video available. Click the Transcript tab on the side of the video window, then copy and paste into a document for student reference.

Connect to Science

Framework for K-12 Science Education PS2.A: Forces and Motion

PS2.B: Types of Interactions

PS2.B: Stability and Instability in Physical Systems

Related Science Concepts

- Mass
- Forces
- Motion
- Levers
- Fulcrum
- Effort arm
- Resistance arm
- Load
- Mechanical advantage
- Musculoskeletal system

Connect to Engineering

Framework for K-12 Science Education

ETS1.A: Defining and Delimiting Engineering Problems

ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

Engineering in Action

The engineering concepts discussed in *Science of the Summer Olympics (SOTSO): Sarah Robles and the Mechanics of Weightlifting* include designing and testing robotic devices that mimic structures and motions found in nature, specifically the human arm. A person's arm is a third- class lever in which the fulcrum of the lever is the elbow. The effort arm of the lever is the forearm, which moves as the biceps contract and relax. The resistance arm of this third-class lever is the weight of the forearm, plus any weight it is trying to move. Biomimetics engineers use movements like those made by human arms to design and build similar robotic devices. In the video, Zenowich discusses and demonstrates his company's Whole Arm Manipulator, or WAMTM Arm, in an effort to better understand how weightlifters like Sarah are able to accomplish amazing feats. He also talks about the extensive computer modeling needed to test and design materials and configurations within realistic constraints, including the practicality of the device and how it will function in the human environment. This effort involves the engineering knowledge-generating activity *experimental engineering research*.

Take Action with Students

Help students brainstorm to form a list of some of the constraints within which engineers have to work to design devices that mimic the various motions of the human body. Use the list to initiate a discussion about how robotic body parts cannot truly mimic the motions because of their lack of physiological components, such as muscles



and nerves, and an actual brain that sends and receives signals necessary to carry out specific bodily functions. Extend the discussion to include engineering design problems associated with any artificial body parts, or machines that do the function of these parts, including artificial hearts (material failure or rejection), dialysis machines (size), and joint replacements (material failure and fit), among others.

Inquiry Outline for Teachers

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student *Copy Masters* begin on page 7.

Explore Understanding

Display some common levers or objects that can be used as levers – such as screwdrivers, scissors, brooms, tennis rackets, baseball bats, nutcrackers, tweezers, or nail clippers – and demonstrate how each object might be used. Also point out some examples of levers that can be found on a playground or around a construction site, including seesaws and wheelbarrows. Use these examples of levers to help students form a definition of a lever: a bar or rod that is free to pivot around a fixed point called a fulcrum. Now use the prompts that follow to spark a discussion of how human legs and arms are levers that can reduce the force needed to move objects over a distance.

- Your arm is a lever because it....
- You use your legs as levers when you....
- If you were lifting a weighted bar from the floor to your chest, you would do it by....
- If you were lifting that same bar from the floor to a position above your head, you would....
- How much mass a weightlifter can lift depends on....
- To prevent injuries while lifting weights, you should....

Show the video SOTSO: Sarah Robles and the Mechanics of Weightlifting.

Continue the discussion of how arms are levers, and how they are used to move mass, using prompts such as the following:

- When I watched the video, I thought about....
- To lift record-breaking amounts of weight, Sarah....
- The expert in the video claimed that because....
- The WAMTM Arm is like Sarah's arms in that it....
- The WAMTM Arm is different from Sarah's arms in that it....
- To complete the snatch, Sarah... until a ____ causes the barbell to....
- To simulate Sarah's moves, the experts....
- In order to achieve her lifts, Sarah explains that....

Before students start their investigations, use diagrams to explain or review the parts of a third-class lever such as the human arm. Then tie this information into what they saw in the video, using the following prompts:

- The body part that provides the force used by Sarah to lift mass is the....
- In terms of levers, the weight is of Sarah's arm.
- In terms of levers, the effort arm of Sarah's arm is
- In terms of levers, the resistance arm of Sarah's arm is....

Ask Beginning Questions

Stimulate small-group discussion with the following prompt: *This video makes me think about these questions*.... Have groups list questions they have about how a weightlifter makes use of force to lift a certain amount of mass. Ask groups to choose one question and phrase it in such a way as to be researchable and/or testable. The following are some examples.

- How does mass affect the amount of force needed to lift it?
- How does the position of a mass on the resistance arm affect the force needed to lift the mass?
- How does the length of an effort arm affect the amount of force that must be applied to move a mass?



How does the length of a resistance arm affect the amount of force that must be applied to move a mass?

Design Investigations

Choose one of these two options based on your students' knowledge, creativity, and ability level.

Open Choice Approach (Copy Master pages 7-8)

Small groups might join together to agree on one question for which they will explore the answer, or each small group might explore something different. Students should brainstorm to form a plan they would have to follow to answer the question. Work with students to develop safe procedures that control variables and enable them to make accurate measurements. Encourage students with prompts such as the following:

- The variable I will test is....
- The variables I will control are....
- The steps I will follow are....
- To conduct the investigation safely, I....

Focused Approach (Copy Master page 8)

The following exemplifies how students might investigate the question of how the mass of the object being moved by a third-class lever is related to the force needed to move it.

- 1. Ask students questions such as the following to spark their thinking:
- What is mass?
- What is force?
- How is mass measured?
- *How is force measured?*
- Students might choose to explore if different masses require different amounts of forces to lift them. Or, they might choose to explore how the length of a resistance arm affects the amount of force needed to move the same mass. Give students free rein in determining how they will explore the effect mass on the force needed to lift it.
- 3. Ensure that students brainstorm a list of variables and determine which can be controlled and which cannot. As needed, help them focus on their chosen variable in each trial. Use prompts such as the following:
- The variable I will test is....
- The variables I will control are....
- 4. Students might use different balance masses to test if mass does indeed affect the force needed to move it. To test this question, students might use a metric ruler (with holes in it), string, masses, and a spring scale to carry out their procedures. One possible procedure might include tying a mass to one of the holes at one end of the ruler, and having one student grip the midpoint of the ruler between the index finger and the thumb loosely enough that it can freely pivot. The spring scale can be hooked into one of the other holes on the other side of the ruler's midpoint to determine the amount of force needed to level the ruler. Use prompts such as the following with students:
- The materials I will use are....
- I will measure the force needed to move each mass by....
- I will repeat each trial _____ times for each mass and determine an average force.
- To conduct the investigation safely, I....
- 5. Students might continue their investigation by exploring how changing the position of a mass on the resistance arm of their ruler lever might affect the amount of force needed to lift the mass. Or, they might test if varying the length of the effort arm in their third-class lever affects the amount of force needed to lift a certain mass.

Make a Claim Backed by Evidence

As students carry out their investigations, ensure that they record their observations. As needed, suggest ways they might organize their data using tables or graphs. Students should analyze their data and then make one or more claims based on the evidence their data show. Encourage students with this prompt: As evidenced by... I claim... because....

An example claim relating mass to the force needed to move it might be the following:



As evidenced by lifting different masses with the same lever, <u>I claim</u> that a larger mass requires more force to lift it than a smaller force does <u>because</u> the values on the spring scale for larger masses were greater than those for smaller masses.

Compare Findings

Encourage students to compare their ideas with those of others—such as classmates who investigated the same or similar question, material they found on the Internet, an expert they chose to interview, or their textbooks. Remind students to credit their original sources in their comparisons. Elicit comparisons from students with prompts such as the following:

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Students might make comparisons like the following:

My ideas are similar to my classmates' in that the data from groups that researched the same question had similar results—mass does affect the amount of force needed to move it.

Reflect on Learning

Students should reflect on their understanding, thinking about how their ideas have changed or what they know now that they didn't before. Encourage reflection, using prompts such as the following:

- My ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- One concept I still do not understand involves....
- One part of the investigation I am most proud of is....

Inquiry Assessment

See the rubric included in the student Copy Masters on page 9.

Incorporate Video into Your Lesson Plan

Integrate Video in Instruction

Visualize a Concept: Use Sarah's comments at the beginning of the video to dispel the common misconception that "....big muscles [are] going to move a lot of weight." Explain that first- and second-class levers can have a significant mechanical advantage — or number of times the lever increases the effort applied to the load. Explain that a third-class lever like the human arm can increase the distance over which a mass is moved, as well as the speed with which it is moved, but it cannot increase the amount of *force* needed to move the mass.

Compare and Contrast: Replay the video segment from 0:23 to 0:38 that shows Sarah doing two types of lifts—the snatch and the clean and jerk. Have students describe how the lifts are similar and different, noting Sarah's use of her arms and how she positions her body as she goes through each lift.

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these E's:

Explore: Use the Focused Approach in the Design Investigations section of the Inquiry Outline to support your lessons on forces and simple machines.

Elaborate: Use the video to encourage students to learn more about the human musculoskeletal system. Ask students to research the bones, muscles, and joints involved in a variety of sports, including weightlifting. Have students summarize their findings with detailed diagrams.

Connect to ... Math

Have students work in pairs to calculate the mechanical advantage (MA) of the levers they used in their investigations. Then have them measure the effort and resistance arms of at least 10 different classmates and calculate those MAs. Challenge students to predict which of their classmates might make a good weightlifter



based on the MA of his or her arms.

Use Video in Assessment

Ask students to closely watch as you play, perhaps two or three times, the video segment from 2:33 to 3:07, which shows Sarah lifting, and the segment from 3:55 to 4:04, which shows Zenowich attempting to mimic one of her lifts. Provide students with these instructions:

Explain why Zenowich couldn't complete his lift with a 5-lb mass and a robotic arm, but Sarah could complete hers lifting more than 550 lbs. with her own arms. Use the following terms in your explanation: force, effort, and momentum.

COPY MASTER: Open Choice Inquiry Guide for Students

Science of the Summer Olympics: Sarah Robles and the Mechanics of Weightlifting

Use this guide to investigate a question about how levers can be used to lift mass. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

Design Investigations

Choose one question. How can you answer it? Brainstorm with your teammates. Write a procedure that controls variables and makes accurate measurements. Add safety precautions as needed.

- The variable I will test is....
- The variables I will control are....
- The steps I will follow are....
- To conduct the investigation safely, I will....

Record Data and Observations

Record your observations. Organize your data in tables or graphs as appropriate.

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data shows. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question. Or do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- My ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....



- One concept I still do not understand involves....
- One part of the investigation I am most proud of is....

COPY MASTER: Focused Inquiry Guide for Students

Science of the Summer Olympics: Sarah Robles and the Mechanics of Weightlifting

Use this guide to investigate a question about how mass affects the amount of force needed to lift it with a lever. Write your lab report in your science notebook.

Ask Beginning Questions

How does the size of a mass affect the amount of force needed to lift it with a lever?

Design Investigations

Brainstorm with your teammates about how to answer the question. Write a procedure that controls variables and allows you to make accurate measurements. Add safety precautions as needed. Use these prompts to help you design your investigation.

- I will make a third-class lever by....
- The mass sizes I will use are....
- I will attach the masses to the lever by....
- I will measure force with a _____ by....
- The steps I will follow to test my variable include....
- The variables I will control are....
- I will repeat each trial times to make sure....
- To be safe, I need to....

Record Data and Observations

Organize your observations and data in tables or graphs as appropriate. The table below is an example using similar balls with different masses moving at the same speed through water.

Mass, Force, and Levers

	Force (N) Needed to Lift It With a Third-Class Lever				
Mass (g)	Trial 1	Trial 2	Trial 3	Average	
grams					
grams					
grams					

COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria	1 point	2 points	3 points
Initial question	Question had a yes/no answer, was off topic, or otherwise was not researchable or testable.	Question was researchable or testable but too broad or not answerable by the chosen investigation.	Question clearly stated, researchable or testable, and showed direct relationship to investigation.
Investigation design	The design of the investigation did not support a response to the initial question.	While the design supported the initial question, the procedure used to collect data (e.g. number of trials, control of variables) was not sufficient.	Variables were clearly identified and controlled as needed with steps and trials that resulted in data that could be used to answer the question.



Variables	Either the dependent or independent variable was not identified.	While the dependent and independent variables were identified, no controls were present.	Variables identified and controlled in a way that results in data that can be analyzed and compared.
Safety procedures	Basic laboratory safety procedures were followed, but practices specific to the activity were not identified.	Some, but not all, of the safety equipment was used and only some safe practices needed for this investigation were followed.	Appropriate safety equipment used and safe practices adhered to.
Observations and Data	Observations were not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what actually took place during the investigation.	Observations were made, but were not very detailed, or data appear invalid or were not recorded appropriately.	Detailed observations were made and properly recorded and data are plausible and recorded appropriately.
Claim	No claim was made or the claim had no relationship to the evidence used to support it.	Claim was marginally related to evidence from investigation.	Claim was backed by investigative or research evidence.
Findings comparison	Comparison of findings was limited to a description of the initial question.	Comparison of findings was not supported by the data collected.	Comparison of findings included both methodology and data collected by at least one other entity.
Reflection	Student reflection was limited to a description of the procedure used.	Student reflections were not related to the initial question.	Student reflections described at least one impact on thinking.

SCIENCE OF THE SUMMER OLYMPICS: Missy Franklin & Fluid Dynamics - An Engineeering Perspective

Video & Source available at: http://nbclearn.com/portal/site/learn/scienceof-the-summer-olympics

Objective:

Framework for K–12 Science Education: PS2.A Forces and Motion, PS2.B: Types of Interactions, ETS1.A: Defining and Delimiting Engineering Problems, ETS1.B: Developing Possible Solutions

Introduction Notes:

SCIENCE OF THE SUMMER OLYMPICS Missy Franklin & Fluid Dynamics An Engineering Perspective

Lesson plans produced by the National Science Teachers Association. Video produced by NBC Learn in collaboration with the National Science Foundation.

Background and Planning Information

About the Video



Timothy Wei, Dean of the College of Engineering at the University of Nebraska, Lincoln, applies concepts of fluid dynamics to "engineering" the strokes of elite swimmers, including Olympic swimmer Missy Franklin, in much the same way as engineers design cars and airplanes to move through the fluid atmosphere.

0:00	0:12	Opening Credits
0:13	0:54	Introducing Missy Franklin
0:55	1:14	Advantages of body size in thrust and drag
1:15	2:02	Timothy Wei: engineering of a swimmer's stroke
2:03	2:26	Stroke in action: frictional (viscous) drag
2:27	2:51	Stroke in action: pressure drag
2:52	3:09	Stroke in action: wave drag
3:10	3:32	Stroke in action: thrust
3:33	3:55	Thrust actions of hands and feet
3:56	4:23	Technique to reduce drag: streamlining
4:24	4:49	Uniqueness of swimmer's stroke and summary
4:50	4:59	Closing Credits

Language Support

To aid those with limited English proficiency or others who need help focusing on the video, make transcript of the video available. Click the Transcript tab on the side of the video window, then copy and paste into a document for student reference.

Connect to Science

Framework for K-12 Science Education PS2.A Forces and Motion PS2.B: Types of Interactions

Related Science Concepts

- Aerodynamics
- Air as a fluid
- Bernoulli's principle
- Drag—frictional, pressure, wave
- Fluid dynamics and friction
- Streamlining
- Thrust

Connect to Engineering

Framework for K–12 Science Education ETS1.A: Defining and Delimiting Engineering Problems ETS1.B: Developing Possible Solutions

Engineering in Action

The engineering problem addressed in *Science of the Summer Olympics (SOTSO): Missy Franklin & Fluid Dynamics* is how to design a swimming stroke that takes advantage of a swimmer's physical features. Missy Franklin has been known to describe her size 13 feet as "flippers" because they are so large. Individuals who do not have the same physical features might add equipment to enable them to swim more effectively.

Engineers at a sporting goods company might be presented with a problem involving the optimum size and shape of flippers to help people increase the surface area of their feet, and thus swim more efficiently. Discuss with students how they would go about solving the problem. Point out that engineers go through a series of design stages, beginning with "blue sky" brainstorming, in which any and all ideas are put on the table. Creativity is very important at this stage. As they progress through various stages of defining constraints – such as materials, costs, weight, flexibility, and testing the designs – the options will be narrowed until the most cost-effective solution for the problem is defined. In the case of flippers, that solution can differ among the companies seeking a solution.

Take Action with Students

Encourage students to explore solutions to a problem related to swim flipper design using the Design



Investigations section of the Inquiry Outline as a guide. As a class, set up constraints within which students will need to design – for example, that the end product must be made of a narrow selection of materials, be of a certain maximum length, and increase water displacement by 20% or more.

Inquiry Outline for Teachers

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student Copy Masters begin on page 7.

Explore Understanding

Discuss with students the parallels between the shapes of objects and how easily an object of a given shape can move through a fluid such as air or water. Use prompts such as the following to start students talking:

- People dive with arms pointed in front instead of doing a "belly flop" because....
- A dolphin's shape helps it swim more quickly than a sea turtle because....
- A skydiver's motion changes when the parachute opens because....

Show the video SOTSO: Missy Franklin & Fluid Dynamics.

Continue the discussion, focusing on the parallels between Missy Franklin's "structure" and that of other streamlined objects or animals. Students might make comparisons among airplanes, submarines, whales, sharks, penguins, automobiles, and so on. Help students recall some of the engineering problems that Missy, as a swimmer – and other objects or animals moving through a fluid, such as air or water – must overcome. Use prompts such as the following:

- When I watched the video I thought about....
- The expert in the video claimed that because....
- The plane moving through air is like a swimmer moving through water in that....
- Shape impacts how an object moves through a fluid by....
- Missy Franklin shows streamlining by....
- Wave drag impacts a swimmer by....
- Fluid friction causes....

Ask Beginning Questions

Stimulate small-group discussion with the prompt: *This video makes me think about these questions....* Then have students work in small groups to list questions they have about factors that influence how Missy (or something else), moves through a fluid. Then groups should choose one question and phrase it in such a way as to be researchable and/or testable. The following are some examples.

- *How does mass affect speed of the swimmer?*
- Will a spherical airplane move as easily through air as a cylindrical one?
- *Are bigger swim flippers necessarily better?*
- How does an object's shape influence wave drag?

Design Investigations

Choose one of these two options based on your students' knowledge, creativity, and ability level.

Open Choice Approach (Copy Master pages 7-8)

Small groups might join together to agree on one question for which they will explore the answer, or each small group might explore something different. Students should brainstorm what they would have to do to answer the selected question. Be sure students define the constraints within which they are designing. Then work with students to develop safe procedures that control variables and make accurate measurements. Encourage students with prompts such as the following:

- The variable we will test is....
- The variables we will control are....
- The steps we will follow are....



• To conduct the investigation safely we will....

Focused Approach (Copy Master pages 8–9)

The following exemplifies how students might investigate a solution to the problem of the optimum size of flippers to increase swimming efficiency.

- 1. Tell students that Missy Franklin often calls her feet her "personal flippers." Ask students questions such as the following to spark their thinking:
- Why does Missy seem to think that flippers might be better than feet?
- How might size make a difference?
- What shape are feet?
- How might shape make a difference?
- What kinds of shapes could you use for flippers?
- Does the length of the toes on the feet make a difference?
- 2. Students might choose to explore different sizes of "flippers." If so, give them free rein in coming up with what their flippers look like and how they will test them for adherence to the design constraints.
- 3. Encourage students to brainstorm a list of possible solutions before settling on one they will try. Students might find that after an initial attempt at a solution they need to start over with another idea. Some might try multiple solutions at the same time. Remind them of the constraints as needed, using prompts such as the following:
- We chose this material because....
- The flippers will displace 20% or more water if we....
- 4. Students should determine a way to compare displacement by the different-sized flippers. They might use a ripple tank or create an overflow tank from a small dishpan and larger tray. They could then move flippers of the same shape but different sizes through the water and measure how much water is displaced by each flipper. Use prompts with students such as the following:
- The materials we will use to hold and catch the displaced water are....
- We will measure the amount of displaced water by....
- To conduct the investigation safely we will....
- 5. Students could also do a qualitative analysis of displacement of air, feeling the "amount" of air moved by each flipper. Using the flippers to move tissue-paper confetti could add a quantitative aspect to their data. Use prompts such as the following to help students visualize their investigation:
- We will move the flipper by....
- We will measure the amount of displaced air by....
- To conduct the investigation safely, we will...
- 6. Students might continue their investigations by focusing on the variable of shape or changing the constraints, such as increasing water displacement by 50%.

Make a Claim Backed by Evidence

As students carry out their investigations, ensure they record their observations. As needed, suggest ways they might organize their data using tables or graphs. Students should analyze their data and then make one or more claims based on the evidence their data shows. Encourage students with this prompt: *As evidenced by... I claim... because....*

An example regarding flipper size might be: <u>As evidenced by</u> displacing water with flippers of three different sizes, <u>I claim</u> that using larger flippers increases swimming effectiveness <u>because</u> the larger the flipper the more water was moved.

Compare Findings

Encourage students to compare their ideas with those of others—such as classmates who investigated the same or similar questions; material they found on the Internet; experts who were interviewed; or their textbooks. Remind students to credit their original sources in their comparisons. Elicit comparisons from students with prompts such as the following:

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....



• My ideas are similar to (or different from) those that I found on the Internet in that....

Students might make comparisons like the following:

My ideas are similar to what I found on the Internet. In researching scuba fins, I found that some people might swim better with smaller fins due to lesser strength of their leg muscles. But for people who have strong leg muscles, larger fins are more efficient in moving water. This would support that having larger feet would enable one to swim faster.

Reflect on Learning

Students should reflect on their understanding; on how their ideas might have changed, or what they know now that they didn't before. Ask groups to make short presentations about their investigations and encourage questions from the audience on the presenters' thinking process as well as their procedures and results. Encourage reflection, using prompts such as the following:

- My ideas have changed from the beginning of this lesson because of this evidence...
- My ideas changed in the following ways...
- When thinking about the claims made by the expert, I am confused about...
- One part of the investigation I am most proud of is....

Inquiry Assessment

See the rubric included in the student Copy Masters on page 10.

Incorporate Video into Your Lesson Plan

Integrate Video in Instruction

Make Predictions: Introduce the four factors of the stroke as described in the video. Stop the video just after each term appears onscreen (frictional drag—2:12, pressure drag—2:32, wave drag—2:57, and thrust—3:12). Ask several students to predict how that factor impacts the swimmer's stroke. Students might view the rest of the clip on mute, describing what they think is happening. Have one or two recorders make notes on the board or chart paper. Then watch the clip again with the sound. Stop at the very end to evaluate students' predictions and to summarize.

Review: Project the video on an interactive whiteboard. Stop the video at different points, such as at 4:02. At that point, have volunteers sketch and label the various impacts to the stroke—frictional drag, wave drag, pressure drag, and thrust—on the swimmers.

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these E's:

Engage: Use the video to engage students in ways the science concepts of fluids, friction, drag, and thrust are involved in engineering efforts. Students may have difficulty imagining the "engineering" of a motion such as a swimming stroke. Point out that it is similar to perfecting a golf swing or a free throw, or identifying the most efficient way to move materials in a factory. For instance, see Amory Lovin's suggestions for reducing friction in pipes through integrated design. Copy and paste the following URL into your browser: http://www.ted.com/talks/amory_lovins_a_50_year_plan_for_energy.html (16:00–17:30)

Explore: Encourage students to explore solutions to a problem related to thrust using the Design Investigations section of the Inquiry Outline as a guide.

Connect to ... STEM

Technology / Debate

One blogger was curious whether the 43 new world records set during the 2009 World Swimming Championships were the result of technology or training. What do you think?

Challenge the class to hold a debate on the topic: Advanced technology is the reason why so many swimmers are breaking records and earning medals.

Divide the class into three teams: one that will argue in favor of the stated topic, one that will argue against it, and one that will act as the audience. Have students work together on ideas to support their team's arguments,



and to refute the other team's likely arguments. The audience might do research about the topic in order to ask relevant questions. Hold the debate by allowing for arguments and rebuttals, back and forth, until all members of both teams have had the opportunity to speak at least once. When the debate has ended, ask the audience to determine which team "won" and why. Remind students to base their votes on evidence presented in the debate only, not their personal opinions on the topic that was debated. Was there one specific argument that convinced them that one team won? Students might use some of the following as springboards for their arguments.

- http://www.nytimes.com/2008/08/12/sports/olympics/12records.html
- http://www.swimmingtechnology.com/
- http://www.sptimes.com/News/082700/Sports/Technology_helping_sw.shtml
- http://www.usaswimming.org/DesktopDefault.aspx
- http://www.swimsmooth.com/

Use Video in Assessment

Explain to students that they will use the concepts from the video to justify air as a fluid. Show the video, perhaps as many as two to three times. Have students write a short paragraph as justification, and diagram the impact of atmosphere as a fluid on airplanes. You might make the video transcript available to those with limited English proficiency. Click the Transcript tab on the side of the video, then copy and paste into a document for student reference.

COPY MASTER: Open Choice Inquiry Guide for Students

Science of the Summer Olympics: Missy Franklin & Fluid Dynamics

Use this guide to investigate a question about Missy Franklin, or the movement of a swimmer or other object, through a fluid. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

Design Investigations

Choose one question. How can you answer it? Brainstorm with your teammates. Write a procedure that controls variables and makes accurate measurements. Add safety precautions as needed.

- The variable I will test is....
- The variables I will control are....
- The steps I will follow are....
- To conduct the investigation safely, I....

Record Data and Observations

Record your observations. Organize your data in tables or graphs as appropriate.

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data shows. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question. Do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) what I found on the Internet in that....



Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- I claim that my ideas have changed from the beginning of this lesson because of this evidence...
- *My ideas changed in the following ways...*
- When thinking about the claims made by the expert, I am confused about...
- One part of the investigation I am most proud of is....

COPY MASTER: Focused Inquiry Guide for Students

Science of the Summer Olympics: Missy Franklin & Fluid Dynamics

Use this guide to investigate a question about density and the movement of a swimmer or other object through a fluid. Write your lab report in your science notebook.

Ask Beginning Questions

How does flipper size impact swimming efficiency?

Design Investigations

How can you answer your question? Brainstorm solutions with your teammates. Write a procedure that will enable you to meet the constraints. Add safety precautions as needed. For example, you might use flippers of various sizes and measure how much water or air is moved by each size. How could you do that?

- The medium in which I will move the flippers is....
- The materials I will use to hold and catch the displaced water or air are....
- The other materials I need are....
- I will measure the amount of displaced water or air by....
- The variables I will control are....
- To be safe I need to....

Record Data and Observations

Organize your data in tables or graphs as appropriate. The table and graph below are examples for using flippers of different sizes.

(page 8)

Relationship of Size	Relationship of Size and Fluid Displacement				
	Amount of Water	Amount of Water Moved			
Flipper Size	Trial 1	Trial 2	Trial 3		
Large					
Medium					
Small					

COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria	1 point	2 points	3 points
Initial question	Question had a yes/no answer, was off topic, or otherwise was not researchable or testable.	Question was researchable or testable but too broad or not answerable by the chosen investigation.	,
Investigation design	The design of the investigation did not support a response to the initial question.	the initial question, the procedure used to collect	



		control of variables) was not sufficient.	the question.
Variables	Either the dependent or independent variable was not identified.	While the dependent and independent variables were identified, no controls were present.	Variables identified and controlled in a way that results in data that can be analyzed and compared.
Safety procedures	Basic laboratory safety procedures were followed, but practices specific to the activity were not identified.	Some, but not all, of the safety equipment was used and only some safe practices needed for this investigation were followed.	Appropriate safety equipment used and safe practices adhered to.
Observations and Data	Observations were not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what actually took place during the investigation.	Observations were made, but were not very detailed, or data appear invalid or were not recorded appropriately.	Detailed observations were made and properly recorded and data are plausible and recorded appropriately.
Claim	No claim was made or the claim had no relationship to the evidence used to support it.	Claim was marginally related to evidence from investigation.	Claim was backed by investigative or research evidence.
Findings comparison	Comparison of findings was limited to a description of the initial question.	Comparison of findings was not supported by the data collected.	Comparison of findings included both methodology and data collected by at least one other entity.
Reflection	Student reflection was limited to a description of the procedure used.	Student reflections were not related to the initial question.	Student reflections described at least one impact on thinking.

SCIENCE OF THE SUMMER OLYMPICS: The Strength and Flexibility of Oscar Pistorius - An Engineering Perspective

Video & Source available at: http://nbclearn.com/portal/site/learn/scienceof-the-summer-olympics

Objective:

Framework for K–12 Science Education: PS2.A: Forces and Motion, PS2.B: Stability and Instability in Physical Systems, ETS1.A: Defining and Delimiting Engineering Problems, ETS1.C: Optimizing the Design Solution, ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

Introduction Notes:

SCIENCE OF THE SUMMER OLYMPICS

The Strength and Flexibility of Oscar Pistorius

An Engineering Perspective

Lesson plans produced by the National Science Teachers Association. Video produced by NBC Learn in collaboration with the National Science Foundation.

Background and Planning Information

About the Video

This video features Oscar Pistorius, a Paralympics Gold Medalist, who qualified to sprint in the 2012 Summer



Olympics. Various researchers, including biomechanical engineer Rory Cooper and physical therapist Justin Laferrier at the University of Pittsburgh, explain the physics involved in using prosthetics designed especially for sprinting, as well as the biomechanics involved to compensate for the loss of active body components. Also briefly discussed in this video is whether or not Oscar's prosthetics give him a competitive advantage over other sprinters.

0:00	0:12	Series opening
0:13	1:23	Introducing Oscar Pistorius
1:24	1:42	Cooper explaining Oscar's use of his prosthetics
1:43	1:56	Introduction to athletic prostheses
1:57	2:05	Cooper explaining Oscar's prostheses
2:06	2:39	Discussion of how Oscar's prosthetics might confer a competitive advantage
2:40	3:32	The physics of Oscar's flex-feet
3:33	5:03	How Oscar and other amputees change coordination and timing
5:04	5:10	Closing Credits

Language Support

To aid those with limited English proficiency or others who need help focusing on the video, make transcript of the video available. Click the Transcript tab on the side of the video window, then copy and paste into a document for student reference.

Connect to Science

Framework for K-12 Science Education PS2.A: Forces and Motion

PS2.B: Stability and Instability in Physical Systems

Related Science Concepts

- Forces
- Motion
- Potential energy
- Speed
- Stride
- Flexibility
- Impact
- Balance
- Composite materials
- Muscles
- Anatomic core

Framework for K-12 Science Education

- ETS1.A: Defining and Delimiting Engineering Problems
- ETS1.C: Optimizing the Design Solution
- ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

Engineering in Action

The engineering solution discussed in Science of the Summer Olympics (SOTSO): The Strength and Flexibility of Oscar Pistorius is a prosthetic limb designed especially for Oscar. Commonly called a flex-foot, this assistive technology has been customized for many other amputee athletes as well. Biomechanical engineers liken the flexible carbon fiber prosthesis to a spring that stores and releases energy. When the wearer runs, the flex-foot first makes contact with the ground at the toe. The curved part of the prosthetic mimics an ankle, causing the foot part of the device to slightly flex, thereby capturing some of the energy of the impact. Then, as the flex-foot leaves the ground, it returns to its original shape, releasing that potential energy, helping to propel the wearer forward. The effort involved in designing such a solution involves the engineering knowledge-generating activities transfer from science and experimental engineering research.

Although presented in the context of athletic competition, the flex-foot solution and assistive technologies in general are just one example of how applied science and engineering design improve peoples' lives. From



stereoscopic camera systems that can calculate the distance to an obstacle, such as a pedestrian crossing the street (described in *SOTSO: Maximizing the Long Jump of Bryan Clay*) to brain protection (described in *SOTSO: Designing Safety Helmets*), engineering solutions permeate daily activities.

Engineering solutions rarely appear out of thin air. Presented with a problem, one of the first activities in the design process is to research the existing understanding about the problem. In some cases, the researcher realizes that few people have begun to think about solving a given problem. In other cases, the understandings and solutions of others provide a springboard to new ways of solving the problem.

Take Action with Students

In 2008, some critics argued that the flex-foot gave Oscar and other users of the prosthetic an unfair advantage over athletes who did not use them. Use the Design Investigations section of the Inquiry Outline to turn students' research into what is known about the science and engineering of the flex-foot, into a debate that uses their findings. Some students might want to research another prosthesis or assistive technology and debate how it might impact competition.

Inquiry Outline for Teachers

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on their grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student *Copy Masters* begin on page 8.

Explore Understanding

Ask students who jog or run for pleasure, or students who are members of the track team, to talk about their running styles and stances. When students have finished, use prompts such as these to find out what students might already know about the physics and biomechanics involved in running, sprinting, or jogging.

- When running, the impact and movement of your foot is....
- As you run, the energy of the impact is absorbed by....
- As your foot leaves the ground, the motion causes....
- As you jog or run, your arms....
- Other muscles you use when running or jogging are....

Show the video SOTSO: The Strength and Flexibility of Oscar Pistorius.

Continue the discussion of the mechanics of running, using prompts such as the following:

- When I watched the video, I thought about....
- Oscar's prosthetics are customized for him by....
- Critics of the flex feet used by Oscar and other athletes argue that....
- The experts in the video claim that because....
- Oscar's coordination and timing differs from runners without flex feet in that....

Ask Beginning Questions

Stimulate small-group discussion with the prompt: *This video makes me think about these questions....* Have small groups list questions they have about how Oscar's flex feet work and how they might be considered to give Oscar a competitive advantage during races in which others are not using flex feet. Ask groups to choose one question and phrase it in such a way as to be researchable and/or testable. The following are some examples.

- How does Oscar's stance impact his start off the blocks as well as other phases of the race?
- How do the flex feet affect the sprinter's balance?
- How does the contact with the ground compare to that of runners without flex feet, and what impact might that have on Oscar's speed?
- In what ways does fatigue impact Oscar's sprint and how does that compare to fatigue's impact on runners without flex feet?
- How might certain types of running shoes give the wearer a competitive advantage over other runners?

Design Investigations



Choose one of these two options based on your students' knowledge, creativity, and ability level.

Open Choice Approach (Copy Master page 8)

Small groups might join together to agree on one question for which they will explore the answer, or each small group might explore something different. Students should brainstorm to form a list of key words and phrases they could use in Internet search engines that might result in resources that will help them answer the question. Review how to safely browse the Web, how to evaluate information on the Internet for accuracy, and how to correctly cite the information found. Suggest students make note, for future inquiry, of any interesting tangents they find in their research efforts. Encourage students with prompts such as the following:

- Words and phrases associated with our question are....
- The reliability of our sources was established by....
- The science concepts that underpin a possible solution are....
- Our research might feed into an engineering design solution such as....
- To conduct the investigation safely, we will....

Focused Approach (Copy Master pages 9–10)

The following exemplifies how students might investigate the question of whether or not Oscar's flex feet give him a competitive advantage over sprinters who do not use flex feet.

- 1. Ask students questions such as the following to spark their thinking:
- How does the repositioning of Oscar's legs during the race compare to runners without flex feet?
- How does the amount of force transmitted to the ground by Oscar's prosthetics compare to that of runners without flex feet?
- How does the function of Oscar's flex feet differ from actual feet, ankles, bones, muscles, and tendons?
- Do Oscar's flex feet have any type of sensors or computers in them?
- How might Oscar's ability to use his flex feet effectively be influenced by how long he has been using assistive technologies? How might this compare to the effectiveness of the running ability of a runner without flex feet?
- Do Oscar's muscles use oxygen any differently from the way the muscles of able-bodied runners use it? What might determine the amount of oxygen used?
- Do all runners and sprinters move in exactly the same way?
- Do the length and weight of Oscar's flex feet give him any competitive advantage?
- 2. Divide students into groups based on opposing positions: yes, Oscar's flex feet give him a competitive advantage over other sprinters, or no, they do not. Have groups conduct research to support their position. Note that if at some point along the way, students change their stands based on what they find out, allow these students to switch groups. The following links include articles that argue both positions. You might provide these to students to get them started, or have them conduct the research on their own. *Note: If links do not automatically load, copy and paste the URL into your Internet browser.*
- The Fast Life of Oscar Pistorius

http://www.nytimes.com/2012/01/22/magazine/oscar-pistorius.html?pagewanted=allarendering and the control of t

Caution:Be aware that this article contains a few references to the potential "sexiness" of high-tech prosthetics. You might search within the article for the word "sex" to evaluate whether you can use all or only part of this resource in your class.

- The Fastest Runner on Artificial Legs: Different Limbs, Similar Function? http://jap.physiology.org/content/107/3/903.long
- Study Revives Olympic Prospects for Amputee Sprinter

http://news.rice.edu/2008/05/16/study-revives-olympic-prospects-for-amputee-sprinter/

- How Olympic "Blade Runner" Sprints Without Feet
 - http://news.discovery.com/adventure/oscar-pistorius-amputee-olympics-120720.html
- Oscar Pistorius Makes History as He Finishes Second in 400m Heat

http://www.guardian.co.uk/sport/2012/aug/04/oscar-pistorius-400m-heat-olympics

• An Amputee Advantage?

http://www.nytimes.com/ref/sports/20070514_RUNNER_GRAPHIC.html?ref=magazine

• Counterpoint: Artificial Legs Do not Make Artificially Fast Running Speeds Possible http://jap.physiology.org/content/108/4/1012.full?sid=fbc9be74-9421-41e8-8387-7deac96a7110



• Össur® Life Without Limitations® Cheetah® Fast Facts

http://www.ossur.com/?PageID=13462

• The Artificial Advantage of Oscar Pistorius: The Evidence without the Emotion, Public Statement II, by Matthew W. Bundle and Peter G. Weyand, February 12, 2012

http://smu.edu/education/apw/Locomotor%20Publications/Public-Statement-II-Pistorius-2-12-2012.pdf

- 1. Provide students with copies of the rubric (page 11) so that they can use it as a guide to conduct their research. Review how to safely browse the web, how to evaluate information on the Internet for accuracy, and how to correctly cite the information found.
- 2. Students might continue their investigation by exploring how the length of the flex feet might give a runner a competitive advantage over other runners using flex feet. Students might begin their inquiry at sites such as the following.
- Beaten Pistorius Apologizes for Timing of "Long" Blade Blast

http://www.cnn.com/2012/09/03/sport/pistorius-paralympics-blade-row/index.html?iref=allsearch

• Science "Unclear" Over Pistorius Claims

http://news.yahoo.com/science-unclear-over-pistorius-claims-155943524--oly.html

• The Biomechanics of Usain Bolt

http://www.nbclearn.com/portal/site/learn/science-of-the-summer-olympics

Evaluate and Compile Findings

Remind students to take notes on what they find as they research. Also encourage groups to continue discussing their position and the evidence they find to support it. Together, discuss how you can present your findings to enhance later reflection.

Make a Claim Backed by Evidence

Have students analyze their findings and then make one or more claims based on the evidence. Encourage students with this prompt: As evidenced by ... I claim... because....

An example claim might be:

As evidenced byscientific studies of Oscar's running and his prosthetics, <u>I claim</u> that flex feet do not result in a competitive advantage <u>because</u> the prosthetics have no computers or sensors and Oscar's body has learned different coordination and timing that compensates for his lack of lower legs.

Compare Findings

Encourage groups to constructively discuss their findings with groups that took the opposing stand, using prompts such as:

- Our ideas are different from the group that says that flex feet do/do not result in a competitive advantage in that....
- Our ideas are similar to the group that says that flex feet do/do not result in a competitive advantage in that....

Students might make comparisons like the following:

My ideas are similar to those of the group taking the opposite stand in that we all agree that runners and sprinters are built differently, have different masses and heights, and use their legs and core in different ways as they run.

Reflect on Learning

Students should reflect on their understanding, thinking about how their ideas have changed or what they know now that they didn't before. Encourage reflection, using prompts such as the following:

- I claim that my ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- One concept I still do not understand involves....
- One aspect of this topic I would like to learn more about is....



Have students share their findings with others. Suggest a variety of ways students can present their information, including electronic slide shows, posters, role-playing skits, or letters to Olympic officials, among others.

Encourage students to reflect on how applied science and engineering practices can improve the lives of people through assistive technologies and solutions to problems in other areas of life. Ask students to consider how engineers might be involved in ethical discussions and practices, in a way similar to society's expectations that doctors practice ethical behavior.

Inquiry Assessment

See the rubric included in the student Copy Masters on page 11.

Incorporate Video into Your Lesson Plan

Integrate Video in Instruction

Bellringer: Show the video with the sound muted, perhaps twice, as students settle in. As they watch, ask them to consider the following questions: What do you think will be discussed in this video, in terms of science and engineering? Do you think this sprinter might have a competitive advantage over other sprinters? Why or why not? Use students' answers as a lead-in to your introduction of the double-amputee sprinter, Oscar Pistorius, and his Flex-Foot Cheetah® prosthetics.

Compare and Contrast: Play, several times, the video segments from 0:31 to 0:38, and from 2:05 to 2:09, which show Oscar competing. Ask students to closely observe both Oscar and the other runners to see if they can detect any differences in the athletes' stances, leg-repositioning motions and timing, and/or arm swing motions.

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these E's:

Explain: Use the video segment from 2:49 to 2:55 to explain what the term *proprioception* means. Proprioception is considered one of the human senses by biomedical researchers, and is defined as the sense of orientation of a person's limbs in space. Unlike balance, which is determined by the inner ear, proprioception is thought to derive from the nervous system in general, but not from a specific organ in the body.

Elaborate: Use the video to encourage students to learn more about the differences between Oscar and sprinters who use a single prosthetic flex-foot when competing. Have students summarize their findings with detailed diagrams that compare and contrast the running styles and compensations involved.

Connect to ... Math / Technology

Have students compare Oscar Pistorius to the top four or five able-bodied male sprinters using only numbers, including leg-positioning time, oxygen use, mass of the lower legs or flex-foot, force exerted when the anatomical foot or flex-foot hits the ground, the amount of stored energy released to propel the sprinter forward, reaction time at the starting block, and actual race times. Suggest that students record their findings in various tables that rank the sprinters by a certain parameter to see where Oscar ranks.

Use Video in Assessment

Play, on mute, the video segment from 3:06 to 3:23, which explains how Oscar's flex feet work. Provide students with the following instructions.

Sequence the steps involved as Oscar runs on his flex feet. Use the following terms in your explanation: impact, energy, propel, release.

COPY MASTER: Open Inquiry Guide for Students

Science of the Summer Olympics: The Strength and Flexibility of Oscar Pistorius

Use this guide to research a question about flex-foot prosthetics, another assistive technology, or the potential



competitive advantage of using such technologies. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

Design Investigations

Choose one question. How can you answer it? Brainstorm a research strategy with your team.

- Words and phrases associated with my question are....
- The reliability of my sources was established by....
- The science concepts that underpin a possible solution are....
- My research might feed into an engineering design solution such as....
- To conduct the investigation safely, I will....

Evaluate and Compile Findings

Review all of your notes and discuss your findings with others in your group. Together, decide how you can present your findings.

Make a Claim Backed by Evidence

Analyze your information, then make one or more claims based on the evidence. You might want to use one of the prompts below to write your claims.

As evidenced by ... I claim ... because

I claim that.... because my findings show that....

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question; do research on the Internet, or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- My ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- One concept I still do not understand involves....
- One aspect of this topic I would like to learn more about is....

COPY MASTER: Focused Inquiry Guide for Students

Science of the Summer Olympics: The Strength and Flexibility of Oscar Pistorius

Use this guide to research Oscar Pistorius and his flex-feet prosthetics to decide whether or not you think they result in a competitive advantage over sprinters who do not use flex feet. Take notes in your science notebook.

Ask a Beginning Question

Do Oscar's flex feet give him a competitive advantage over sprinters who do not use flex feet?

Design Investigations

How can you answer your question? Brainstorm a research strategy with your team. To get started, think about how answers to questions such as these might support your stance.

- How does the repositioning of Oscar's legs during the race compare to runners without flex feet?
- How does the amount of force transmitted to the ground by Oscar's prosthetics compare to that of runners without flex feet?



- How does the function of Oscar's flex feet differ from actual feet, ankles, bones, muscles, and tendons?
- Do Oscar's flex feet have any type of sensors or computers in them?
- How might Oscar's ability to use his flex feet effectively be influenced by how long he has been using assistive technologies? How might this compare to the effectiveness of the running ability of a runner without flex feet?
- Do Oscar's muscles use oxygen any differently from the way the muscles of other runners use it? What might determine the amount of oxygen used?
- Do all runners and sprinters move in exactly the same way?
- Do the length and weight of Oscar's flex feet give him any competitive advantage?

Conduct research to support your stand. Be sure to use appropriate precautions when browsing the web.

- Words and phrases associated with my question are....
- The reliability of my sources was established by....
- The science concepts that underpin a possible solution are....
- My research might feed into an engineering design solution such as....
- To conduct the investigation safely, I will....

You might begin your research with the following two resources. Recall how to safely browse the Web and how to evaluate information on the Internet for accuracy, or ask for guidance from your teacher or another trusted adult. Be sure to attribute findings to appropriate sources.

An Amputee Advantage?

http://www.nytimes.com/ref/sports/20070514_RUNNER_GRAPHIC.html?ref=magazine

Counterpoint: Artificial Legs Do not Make Artificially Fast Running Speeds Possible http://jap.physiology.org/content/108/4/1012.full?sid=fbc9be74-9421-41e8-8387-7deac96a7110

Evaluate and Compile Findings

Review all of your notes and discuss your findings with others in your group. Together, decide how you can present your findings.

Make a Claim Backed by Evidence

Analyze your information, then make one or more claims based on the evidence. You might want to use one of the prompts below to write your claims.

As evidenced by ... I claim ... because

I claim that.... because my findings show that....

My Evidence	My Claim	My Reason

Compare Findings

Review the video then constructively discuss your findings with classmates who took the opposite stance. Use these prompts to help you in your discussions.

- My ideas are different from those of the group that says that flex feet do/do not result in a competitive advantage in that....
- My ideas are similar to those of the group that says that flex feet do/do not result in a competitive advantage in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- My ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- One concept I still do not understand involves....
- One aspect of this topic I would like to learn more about is....



Share your findings with others. You might present your investigation in an electronic slide show, poster, role-playing skit, or letter to Olympic officials, among others.

Also reflect on how applied science and engineering practices can improve the lives of people through assistive technologies and solutions to problems in other areas of life. Consider how engineers might be involved in ethical discussions and practices in a way similar to society's expectation that doctors practice ethical behavior. Discuss your reflection within your investigative group.

COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria	1 point	2 points	3 points
Initial question	Question had a yes/no answer, was off topic, or otherwise was not researchable or testable.	Question was researchable or testable but too broad or not answerable by the chosen investigation.	Question clearly stated, researchable or testable, and showed direct relationship to investigation.
References cited	Group incorrectly cited all of the references used in the study.	Group correctly cited some of the references used in the study.	Group correctly cited all of the references used in the study.
Claim	No claim was made or the claim had no evidence to support it.	Claim was marginally supported by the group's research evidence.	Claim was well supported by the group's research evidence.
Findings comparison	Only a few members of the group constructively argued their stance.	Most members of the group constructively argued their stance.	All members of the group constructively argued their stance.
Reflection	None of the reflections were related to the initial questions.	Some reflections were related to the initial questions.	All reflections were related to the initial questions.
Presentations	Groups neither effectively nor cooperatively presented findings to support their stance.	Groups effectively or cooperatively presented findings to support their stance.	Groups effectively and cooperatively presented findings to support their stance.

SCIENCE OF THE SUMMER OLYMPICS: The Biomechanics of Usain Bolt - An Engineeering Perspective

Video & Source available at: http://nbclearn.com/portal/site/learn/scienceof-the-summer-olympics

Objective:

Framework for K–12 Science Education: PS2.A Forces and Motion, PS2.B: Types of Interactions, LS1.A: Structure and Function, ETS1.A: Defining and Delimiting Engineering Problems, ETS1.B: Developing Possible Solutions, ETS1.C: Optimizing the Design Solution

Introduction Notes:

SCIENCE OF THE SUMMER OLYMPICS The Biomechanics of Usain Bolt An Engineering Perspective

Lesson plans produced by the National Science Teachers Association. Video produced by NBC Learn in collaboration with the National Science Foundation.

Background and Planning Information



About the Video

Mechanical engineers Dr. Anette Hosoi (Massachusetts Institute of Technology) and Samuel Hamner (Stanford University) study Usain Bolt's physical structure to help determine how he is able to run so fast. Their findings might enable them to develop solutions for people with movement disorders or to optimize the performance of athletes.

0:00	0:12	Series opening
0:13	0:59	Introducing Usain Bolt
1:00	1:23	Anette Hosoi describing the uniqueness of Usain's abilities
1:24	1:58	Usain's physical characteristics and stride length
1:59	2:17	Usain's physical characteristics and mass
2:18	2:41	Influence of muscle strength on force
2:42	3:23	Samuel Hamner's reasons for studying Usain
3:24	4:09	Running stance phase
4:10	4:27	Running flight phase
4:28	4:48	Electrical signals, and coordination
4:49	5:14	Everything coming together for Usain
5:15	5:24	Closing credits

Language Support

To aid those with limited English proficiency or others who need help focusing on the video, make transcript of the video available. Click the Transcript tab on the side of the video window, then copy and paste into a document for student reference.

Connect to Science

Framework for K-12 Science Education PS2.A Forces and Motion

PS2.B: Types of Interactions LS1.A: Structure and Function

Related Science Concepts

- Force and the resultant pressure on a surface
- Action and reaction forces (running on a track)
- Speed and acceleration of an object (a human body)
- Motion and how human movements result in motion
- Relationship of weight and mass
- Muscular system and how it moves the human body
- Reaction time
- Gene expression due to heredity and environment

Connect to Engineering

Framework for K-12 Science Education

ETS1.A: Defining and Delimiting Engineering Problems

ETS1.B: Developing Possible Solutions

ETS1.C: Optimizing the Design Solution

Engineering in Action

Mechanical engineers create and build mechanical devices, while biomechanical engineers blend traditional engineering techniques with biological science and medicine. Today, many mechanical engineers are lending their expertise to the analysis of living systems. The development of a prosthetic tail for Winter, a dolphin at the Clearwater (Florida) Marine Aquarium, is just one example. Biomimicry – such as modeling the nosecone of a Japanese bullet train after a kingfisher's beak, so the train is quieter as it emerges from tunnels – is a growing field as well.

Given a problem, engineers begin the search for a solution by analyzing what they have to work with. In the case of Usain Bolt, Samuel Hamner analyzes the physical attributes of Usain's body as well as how various parts of



his body work together to accomplish his goals. Without being able to observe Usain's motion—how his bones and muscles move—it would be impossible to improve his motion through an engineering process. Unlike physical mechanical engineering solutions, which can be arrived at through manipulating physical factors, biological engineering problems begin with the genetics of the individual (human or other organism) that is the focus of the problem. While other constraints can influence the solution, first and foremost the engineering solution has to work within the genetic constraints.

Take Action with Students

Use the Design Investigations section of the Inquiry Outline as a guide for helping students to explore solutions to a problem related to stride length and speed. The activity focuses on analysis of an action and how adjusting one component of the action influences the result.

Inquiry Outline for Teachers

Encourage inquiry using a strategy modeled on the research-based science writing heuristic. Student work will vary in complexity and depth depending on grade level, prior knowledge, and creativity. Use the prompts liberally to encourage thought and discussion. Student Copy Masters begin on page 6

Explore Understanding

Show students photos of famous athletes or gain permission from school athletes to use them as examples. Ask students to point out physical characteristics that might influence how each person excels at his or her sport. You might need to supplement the discussion with additional images or demonstrations of actions involved in some sports, such as golf or discus. Use prompts such as the following to start students talking:

- During a golf swing, the body....
- Characteristics that might help a golfer are....
- During a throw, a football quarterback....
- Characteristics that might help a quarterback are....

Show the video SOTSO: The Biomechanics of Usain Bolt.

Focus the discussion on Usain's physical characteristics. Stop the video at 1:37 and ask students to make predictions about how Usain's height gives him an advantage. Encourage students to jot down points about Usain's physical structure as they finish watching the video, and then discuss the video using prompts such as the following:

- When I watched the video I thought about....
- The expert in the video claimed that because....
- Usain is not expected to run so fast because....
- If "mechanics" is about how something works, then "biomechanics" is about....
- Because Usain is bigger, he has to compensate by....
- The stance phase in running differs from the flight phase by....
- I would like to know more about....
- I would do research to find out more about....

Ask Beginning Questions

Stimulate small-group discussion with the prompt: *The video makes me think about these questions....* Then have students work in small groups to list questions they have about factors that influence how Usain, other athletes, and people in other professions take advantage of their physical attributes to excel. Then groups should choose one question and phrase it in such a way as to be researchable and/or testable. Some examples include the following:

- How does stride length impact a runner's speed?
- Is a longer stride length important in excelling at other kinds of walking/running sports?
- Does the height off the ground during the flight phase make a difference?
- How would a runner with a shorter stride compensate?
- Is Usain just quicker off the starting blocks than other runners?
- Could Usain be just as fast if he did not start the race in starting blocks?



Design Investigations

Choose one of these two options based on your students' knowledge, creativity, and ability level.

Open Choice Approach (Copy Master pages 6-7)

Small groups might join together to agree on one question for which they will explore the answer, or each small group might explore something different. Students should brainstorm what they would have to do to answer the selected question. Then work with students to develop safe procedures that control variables and make accurate measurements. Encourage students with prompts such as the following:

- I will research the question by....
- The variables I will test and control are....
- The constraints I have to design within are....
- The steps I will follow are....
- To conduct the investigation safely, I will....

Focused Approach (Copy Master pages 7-8)

The following exemplifies how students might investigate a question about how to analyze the effect of stride length on speed in an activity such as race walking. Point out that race walking is also an Olympic sport, with specific rules, or constraints. The most important one for students to consider is that one foot has to be in contact with the ground at all times, thus there is no flight phase.

- 1. Ask students questions such as the following to spark their thinking.
- How do the mechanics of race-walking compare to running?
- How might you calculate stride length?
- *How might stride length be related to speed?*
- How can you compare results from different individuals?
- How might foot size make a difference?
- 2. Students might choose to do further research about race walking and make comparisons between it and Usain's sprinting action. This comparison might include: labeled diagrams of foot position, muscles involved, and other mechanics.
- 3. Encourage students to brainstorm several methods of determining stride length before settling on one they will try. Students might find that after an initial attempt at a methodology, they need to start over with another idea. Some might try multiple solutions at the same time. Use prompts with students such as the following:
- I will measure stride length over a distance of because....
- Stride length is measured heel to heel or toe to toe because....
- We chose to participate in the trials because he, she, or they....
- 4. Team members should work with the participant(s) to help the participant(s) adhere to the rule of at least one foot on the ground while the participants change their stride lengths. Stride lengths might be calculated from a central portion of a trial so as to capture length that is more normal for the variable being tested. Use prompts with students such as:
- We will have the participant wear _____ shoes (or go barefoot) because....
- We will measure the average length by....
- The variables we will control are....
- We will have the participants vary their strides by....
- To conduct the investigation safely, I will....
- 5. Students should analyze the action and make claims about how changing the stride length impacted speed.
- 6. Students might continue their investigation by analyzing another aspect of mechanics, such as the effect of arm swing on speed.

Make a Claim Backed by Evidence

As students carry out their investigations, ensure that they record their observations. As needed, suggest ways they might organize their data using tables or graphs. Students should analyze their data and then make one or more claims based on the evidence their data shows. Encourage students with this prompt: As evidenced by... I claim... because....

An example regarding the effect of stride length on speed in race walking might be the following: <u>As evidenced</u>



by calculating speed to cover a distance both before and after Colin's

stride was lengthened, <u>I claim</u> lengthening the stride negatively impacts speed during race walking <u>because</u> it became too difficult for Colin to keep one foot in contact with the ground at all times, which is a constraint of the process.

Compare Findings

Encourage students to compare their ideas with those of others—such as classmates who investigated the same or a similar question, material they found on the Internet, an expert they chose to interview, or their textbook. Remind students to credit original sources in their comparisons. Elicit comparisons from students with prompts such as the following:

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Students might make comparisons like the following.

My ideas are different from those of the other groups. Some others found that lengthening the stride made the race walker faster while others found no change in the speed of their race walker. I think this could be due to the differences among the race walkers themselves.

Reflect on Learning

Students should reflect on their understanding, thinking about how their ideas have changed or what they know now that they didn't before. Have students respond to one of the prompts in writing and then ask volunteers to share with the class, or have partners exchange responses and ask questions of each other. Encourage reflecting using prompts such as the following:

- My ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- As I worked on this project, I wish I had spent more time on....
- One piece of evidence I still do not understand is....

Inquiry Assessment

See the rubric included in the student Copy Masters on page 10.

Incorporate Video into Your Lesson Plan

Integrate Video in Instruction

Bellringer: Play the video as students gather for class, repeating at least once. Instruct students to listen and watch for Usain's personal reactions to his running prowess and training regime. Then have students briefly discuss how Usain's attitude might have both positive and negative impact on his success.

Visualize a Concept: A 25-second segment beginning at approximately 1:59 relates the components of an action-reaction force between Usain and the track. Use this as a practical application of the concept during a discussion of Newton's three laws of motion.

Using the 5E Approach?

If you use a 5E approach to lesson plans, consider incorporating video in these E's:

Engage: Use the video to prompt students' thinking about how the intensity of action-reaction forces between a runner and the ground are dependent on factors such as mass and speed. Students might begin to generate questions that can become the focus of supporting inquiry activities.

Elaborate: Use the video to extend understanding of the interaction of heredity and environment in humans. Students can hypothesize how Usain and other athletes or celebrities with specific physical attributes – such as large muscles or flexible limbs – are impacted by training regimes and nutrition.

Connect to ... STEM



Math:

Students might research distances for various races, and determine how quickly Usain could complete each race if he were able to maintain his sprinting speed and stride length over longer distances. Students might make comparisons with winning times in famous marathons, such as those held in Boston or New York, or other Olympic events. Students also might calculate their own top speed and stride length and compare those with their calculations for Usain.

Use Video in Assessment

To assess student understanding of the interaction of body systems – or specifically, just the muscular and skeletal systems – play any one of the segments showing Usain running, with the sound muted. Then give the following instructions.

Describe what is occurring among body systems (or between muscles and bones) to enable Usain to move so quickly.

COPY MASTER: Open Choice Inquiry Guide for Students

Science of the Summer Olympics: The Biomechanics of Usain Bolt

Use this guide to investigate a question about Usain Bolt, or how a movement might be improved through redesign. Write your lab report in your science notebook.

Ask Beginning Questions

The video makes me think about these questions....

Design Investigations

Choose one question. How can you answer it? Brainstorm with your teammates. Write a procedure that controls variables and makes accurate measurements. Add safety precautions as needed.

- The constraints I will work within are....
- The variable I will test is....
- The variables I will control are....
- The steps I will follow are....
- To conduct the investigation safely, I will

Record Data and Observations

Record your observations. Organize your data in tables or graphs as appropriate.

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data shows. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question; do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

• My ideas have changed from the beginning of this lesson because of this evidence....



- My ideas changed in the following ways....
- As I worked on this project, I wish I had spent more time on....
- One piece of evidence I still do not understand is....

COPY MASTER: Focused Inquiry Guide for Students

Science of the Summer Olympics: The Biomechanics of Usain Bolt

Use this guide to investigate a question about how to analyze an action and the impact of changing one aspect of that action. Write your lab report in your science notebook.

Ask Beginning Questions

How does changing the stride length impact speed in race walking?

Design Investigations

How can you answer your question? Brainstorm solutions with your teammates. Write a procedure that will enable you to meet the constraints. Add safety precautions as needed. For example, you might measure a normal stride length and then change it. How could you do that? What impact would it have?

- I will have the participant wear shoes (or go barefoot) because....
- I will measure the average length by....
- The variables I will control are....
- I will have the participants vary their stride by....
- To be safe, I need to....

Increased Stride

Record Data and Observations

Organize your data in tables or graphs as appropriate. Examples are shown below.

Speed	and	Normal	Stride
-------	-----	--------	--------

Distance			
	Number Steps	of	Length of Stride
Trial 1			
Trial 2			
Trial 3			
Average (Mean)			
Speed			

Speed and

Distance			
	Number Steps	of	Length of Stride
Trial 1			
Trial 2			
Trial 3			
Average (Mean)			
Speed			



Speed Stride Length and Speed Speed

Make a Claim Backed by Evidence

Analyze your data and then make one or more claims based on the evidence your data shows. Make sure that the claim goes beyond *summarizing* the relationship between the variables.

My Evidence	My Claim	My Reason

Compare Findings

Review the video and then discuss your results with classmates who investigated the same or a similar question; do research on the Internet or talk with an expert. How do your findings compare? Be sure to give credit to others when you use their findings in your comparisons.

- My ideas are similar to (or different from) those of the experts in that....
- My ideas are similar to (or different from) those of my classmates in that....
- My ideas are similar to (or different from) those that I found on the Internet in that....

Reflect on Learning

Think about what you found out. How does it fit with what you already knew? How does it change what you thought you knew?

- My ideas have changed from the beginning of this lesson because of this evidence....
- My ideas changed in the following ways....
- As I worked on this project, I wish I had spent more time on....
- One piece of evidence I still do not understand is....

COPY MASTER: Assessment Rubric for Inquiry Investigations

Criteria	1 point	2 points	3 points



Initial question	Question had a yes/no answer, was off topic, or otherwise was not researchable or testable.	Question was researchable or testable but too broad or not answerable by the chosen investigation.	Question clearly stated, researchable or testable, and showed direct relationship to investigation.
Investigation design	The design of the investigation did not support a response to the initial question.	While the design supported the initial question, the procedure used to collect data (e.g., number of trials, control of variables) was not sufficient.	Variables were clearly identified and controlled as needed with steps and trials that resulted in data that could be used to answer the question.
Variables	Either the dependent or independent variable was not identified.	While the dependent and independent variables were identified, no controls were present.	Variables identified and controlled in a way that results in data that can be analyzed and compared.
Safety procedures	Basic laboratory safety procedures were followed, but practices specific to the activity were not identified.	Some, but not all, of the safety equipment was used and only some safe practices needed for this investigation were followed.	Appropriate safety equipment used and safe practices adhered to.
Observations and Data	Observations were not made or recorded, and data are unreasonable in nature, not recorded, or do not reflect what actually took place during the investigation.	Observations were made, but were not very detailed, or data appear invalid or were not recorded appropriately.	Detailed observations were made and properly recorded and data are plausible and recorded appropriately.
Claim	No claim was made or the claim had no relationship to the evidence used to support it.	Claim was marginally related to evidence from investigation.	Claim was backed by investigative or research evidence.
Findings comparison	Comparison of findings was limited to a description of the initial question.	Comparison of findings was not supported by the data collected.	Comparison of findings included both methodology and data collected by at least one other entity.
Reflection	Student reflection was limited to a description of the procedure used.	Student reflections were not related to the initial question.	Student reflections described at least one impact on thinking.

ADDITIONAL ENGINEERING LESSON PLANS CAN BE FOUND AT:

http://nbclearn.com/portal/site/learn/scienceof-the-summer-olympics

NFL (FOOTBALL) SPORTS APPLICATION LESSONS & VIDEOS AVAILABLE AT: http://nbclearn.com/nfl

LESSON PLANS AVAILABLE AT:

http://lessonopoly.org/lessonplansearch&searchall=1&byauthor=NBCLearn

VIDEO COLLECTION OF VARIOUS APPLICATIONS OF SCIENCE IN VARIOUS SPORTS:

 $\underline{http://search.espn.go.com/results?page=1\&searchString=sports+science\&dims=6}$

AMENDED AND RESTATED ARTICLES OF INCORPORATION

OF

SPORTS LEADERSHIP AND MANAGEMENT FOUNDATION, INC.

To the Department of State State of Florida

Pursuant to the provisions of the Florida Not-For-Profit Corporation Act, the corporation hereinafter named (the "Corporation"), does hereby amend and restate its Articles of Incorporation.

- 1. The name of the corporation is Sports Leadership and Management Foundation, Inc.
- 2. The text of the Amended and Restated Articles of Incorporation of the Corporation is annexed hereto and made a part hereof.

CERTIFICATE

It is hereby certified that:

- 1. The date of adoption of the aforesaid amendments and restatement was May 22, 2012.
- 2. This amendment and restatement of the Articles of Incorporation does not require member approval and has been duly approved by the Board of Directors.

Executed on June 4, 2012

SPORTS LEADERSHIP AND MANAGEMENT FOUNDATION, INC.

By:

Rene Ruiz, President

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AMENDED AND RESTATED ARTICLES OF INCORPORATION OF

SPORTS LEADERSHIP AND MANAGEMENT FOUNDATION, INC. A Florida Not For Profit Corporation

I, the undersigned President, for the purpose of amending and restating the Articles of Incorporation for Sports Leadership And Management Foundation, Inc. (the "Corporation",) a corporation under Sections 617.1001, 617.1002, and 617.1007 of the Florida Not For Profit Corporation Act (the "Act"), do hereby execute the following Amended and Restated Articles of Incorporation, and certify as follows:

ARTICLE I NAME

The name of the corporation shall be: SPORTS LEADERSHIP AND MANAGEMENT FOUNDATION, INC.

ARTICLE II PRINCIPAL OFFICE

The principal place of business and mailing address of the Corporation shall be:

998 SW 1ST STREET MIAMI, FLORIDA 33130

ARTICLE III PURPOSES

- 1. The Corporation is not-for-profit and is organized and shall be operated exclusively for educational purposes as described in Section 501(c)(3) of the Internal Revenue Code of 1986, as amended or the corresponding provision of any future United States Internal Revenue Law (the "Code"), including specifically the organization and operation of charter schools.
- 2. The Corporation admits students of any race, color, national, and ethnic origin to all rights, privileges, programs, and activities generally accorded or made available to students at the school. It does not discriminate on the basis of race, color, national and ethnic origin in administration of its educational policies, admissions policies, scholarship, and loan programs, and athletic and other school-administered programs.
- 3. No part of the earnings of the Corporation shall inure to the benefit of any director or officer of the Corporation, or to any other person (except that the Corporation may pay reasonable compensation for services rendered to or on behalf of the Corporation and make other payments and distributions in furtherance of one or more of its purposes), and no director or officer of the Corporation, or any other person shall be entitled to share in the distribution of any of the corporate assets on dissolution of the Corporation. The Corporation shall pay no dividends.

- 4. The Corporation shall not participate, directly or indirectly, or intervene in (including the publishing or distribution of statements) any political campaign on behalf of or in opposition to any candidate for public office. The Corporation shall not have the objectives nor engage in activities that would characterize it as an "action organization" as defined in Treasury Regulations.
- 5. Notwithstanding any other provision of these articles, the Corporation shall not carry on any activities not permitted to be carried on by an organization exempt from Federal income tax under Section 501(c)(3) of the Code.
- 6. Upon the dissolution of the Corporation, the Board of Directors will, after paying or making provision for the payment of all the liabilities of the Corporation, dispose of all the assets of the Corporation exclusively to Mater Academy, Inc., provided that at the time of such distribution Mater Academy, Inc. is a not for profit corporation or trust described in Section 509(a)(1) or 509(a)(2) of the Code (an "Eligible Distributee"). In the event that Mater Academy, Inc. is not an Eligible Distributee, upon the dissolution of the Corporation, the Board of Directors will, after paying or making provision for the payment of all the liabilities of the Corporation, dispose of all the assets of the Corporation exclusively to not for profit corporations or trusts described in Section 509(a)(1) or 509(a)(2) of the Code which are organized and operated to support education in Miami-Dade County, Florida, including specifically the support and operation of charter schools.

ARTICLE IV ELECTION OF DIRECTORS

The manner in which the directors are elected or appointed shall be as provided in the Bylaws.

ARTICLE VI MEMBERSHIP

The Corporation's sole member shall be Mater Academy, Inc. The member shall have such rights as shall be set forth in the Bylaws.

ARTICLE VII AMENDMENTS

These Amended and Restated Articles of Incorporation may be further amended by the act of the Board of Directors of the Corporation. Amendments may be proposed and adopted in the manner provided in the Bylaws of the Corporation.

ARTICLE VII REGISTERED AGENT AND STREET ADDRESS

The name and Florida street address of the registered agent are:

CORPORATION SERVICE COMPANY 1201 HAYS STREET TALLAHASSEE FL 32301-2525 US

IN WITNESS WHEREOF, the undersigned President of the Corporation has executed these Amended and Restated Articles of Incorporation this ______ day of _______, 2012.

By:

Kene Ruiz, President

AMENDED AND RESTATED BYLAWS

OF

SPORTS LEADERSHIP AND MANAGEMENT FOUNDATION, INC.

A Florida Not-For-Profit Corporation

Dated as of April, 2013

AMENDED AND RESTATED BYLAWS OF SPORTS LEADERSHIP AND MANAGEMENT FOUNDATION, INC.

A Florida Not for Profit Corporation

ARTICLE I PURPOSE AND RESTRICTIONS

1.1 Purpose.

- (a) Sports Leadership and Management Foundation, Inc. (the "Corporation") is not-for-profit and is organized and shall be operated exclusively for educational purposes as described in Section 501(c)(3) of the Internal Revenue Code of 1986, as amended or the corresponding provision of any future United States Internal Revenue Law (the "Code"), including specifically the organization and operation of charter schools.
- (b) The Corporation admits students of any race, color, national, and ethnic origin to all rights, privileges, programs, and activities generally accorded or made available to students at the school. It does not discriminate on the basis of race, color, national and ethnic origin in administration of its educational policies, admissions policies, scholarship, and loan programs, and athletic and other school-administered programs.

1.2 Restrictions.

- (a) No part of the earnings of the Corporation shall inure to the benefit of any director or officer of the Corporation, or to any other person (except that the Corporation may pay reasonable compensation for services rendered to or on behalf of the Corporation and make other payments and distributions in furtherance of one or more of its purposes), and no director or officer of the Corporation, or any other person shall be entitled to share in the distribution of any of the corporate assets on dissolution of the Corporation. The Corporation shall pay no dividends.
- (b) The Corporation shall not participate, directly or indirectly, or intervene in (including the publishing or distribution of statements) any political campaign on behalf of or in opposition to any candidate for public office. The Corporation shall not attempt to influence legislation by propaganda or otherwise. The Corporation shall not have the objectives nor engage in activities that would characterize it as an "action organization" as defined in Treasury Regulations.
- (c) Notwithstanding any other provision of these articles, the Corporation shall not carry on any activities not permitted to be carried on by an organization exempt from Federal income tax under Section 501(c)(3) of the Code.
- (d) Upon the dissolution of the Corporation, the Board of Directors will, after paying or making provision for the payment of all the liabilities of the Corporation, dispose of all the assets of the Corporation exclusively to Mater Academy, Inc., provided that at

the time of such distribution Mater Academy, Inc. is a not for profit corporation or trust described in Section 509(a)(1) or 509(a)(2) of the Code (an "Eligible Distributee"). In the event that Mater Academy, Inc. is not an Eligible Distributee, upon the dissolution of the Corporation, the Board of Directors will, after paying or making provision for the payment of all the liabilities of the Corporation, dispose of all the assets of the Corporation exclusively to not for profit corporations or trusts described in Section 509(a)(1) or 509(a)(2) of the Code which are organized and operated to support education in Miami-Dade County, Florida, including specifically the support and operation of charter schools.

ARTICLE II MEMBERS

- 2.3 <u>Membership</u>. The Corporation shall have one (1) member (the "Member") which shall be Mater Academy, Inc., a Florida not-for-profit corporation.
- 2.4 <u>Action By The Member</u>. The Member shall have the right to vote only with respect to those actions and issues specifically described in these Bylaws as requiring a vote of the Member. Any action of the Member shall be taken by a written consent signed by the Member.
- 2.5 <u>Member Vote Required</u>. Notwithstanding anything herein to the contrary, the actions enumerated below must be approved by the Member by formal resolution of the Member's board of directors:
 - (a) The issuance of new or additional membership interests;
- (b) Any merger or consolidation of the Corporation with or into any other entity, or of any other entity with or into the Corporation;
- (c) Any amendment to the Articles of Incorporation or the Bylaws of the Corporation;
 - (d) The dissolution or liquidation of the Corporation;
- (e) The compensation to be paid to committee members, the President, or any other officers;
- (f) The appointment of Directors or the nomination of prospective Directors;
 - (g) The designation of Officers;
- (h) The acquisition of any financing, including the approval of the amount of the financing, the security for such financing and all other terms of the financing, and the direct or indirect borrowing of money, whether secured or unsecured, the refinancing, extending or modifying in any material manner of any loan or delivering any guaranty of any loan or other obligation; and

(i) Admitting in writing the Corporation's inability to pay its debts generally; authorizing a general assignment by the Corporation for the benefit of creditors; the filing of any petition or answer by the Corporation seeking to adjudicate it a bankrupt or insolvent; seeking for itself any liquidation, winding up, reorganization, arrangement, adjustment, protection, relief, or composition of the Corporation or its debts under any law relating to bankruptcy, insolvency or reorganization or relief of debtors; seeking, consenting to, or acquiescing in the entry of an order for relief or the appointment of a receiver, trustee, custodian, or other similar official for the Corporation or for any substantial part of its property; or company action taken by the Corporation to authorize any of the actions set forth above.

ARTICLE III DIRECTORS

- 3.1 <u>Management of the Corporation</u>. Except as otherwise set forth in Article II, all powers of the Corporation shall be exercised by and under the authority of the Board of Directors (the "Board"), and the property, business, and affairs of the Corporation shall be managed under the Board's direction. Except as specifically set forth to the contrary herein, the Board may not take any action, except upon the approval thereof by the affirmative vote of a majority of the Board members during a meeting at which a quorum is attained.
- 3.2 <u>Number of Directors</u>. The initial Board shall consist of five (5) Directors named in the Articles of Incorporation. The number of Directors may at any time be increased or decreased to no more than nine (9) and no fewer than three (3) by a majority vote of the Board. In the event of an increase in the number of Directors, the additional directorships created shall be filled in a manner proscribed herein for the election of Directors in accordance with Section 3.3.
- 3.3 <u>Election of Directors</u>. The Directors of the Corporation shall be elected by the Member and shall serve for a term determined by the Member.
- 3.4 <u>Removal of Directors</u>. Any member of the Board may be removed from office with or without cause at any time by the Member. Any vacancies created by the removal of a Director in accordance with this Section 3.4 shall be filled in accordance with the provisions of Section 3.6.
- 3.5 <u>Resignation of Directors</u>. A Director may resign at any time by delivering written notice to the Board. A resignation is made effective when notice is delivered unless the notice specifies a later effective date. If a resignation is made effective at a later date, the Board may fill the pending vacancy before the effective date, in accordance with the provisions of Section 3.6, if the Board provides that the successor does not take office until the effective date. No reduction of the authorized number of Directors shall have the effect of removing any Director before that Director's term of office expires.
- 3.6 <u>Vacancies on Board</u>. Whenever any vacancies shall occur on the Board by death, resignation, or removal, such vacancy on the Board may be filled by the Member.
- 3.7 <u>Annual Meeting.</u> An annual meeting of the Board shall be held during June of each year at the time and place designated by the Board for the purpose of transacting such

business as may come before the Board. The President of the Corporation shall preside at the annual meeting of the Directors.

- 3.8 <u>Regular Meetings.</u> In addition to the annual meeting, the Board may hold other regular meetings at such times as shall be fixed by the Board. The Board may publish a schedule of regular meetings to be held during the course of the ensuing year, and shall notice all regular meetings as prescribed in Section 3.11. The President of the Corporation shall preside at any regular meeting of the Directors.
- 3.9 <u>Special Meetings.</u> Special meetings of the Board may be called by the President of the Corporation. Further, special meetings of the Board must be called by the President within fourteen (14) days of receipt of a written request of any two (2) or more Directors. The President may designate any place as the place for holding any special meeting of the Board called by them. If no designation is made, the place of meeting shall be the principal office of the Corporation. All special meetings shall be noticed as prescribed in Section 3.11. The President of the Corporation shall preside at any special meeting of the Directors.
- 3.10 Notice of Meetings. Notice of all meetings shall be given before the time of the holding of the meeting in accordance with applicable law, rules, and regulations. Notice in each case shall specify the place, day and hour of the meeting, and in the case of a special meeting, the purpose or purposes of the special meeting, provided that these Bylaws may be neither amended nor repealed nor may new Bylaws be adopted at any meeting unless the notice of such meeting shall contain a description of the proposed changes. Notice shall be given by the Secretary, or the Secretary's designee, or in his or her absence or upon his or her failure to act, by an officer designated by the Chairperson of the Board or the President. Notwithstanding the aforementioned, notice of all meetings shall be in accordance with Florida Statutes 286.011, as applicable.
- 3.11 Quorum. Fifty percent (50%) of the Directors then-in-office shall constitute a quorum for the transaction of business. Except as otherwise provided by law, the Articles of Incorporation, or these Bylaws, the affirmative vote of at least a majority of the Directors participating in a meeting at which quorum is attained shall be necessary for an action of the Board.
- 3.12 <u>Adjournment.</u> Once quorum has been attained and a meeting of the Board commenced, a majority of the Directors may adjourn such meeting to another time and place.
- 3.13 <u>Notice of Adjournment.</u> Notice of the time and place of any such adjourned meeting shall be given before the time of the adjourned meeting, in the manner specified in Section 3.11 of this Article, and in compliance with Florida Statutes 286.011.
- 3.14 <u>Fees and Compensation of Directors.</u> Each Director may be paid or reimbursed for his or her actual out-of-pocket expenses, if any, including for attendance at each meeting of the Board and a committee thereof, but shall not receive any compensation, directly or indirectly, from charter school's operations or as otherwise may be prohibited by applicable law or the terms of any charter school charter.

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ARTICLE IV COMMITTEES

- 4.1 <u>Committees of the Board</u>. The Board may, by resolution, establish standing committees and special committees of the Board. Unless otherwise specified by resolution of the Board or these Bylaws, the Board shall annually appoint the members and the chairs of the standing committees and shall fill vacancies on any standing committee. Appointments to the standing committees shall be made by the Board at the annual meeting. In addition, the President may, if so authorized by the Board, appoint the members and chairs of such special committees as the Board may create, which members and chairs may include persons who are not members of the Board. All committee appointments and chair appointments must be approved by a vote of the Board.
- 4.2 <u>Standing Committees</u>. Standing committees shall be created as required by resolution of the Board. The purpose, duties, number of members, and reporting requirements of each standing committee shall be specified in the resolution creating the committee.
- 4.3 <u>Special Committees</u>. Special committees shall be created as required by resolution of the Board. The purpose, duties, number of members, and reporting requirements of each special committee shall be specified in the resolution creating the committee.
- 4.4 <u>Committee Members' Term of Office</u>. Unless otherwise specified by resolution of the Board, members of each committee shall continue in office until the next annual meeting of the Board and until their successors are appointed, unless the committee of which they are members shall be sooner terminated by resolution of the Board or until their earlier death, resignation, or removal as committee members.
- 4.5 <u>Committee Meetings</u>. Meetings of any committee may be called by the chairman of such committee or upon the written request of one-third (1/3) of the committee members. The call for any meeting shall be by giving notice of such meeting which sets forth its time and place and is delivered to the residence or place of business of the committee members as listed in the Secretary's office at least five (5) days prior to such meeting. Unless otherwise provided in these Bylaws, a majority of the members of any committee shall constitute a quorum for the transaction of business. After a quorum has been established at a committee meeting, the subsequent withdrawal of committee members from the meeting so as to reduce the number of committee members present to fewer than the number required for a quorum shall not affect the validity of any action taken at the meeting. Each committee shall keep minutes of its meetings and report to the Board as necessary with recommendations.
- 4.6 <u>Resignation or Removal of Committee Members</u>. A member of any committee may resign at any time by tendering his/her resignation in writing to the President or the Board. The Board, by a vote, may remove, with or without cause, any member from a committee and specifically, but not by way of limitation, may remove any member from a committee for failing to attend three (3) consecutive meetings of the committee.

ARTICLE V OFFICERS

- 5.1 Officers. The officers of the Corporation shall be a President, a Secretary and a Treasurer. The Corporation may also have, at the discretion of the Board one or more Vice Presidents, and such other officers as determined by the Board. Any number of offices may be held by the same person; provided however, no officer shall execute, acknowledge or verify any instrument in more than one capacity. Officers need not be residents of the State of Florida or United States citizens. Officers need not be Directors of the Corporation.
- 5.2 <u>Appointment and Term of Office</u>. The officers of the Corporation shall be appointed annually by the Board at the annual meeting. If the appointment of officers does not occur at this meeting, the appointment shall occur as soon thereafter as practicable. Each officer shall hold office until a successor has been duly appointed and qualified, or until an earlier resignation, removal from office, or death.
- 5.3 <u>Vacancies</u>. A vacancy in any office because of death, resignation, removal, disqualification, or otherwise shall be filled by an election by the Board for the remaining unexpired term of such office.
- 5.4 <u>Removal of Officers</u>. The Board may remove any officer of the Corporation from his or her office or position at any time, with or without cause.
- 5.5 <u>Resignation of Officers</u>. Any officer of the Corporation may resign at any time from his or her office or position by delivering notice to the President. Such resignation is effective when the notice is delivered unless the notice specifies a later effective date. If a resignation is made effective at a later date and the corporation accepts the future effective date, the Board may fill the pending vacancy before the effective date if the Board provides that the successor does not take office until the effective date.
- 5.6 <u>President.</u> The President shall be the chief executive officer of the Corporation and shall, subject to the control of the Board, have general supervision, direction and control of the business and the officers of the Corporation. The President shall preside at all meetings of the Corporation. The President shall have the general powers and duties of management usually vested in the office of President of a Corporation, and shall have such other powers and duties as may be prescribed by the Board or the Bylaws.
- 5.7 <u>Vice Presidents.</u> The Vice Presidents shall have such other powers and perform such other duties as from time to time may be prescribed for them respectively by the Board or the President.
- 5.8 Secretary. The Secretary shall keep or cause to be kept, at the principal office or such other place as the Board may direct, a book of minutes of all meetings and actions of Directors and committees of Directors, with the time and place of holding, whether regular or special, and if special, how authorized, the notice given, the names of those present and a record of the proceedings. The Secretary shall give, or cause to be given, notice of all meetings required by the Bylaws or by law to be given, and he shall keep the seal of the Corporation if one is adopted, in safe custody, and shall have such other powers and perform such other duties as may be prescribed by the Board or by the Bylaws.

- 5.9 <u>Treasurer</u>. The Treasurer shall keep and maintain, or cause to be kept and maintained, adequate and correct accounting records of all transactions of the Corporation including accounting for its assets, liabilities, receipts, disbursements, gains and losses. The Treasurer shall deposit or cause to be deposited all moneys and other valuables in the name and to the credit of the Corporation with such depositaries as may be designated by the Board. The Treasurer shall prepare, or have prepared, financial statements on a periodic basis including a statement of financial position, statement of activities, statement of cash flows and such other statements as requested by the President and the Board or those that are required to be in compliance with not-for-profit accounting. The Treasurer shall have such other powers and perform such other duties as may be prescribed by the Board or Bylaws.
- 5.10 <u>Succession of Officers</u>. Unless otherwise directed by a vote of the Board, in the event that an officer of the Corporation has not resigned or been removed but is unable to act in such position for a period of one (1) month or more, whether due to disability or other reason, then another officer of the Corporation shall serve in that office until such officer is either removed or is able to perform his/her services in the following order:
 - (a) The Vice President shall perform the services of the President.
 - (b) The President shall perform the services of the Secretary.
 - (c) The Secretary shall perform the services of the Treasurer.
- 5.11 <u>Salaries</u>. Each officer may be paid a reasonable salary, as may from time to time be determined by action of the Board, unless prohibited by law or otherwise. No such payment shall preclude any officer from serving this corporation in any other capacity and receiving compensation for such services, except that no director shall receive any compensation, direct or indirect, from the charter school's operations or as otherwise may be prohibited by applicable law or the terms of any charter school charter.

ARTICLE VI BOOKS AND RECORDS

The Corporation shall maintain accurate and complete accounting records and shall keep records of minutes of all meetings of its Board, a record of all actions taken by the Board without a meeting, and a record of all actions taken by a committee of the Board in place of the Board on behalf of the Corporation. The Corporation shall keep a copy of the following records: (a) its Articles or Restated Articles of Incorporation and all amendments thereto currently in effect; (b) its Bylaws or Restated Bylaws and all amendments thereto currently in effect; (c) a list of the names and business street addresses of its current Directors and officers; and (d) its most recent annual report delivered to the Department of State. Any books, records and minutes may be in written form or in any other form capable of being converted into written form within a reasonable time.

ARTICLE VII INDEMNIFICATION

Appendix C Articles of Incorporation and Bylaws

- 7.1 <u>Indemnification</u>. This Corporation shall indemnify its directors and its officers to the fullest extent permitted by the provisions of the Florida General Corporation Act and the Florida Not For Profit Corporations Act, as the same may be amended and supplemented, from and against any and all of the expenses or liabilities incurred in defending a civil or criminal proceeding, or other matters referred to in or covered by said provisions, including advancement of expenses prior to the final disposition of such proceedings and amounts paid in settlement of such proceedings. The indemnification provided for herein shall not be deemed exclusive of any other rights to which those indemnified may be entitled under any bylaw, agreement, vote of disinterested directors or otherwise, both as to action in his or her official capacity and as to action in another capacity while holding such office. The right to indemnification shall continue as to a person who has ceased to be a director or officer and shall inure to the benefit of the heirs, executors and administrators of such a person, and an adjudication of liability shall not affect the right to indemnification for those indemnified.
- 7.2 <u>Insurance</u>. The Corporation may purchase and maintain insurance on behalf of any person who is or was a director, officer, employee or agent of the Corporation or who is or was serving at the request of the Corporation as a director, officer, employee, or agent of another corporation, partnership, joint venture, trust, or other enterprise against any liability asserted against him/her and incurred by him/her in any such capacity or arising out of his/her status as such, whether or not the Corporation would have the power to indemnify him/her against such liability under the provisions of this Article VII.

ARTICLE VIII MISCELLANEOUS

- 8.1 <u>Corporate Seal</u>. The Board may provide for a corporate seal which may be facsimile, engraved, printed or an impression seal which shall be circular in form and shall have inscribed thereon the name of the corporation, the words "Seal" and "Not for Profit, Florida" and the year of incorporation.
- 8.2 Execution of Contracts. The Board, except as may be otherwise provided in these Bylaws, may authorize any officer or officers, employee or employees, agent or agents, to enter into any contract or execute and deliver any contract or other instrument in the name of and on behalf of the Corporation, and such authority may be general or confined to specific instances. Unless authorized so to do by these Bylaws or the Board, no officer or agent or employee shall have any power or authority to bind the Corporation by any contract or engagement, or to pledge its credit, or to render it liable pecuniarily for any purpose or in any amount.
- 8.3 <u>Deposits</u>. All funds of the Corporation not otherwise employed shall be deposited from time to time to the credit of the Corporation in such banks, trust companies or other depositories as may be designated from time to time by the Board or a committee of the Board to which it may delegate such power, or any officer or officers, employee or employees, or agent or agents of the Corporation to whom such power may be delegated by the Board or by such committee, and for the purpose of such deposit, all checks, drafts, and other orders for the payment of money which are payable to the order of the Corporation, may be endorsed,

Appendix C Articles of Incorporation and Bylaws

assigned and delivered by any officer of the Corporation or in such other manner as may from time to time be determined by resolution of the Board or of such committee.

- 8.4 <u>Borrowing, Checks, Drafts, Etc.</u> The Corporation, whenever its general interests require, may borrow money, obtain credit and issue evidences of indebtedness for the repayment thereof, may guarantee evidences of indebtedness or other types of securities issued by others, and may assign and grant interests in any property or assets of the Corporation as security for such debts and obligations. All promissory notes, guarantees, checks, drafts or other evidences of indebtedness issued in the name of the Corporation shall be signed or endorsed by such officer or officers, employee or employees, or agent or agents of the Corporation, as shall from time to time be determined by resolution of the Board.
- 8.5 <u>Gender, etc.</u> All masculine pronouns and any variations thereof shall be deemed to refer to the masculine, feminine or singular or plural as the identity of the person(s) may require.

ARTICLE IX AMENDMENTS

These Bylaws may be altered, amended or repealed and new Bylaws may be adopted by a majority vote of the Board.

CHARTER SCHOOL MANAGEMENT AGREEMENT BETWEEN

_____CHARTER SCHOOL, INC

AND

ACADEMICA

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CHARTER SCHOOL MANAGEMENT AGREEMENT

This is an Agreement for the Management and Administration of a Charter School by and between
CHARTER SCHOOL, INC. ("CharterSchoolCorp") and
ACADEMICA ("Manager")
WHEREAS,CHARTER SCHOOL, INC has a contract ("the Charter")
with County Public Schools (the "Sponsor") to operate a charter school, known
(the "School");
WHEREAS, the School is governed by the Board of Directors of
CHARTER SCHOOL, INC (the "Board");
WHEREAS, academic control and freedom are integral to the success of the School and the
Board must have complete autonomy and control over its academic program, staffing needs, and
curriculum;
WHEREAS, CharterSchoolCorp desires to ensure that its School is professionally managed and
operated in accordance with the requirements of its Charter and the requirements of all State and Federal
laws as well as the requirements of local municipal and or county ordinances which may be applicable to
the operation of the School or its facilities;
WHEREAS, Manager is an educational service provider established to provide professional
planning, accountability, compliance, management and support services to public charter schools;
WHEREAS, it is Manager's mission to ensure that the vision of the School's Board of Directors
is faithfully and effectively implemented;
WHEREAS, Manager's officials are familiar with the governmental agencies and requirements
needed to establish and operate a public charter school as well as the requirements of the Charter, all State
and Federal authorities, and the local municipal and or county government which may be applicable to the
operation of the School or its facilities;
WHEREAS, Manager's officials are familiar with the various local, state and federal funding
sources for charter school programs and have successfully obtained grants, other forms of revenue and
financing for charter school programs in Florida;

WHEREAS, Manager's officials have attended and will continue to attend local, state, and

federal meetings and conferences for charter school operators and consultants;

WHEREAS, Manager manages a network of charter schools and believes that there are benefits

to be obtained from having a uniform system-wide reporting, record-keeping and accountability system and

benefits to having a wide variety of employment opportunities and options available to the employees of

public charter schools managed by Manager; and

WHEREAS, CharterSchoolCorp and Manager desire to enter into this agreement for the purpose

of having Manager provide professional planning, accountability, compliance, management and support

services;

NOW THEREFORE, the parties to this Agreement agree as follows:

DUTIES OF MANAGER:

1. Recitals

The forgoing recitals are true, correct and incorporated herein.

2. Engagement

CharterSchoolCorp engages Manager to provide management and administrative services to the

School as more fully set forth herein. Manager accepts such engagement pursuant to the terms of this

Agreement.

3. <u>Management and Administrative Duties</u>

Manager will coordinate the management and administrative duties required to operate the School.

In connection with this, Manager will report to the Board and advise it of the systems established for

administrative duties, including those related to initial setup and the ongoing operational budget. In

providing services, Manager will comply with all Board and School policies and procedures, the Charter,

and with all applicable state and federal rules and regulations. Manager's services will include, but not be

limited to: identification, design and procurement of facilities; staffing recommendations; and, human

resource coordination. In addition, Manager's services shall include services required for the day to day

administration of the School such as regulatory compliance, legal and corporate upkeep, and the

maintenance of the books and records of the School as well as the bookkeeping, budgeting and financial

forecasting that is required by the governing Board for its oversight. The Board will review the

recommendations made by Manager and act upon them in the manner the Board decides.

4. **Board of Directors Meetings**

Manager will assist in the coordination of and attend the meetings of the Board of the School.

Unless otherwise instructed by the Board, Manager shall maintain the minutes and records of those meetings and ensure that the School complies with the requirements of State law and the Charter regarding such meetings and record keeping.

5. Record Keeping

Manager will maintain the records of the School at the location designated by the Board. Manager will ensure compliance with the State and Charter requirements for record keeping. In addition, Manager will ensure that designated on site staff receives proper training by the Sponsor's appropriate departments for student school record keeping through its designated Management Information Services (MIS) programs.

6. Bookkeeping

Manager will coordinate with the accounting firms selected by the Board and serve as liaison with them to ensure the accuracy and timeliness of financial reporting, record keeping, and audits as may be required by the Charter and State law.

7. <u>Staff Administration</u>

Manager will identify and propose for employment by or on behalf of CharterSchoolCorp qualified principals, teachers, paraprofessionals, administrators and other staff members and education professionals for positions in the School. The teachers employed for the School will be certified as required by Chapter 1002.33, Florida Statutes. CharterSchoolCorp may employ or contract with skilled selected non-certified personnel to assist instructional staff members as teachers' aides in the same manner as defined in Chapter 1002.33, Florida Statutes and Florida Charter School Legislation. Manager will coordinate with the Board or the Hiring Committee established by the Board to identify, recruit and select individuals for School-based positions. The Board will make all hiring decisions in its discretion and in accordance with law. All employees selected by the Board shall be CharterSchoolCorp employees or employees leased to CharterSchoolCorp, and will not be employees of Manager. Manager will prepare employment contracts for approval by the Board that are to be used for the purpose of hiring employees. Manager will propose a professional employee management company to the Board which can perform the human resource services for the School. Once the Board approves a human resource provider Manager will

coordinate such services. The Board will have complete discretion to decide which professional employee management company and its method of human resource management to use, if any. Manager agrees to act as the liaison for the School vis-à-vis the human resource services provider. All School-based employees will be assigned to the School and may only be removed, dismissed, or transferred by Board approval.

8. Financial Projections and Financial Statements

Manager will prepare annual budgets and financial forecasts for the School to present to the Board for review and approval or disapproval. The School will utilize the standard state codification of accounts as contained in the Financial and Program Cost Accounting and Reporting for Florida Schools, or shall utilize GAAP Accounting at the direction of the Board, as a means of codifying all transactions pertaining to its operations. The Board shall annually adopt and maintain an operating budget. The Board, based on recommendations made by a certified public accounting firm, will adopt accounting policies and procedures. Manager will prepare, with the review and approval of the Board, regular unaudited financial statements as required to be delivered to the Sponsor, which will include a statement of revenues and expenditures and changes in fund balances in accordance with generally accepted accounting principals. These statements will be provided in advance of the deadline for submission of such reports to the Sponsor. CharterSchoolCorp will provide the Sponsor with annual audited financial reports as required by the Charter. These reports will be prepared by a qualified independent, certified public accounting firm. Manager will provide the regular unaudited financial statements, books and records to the auditor for review in connection with the preparation of the reports. The reports shall include a complete set of financial statements and notes thereto prepared in accordance with the Charter and generally accepted accounting principals for inclusion into the School's financial statements annually, formatted by revenue source and expenditures and detailed by function and object.

9. Designated Contact Person

The designated contact person of Manager shall be the President of Academica (currently Fernando Zulueta). An alternate contact person shall be the Vice-President and Director of Operations (currently Maggie Fresen).

10. Grant Solicitation

In consultation with the Board, and with Board approval, Manager will solicit grants available for the funding of the School from the various government and private and institutional sources that may be

available. Such grants will include, but are not limited to federal grants programs and various continuation grants for charter schools.

11. Financing Solicitation and Coordination

Manager will coordinate obtaining financing from private and public sources for loans desired by the Board.

12. Other Funding Sources

Manager will coordinate the solicitation of Capital Outlay Funds, if available, from the appropriate state or local agencies. Similarly, Manager will coordinate the solicitation of other state, federal, or local government funds earmarked for school facilities development, improvement, or acquisition as well as other sources of funding that may become available to charter schools from time to time.

13. Annual Reporting

Manager will coordinate the preparation of the Annual Report required by the Charter School Legislation for the School.

The Report will be submitted to the Board for approval, and Manager will coordinate the delivery and review process established by the Sponsor and Charter School legislation for the Annual Report.

14. Student Assessment

At the direction of the Board, Manager will coordinate a student assessment methodology, independent from State and/or Sponsor required assessments, and retain on behalf of CharterSchoolCorp professionals to administer and evaluate results. Manager will provide the Board with proposals from professionals offering to provide assessment and student evaluation services for the Board either to approve or reject.

15. School Board Representation

Manager will serve as primary liaison with the Sponsor and its officials on behalf of the School. In connection therewith, Manager's representatives will attend required meetings and public hearings.

16. Governmental Compliance

Manager will ensure compliance with state regulations and reporting requirements of the Charter School. Manager will also ensure the School's compliance with its Charter with the Sponsor, a copy of which is incorporated herein by reference.

17. Charter Renewal Coordination

Manager will coordinate with the Sponsor for the renewal of the School's Charter on a timely basis. On behalf and with the direction of the Board, Manager will negotiate the terms of the renewal Charter with the Sponsor and provide the Board with notice and seek Board approval of any renewal provisions which modify or alter the terms of the original Charter between the School and the Sponsor.

18. <u>Curriculum Development</u>

Manager shall identify and or develop curricula in connection with the operations of the School and the vision of the Board in a manner that complies with applicable federal, state and local laws and regulations. All curricula shall be approved by the Board prior to use.

19. Pre-School, After-Care, Early Drop-Off

Manager shall identify and or develop Pre-School, After-Care, Early Drop-Off programs to be offered as services ancillary but separate from the operations of the School. These are programs that are not encompassed by the Charter School Agreement between the School and the Sponsor. Accordingly, the School may elect not to offer these programs directly, but rather to authorize Manager to do so. In furtherance of that, Manager will retain the necessary operators to provide the underlying services to the parents and students desiring them. Manager will coordinate the provision of those services directly where applicable and establish agreements to reimburse the School for the use of the facilities, utilities, cleaning services and other costs consumed or incurred by those uses. Manager and/or the selected service providers shall be the direct primary supplier to the parents and students of those ancillary services and will indemnify and hold harmless the School for any liability resulting from them. The terms and conditions for these programs including financial terms, operating procedures, and ownership, shall be subject to Board review and approval.

20. Facilities Identification Expansion, Design and Development

Manager shall coordinate with the Board for the purpose of identifying the facilities needs of the School from year to year. In connection therewith, Manager shall assist the School in identifying, procuring and planning the design of new facilities or in the expansion of existing ones. Manager may identify and solicit investors to acquire and develop facilities for lease or use by the school. Where such investors are related to Manager or its principles, that relationship will be disclosed to the Board. Further, Manager shall recommend and retain on behalf of the School qualified professionals in the fields of school

design and architecture and engineering as well as in the area of development and construction for the expansion, design, development, and construction of new or existing facilities.

21. Systems Development

Manager will identify and develop a school information system to be used in connection with the administration and reporting system for the School. This includes, but is not limited to, accounting documentation filing systems, student records systems, computer systems, and telecommunications services.

TERM OF AGREEMENT

22. Initial Term

The term of the Agreement shall commence on the start of the 2014-2015 school year. The commencement date shall be deemed to be July 1, 2014, although the parties recognize that Manager has provided services to the Board in connection with the School and Charter before this date.

The initial term of this Agreement shall be five (5) years unless the Board for cause terminates this Agreement per section 24 of this Agreement. At the conclusion of the term of this Agreement, CharterSchoolCorp shall have the option to renew this contract with Manager.

23. Renewal

Unless terminated by the Board, the terms of this Agreement shall be renewed along with any renewals to the Charter Agreement. Manager agrees to renew this Agreement at CharterSchoolCorp's option on the then-current terms and conditions unless there has been an uncured material breach hereunder by CharterSchoolCorp, after 60 days written notice of such breach and demand for cure, or unless CharterSchoolCorp has given at least 90 days' notice that this Agreement will not be renewed.

24. Termination

In the event of a breach of this Agreement by either party, the non-breaching party shall give the other party written notice of such breach and sixty (60) days to cure such breach from the date of giving such notice to Manager. "Breach" shall be defined as a material breach of this Agreement by Manager or CharterSchoolCorp; the failure of Manager to provide educational support and management services sufficient to operate the School in a manner that complies with the standards of the Sponsor; any debarment of or similar action against Manager by any governmental entity; or any action or conduct by Manager or its principals that may bring disrepute to the School or Board (e.g., any arrest or conviction for a crime of

moral turpitude or any felony) or that may endanger or materially lessen the safety of students. If the Sponsor terminates or materially changes its Charter Agreement with the School or Board for the operation of the School, either the School or Board, or Manager may upon thirty (30) days written notice terminate this Agreement without penalty or liability of any kind to either party. Either party may terminate this Agreement at any time and for any reason, irrespective of cause, upon providing the other party 90 days' notice of termination. In the event of termination of this Agreement for any reason, the compensation to be paid by CharterSchoolCorp to Manager under this Agreement shall be pro-rated.

COMPENSATION

25. Base Compensation

CharterSchoolCorp shall pay Manager a management fee of \$450 per student Full Time Equivalent (FTE) per annum during the term of this Agreement, unless terminated, provided CharterSchoolCorp receives such funds. The fee shall be payable in equal monthly installments, provided that CharterSchoolCorp shall have no obligation to pay such fee before receiving its FTE funding from the Sponsor or the State of Florida, in which event the monthly installments shall accrue until funding is received. The fee shall be adjusted annually at each anniversary of this Agreement based on the change in the prior year's Consumer Price Index or on the basis of the year-to-year percentage change in the per student Full Time Equivalent (FTE) funding provided to the school under the law, whichever is less, but in no event shall any adjustment reduce the management fee below the initial level of \$450 per student Full Time Equivalent (FTE) per annum as stated above.

26. Additional Services

Manager will provide additional services not covered under this Agreement to the Board as requested by the Board by proposal to Board and subject to Board approval. This may include services that are not within the regular course of running the School, including but not limited to special projects, litigation coordination, and land use coordination. Such projects may include the engagement, at the expense of CharterSchoolCorp, of other professionals or consultants who may be independent from Manager or part of Manager's network of consulting professionals.

27. Reimbursement of Costs

Manager shall be reimbursed for actual costs incurred in connection with travel, lodging, and food, attending required conferences and other events on behalf of the School, provided that the Board shall give prior written approval for such cost.

28. <u>Incurred Expenses</u>

Pursuant to the agreement of the Board and Manager, Manager may defer some or all of the management fees and/or costs for additional services and/or reimbursements due hereunder from one fiscal year to the next, which will be duly noted in the schools financial records.

OTHER MATTERS

29. Conflicts of Interest

No officer, shareholder, employee or director of Manager may serve on the Board. Manager will comply with the Conflicts of Interest rules set out in the Charter. In addition, if there exists some relationship between Manager, its officers, directors or principals and any other person or entity providing goods or services to the School, Manager agrees to disclose the relationship to the Board.

30. Insurance and Indemnification

Manager shall carry liability insurance and indemnify the School for acts or omissions of Manager. Manager agrees to provide, upon request of the Board, certificates of insurance with carriers, in amounts and for terms reasonably acceptable to the Board. Manager hereby agrees to indemnify, hold harmless and protect CharterSchoolCorp, the Board, the School and their successors and assigns, from and against any and all liabilities, claims, forfeitures, suits, penalties, punitive, liquidated, or exemplary damages, fines, losses, causes of action, or voluntary settlement payments, of whatever kind and nature, and the cost and expenses incident thereto (including the costs of defense and settlement and reasonable attorney's fees) (hereinafter collectively referred to as "claims") which such party may incur, become responsible for, or pay out as a result of claims connected to the acts, services, conduct or omissions of Manager, its employees or agents.

31. Miscellaneous

(1) Neither party shall be considered in default of this Agreement if the performance of any part or all if this Agreement is prevented, delayed, hindered or otherwise made impracticable or impossible by reason of any strike, flood, hurricane, riot, fire, explosion, war, act of God, sabotage, accident or any

other casualty or cause beyond either party's control, and which cannot be overcome by reasonable

diligence and without unusual expense.

(2) This Agreement shall constitute the full, entire and complete agreement between the

parties hereto. All prior representations, understandings and agreements are superseded and replaced by

this Agreement. This Agreement may be altered, changed, added to, deleted from or modified only through

the voluntary, mutual consent of the parties in writing, and said written modification(s) shall be executed

by both parties. Any amendment to this Agreement shall require approval of the Board.

(3) Neither party shall assign this Agreement without the written consent of the other party;

(4) No waiver of any provision of or default under this Agreement shall be deemed or shall

constitute a waiver of any other provision or default unless expressly stated in writing.

(5) If any provision or any part of this Agreement is determined to be unlawful, void or

invalid, that determination shall not affect any other provision or any part of any other provision of this

Agreement and all such provisions shall remain in full force and effect.

(6) This Agreement is not intended to create any rights of a third party beneficiary.

(7) This Agreement is made and entered into in the State of Florida and shall be interpreted

according to and governed by the laws of that state. Any action arising from this Agreement, shall be

brought in a court in Miami-Dade County, Florida.

(8) In the event of a dispute arising from this Agreement, the prevailing party shall be

awarded reasonable attorneys' fees and costs.

(9) Every notice, approval, consent or other communication authorized or required by this

Agreement shall not be effective unless same shall be in writing and sent postage prepaid by United States

mail, directed to the other party at its address hereinafter provided or such other address as either party may

designate by notice from time to time in accordance herewith:

Academica 6340 Sunset Drive

Miami, Florida 33143

Attn: President

Charter School Inc.

ADDRESS LINE 1

ADDRESS LINE 2

Attn: Chairperson

(10)The headings in the Agreement are for convenience and reference only and in no way

define, limit or describe the scope of the Agreement and shall not be considered in the interpretation of the Agreement or any provision hereof.

- (11) This Agreement may be executed in any number of counterparts, each of which shall be an original, but all of which together shall constitute one Agreement.
- (12) Each of the persons executing this Agreement warrants that such person has the full power and authority to execute the Agreement on behalf of the party for whom he or she signs.

THIS AGREEMENT was approved at a m	eeting of the Board of Di	rectors of
CHARTER SCHOOL, INC held on the	day of	201 At that
meeting, the undersigned Director of	CHARTER S	CHOOL, INC was authorized
by the Board to execute a copy of this Agreement.		
IN WITNESS WHEREOF, the parties her	reto have executed this Co	ontract as of the day and year
first above written.		
CharterSchoolCorp		
(For CHARTER SCHOOL)		
Ву:	Date:	
, Chair / President		
ACADEMICA		
By: Fernando Zulueta, President	Date:	

JOB DESCRIPTION

POSITION TITLE: School Principal

CONTRACT YEAR: Twelve Months

QUALIFICATIONS

EDUCATION: An earned master's Degree (or higher) from an accredited college or university

EXPERIENCE

REQUIRED: A total of five (5) years of school experience is required; which includes a minimum of three (3) years of required experience as a Principal/Assistant School Principal. Valid Florida Certification in School Principal, or Professional School Principal.

REPORTS TO: School Governing Board

SUPERVISES: All Administrative, Instructional, and Non-Instructional staff at the school.

POSITION GOAL: To provide the leadership and management necessary to administer and implement all programs, activities and policies essential to ensure high quality educational experiences and services for all students in a safe, nurturing, and enriching environment.

ESSENTIAL PERFORMANCE RESPONSIBILITIES:

LEADERSHIP

The School Principal shall:

- Administer, control, and supervise the instructional program of the school operations and school personnel.
- Encourage teachers and pupils to perform to the best of their ability.
- Interpret the educational program of the school and school system to the community.
- Provide leadership and direction for all aspects of the school's operation.
- Facilitate frequent communication with parents of the school community.
- Coordinate and adapt school curricular programs and policies.

- Assume responsibility for the buildings, grounds, equipment and supplies of the school; supervise the work of the custodians and maintenance staff; report to the governing board the conditions and needs of the school.
- Develop, implement, and evaluate the School Improvement Plan.
- Keep accurate account of all money paid to the school and record the purpose for which it was paid.
- Supervise and coordinate the budgetary process.
- Coordinate and conduct the interview process and make hiring and termination decisions for all staff.
- Develop and supervise New Teacher programs.
- Compile and prepare all student achievement outcomes.
- Report directly to the Governing Board for all purposes.
- Coordinate, supervise, and conduct the evaluations of all staff.
- Oversee the School Advisory Council.
- Maintain a positive and productive relationship with the Parent-Teacher Association.
- Supervise all students and staff.
- Coordinate and supervise the testing and assessment program.
- Enforce the discipline plan and assist teachers with all concerns and issues related to student behavior.
- Serve as final arbitrator for serious discipline problems in accordance with Sponsor and Board's policy and state statutes.
- Establish, actively pursue, and monitor a school mission, vision and goals l in collaboration with staff, parents, students, and other stakeholders that are aligned with the Board's mission and goals.
- Supervise and coordinate school-wide programs, curricula and course options.
- Supervise and coordinate student registration, scheduling, and master scheduling construction.
- Oversee the grade reporting system.
- Monitor substitute teachers and the class coverage process.
- Supervise school activities and special events, and initiate fundraising activities.
- Establish business partnerships and positive relationships with community leaders.
- Maintain a master schedule of all school activities and events, including extracurricular trips.
- Coordinate and schedule the use of facilities for all events.
- Implement and enforce attendance and tardy policies and procedures for all students.
- Exercise proactive leadership in promoting the vision and mission of the school.
- Model and maintain high standards of professional conduct.
- Set high standards and expectations for self, others, and school.

- Demonstrate satisfactory or above performance on the Florida Principal Competencies while performing all duties required by the job description.
- Provide leadership in the implementation of the Sunshine State Standards, Florida Write, Florida Comprehensive Assessment Test (FCAT) and other tests designed and adapted to measure student achievement.
- Maintain active involvement in the school improvement planning process with the School Advisory Council by providing resources for decisionmaking and priority setting.
- Use quality improvement principles and process in daily administration of school.
- Implement procedures and policies that ensure a safe and orderly learning environment.
- Anticipate difficult situations and develop plans to handle them.
- Manage and administer the development, implementation and assessment of the instructional program at the assigned school so as to ensure student growth and achievement is continuous and appropriate.
- Use collaborative leadership style and quality processes to involve stakeholders in establishing and achieving the school's mission and goals.
- Provide leadership and direction for all aspects of the school's operation.
- Build teams to accomplish plans, goals and priorities.
- Conduct staff meetings to discuss policy changes, instructional programs, potential problems and resolution of existing problems.
- Use appropriate interpersonal styles and methods to guide individuals or groups to task accomplishment.
- Act quickly to stop possible breaches of safety, ineffective procedures, or interference with operations.
- Communicate effectively both orally and in writing with parents, students, teachers and the community.
- Communicate school information, goals, student learning and behavior expectations to stakeholders.
- Develop and maintain a school atmosphere conducive to learning and student achievement.
- Maintain visibility and accessibility on the school campus and at school related activities and events.
- Establish procedures used in the event of school crisis and/or civil disobedience and provide leadership in the event of such incidents.
- Provide leadership to involve the school in quality initiatives.
- Establish procedures for an accreditation program and monitor standards to ensure they are met.
- Provide for the articulation of the school's instructional program among school personnel.
- Use effective communication techniques with students, teachers, parents and stake holders.
- Communicate, through proper channels, to keep Board of Directors informed of impending problems or events of an unusual nature.

INFORMATION & ANALYSIS

- Address the diverse needs of the school population consistent with the Board's policies and Strategic Plan.
- Use current research, performance data, and feedback from students, teachers, parents and community to make decisions related to improvement of instruction.
- Provide leadership and direction for the implementation and evaluation of curriculum and instruction at the school.
- Analyze and use data for decision-making to improve actions, plans, and processes.
- Access, analyze, interpret and use data in decision-making.
- Use key information such as benchmarks and comparison data in the analysis of results to effectively measure performance.
- Make data accessible to all stakeholders

STRATEGIC PLANNING

- Develop long and short- term plans and goals within the School Improvement Plan, aligned with the strategic plan of the Board.
- Collaborate and provide resources to ensure the development of the School's Improvement Plan.
- Communicate overall School Improvement Plan requirements to all staff so each employee can understand how the goals and plans relate to his/her work.
- Allocate resources consistent with implementation of the School Improvement Plans.
- Utilize a systematic process for collecting input from stakeholders and incorporates customer requirements in development of School Improvement Plan.
- Establish procedures to monitor processes, activities and responsibilities and respond to feedback.
- Establish and coordinate procedures for student, teacher, parent and community evaluation of curriculum.
- Direct the development of the master schedule and assign teachers according to identified needs.
- Facilitate the horizontal and vertical articulation of curriculum within the school as well as between the school and its feeder system.
- Oversee the selection and acquisition of instructional materials and equipment
- Collect input and analyze data to develop goals.
- Set high goals and standards for self, others and the organization...
- Provide recognition and celebration for student, staff, and school accomplishments.

COMMUNITY ENGAGEMENT

- Facilitate a program of family and community involvement.
- Develop positive relationships with students, parents, teachers, community.
- Work with parents to resolve complaints or concerns.
- Develop and maintain positive school/community relations and act as liaison between the two.
- Promote/market the school and its priorities to the community
- Establish processes and methods to respond to valid customer requirements.
- Facilitate, coordinate, and monitor the implementation of Student Education programs and services.
- Implement procedures to ensure that rights of children with disabilities and parents of such children are protected.
- Interact with government and service agencies relative to student welfare.
- Establish processes to determine customer needs and level of satisfaction.
- Establish guidelines for desirable student conduct and follow suspension and expulsion policies and procedures.
- Supervise the implementation of the school's student services plan, including guidance, drop-out prevention, health services, attendance and related areas.
- Take appropriate reporting and/or referral action whenever abuse situations are recognized.
- Provide leadership support for community involvement programs and business partnerships at the school level.
- Direct and develop the recruitment of Business Partners to benefit the school and community.
- Develop activities with business partners that promote student achievement.

HUMAN RESOURCES

- Manage appropriately and professionally personnel issues, including hiring, evaluations, staff deficiencies and retention; provides feedback on professional performance and offer assistance to strengthen weaknesses in performance.
- Interview and select qualified personnel
- Establish job assignments, supervise all assigned personnel, and conduct performance evaluations in accordance with current board policies and legislation.
- Delegate responsibilities to appropriate staff members.
- Make difficult personnel decisions according to policy when necessary including dealing with ineffective teacher or other staff performance.
- Establish and maintain individual professional development plans for each instructional employee that is linked to student achievement.
- Assign tasks and supervise personnel in task accomplishment including special projects.
- Analyze data and information to plan staff development to accomplish school goals.
- Complete annual Needs Assessment to determine staff development needs.

- Lead and manage development of personnel through staff development, inservice and other developmental activities that are linked to student achievement gains and the school improvement plan.
- Facilitate the development and implementation of an effective staff development program.
- Participate, successfully, in the staff development programs offered to increase the individual's skill and proficiency related to the assignment
- Build a school community and environment, which supports learning and growth for everyone toward realization of the school's mission.
- Participate in Governing Board management meetings and other activities to enhance professional development.
- Serve as a coach/mentor to assistant principals or others who are preparing for School Principal certification.
- Review current developments, literature and technical sources of information related to job responsibility.
- Use team approaches in solving problems and improving processes and providing frequent feedback to those involved in improvement efforts.
- Consider data and results from action research when solving problems and improving processes.
- Contribute to positive staff morale through flexibility, support and recognition of groups and individuals working toward school improvement.
- Consider the aspirations of self and others in relation to the jobs and tasks assigned when assessing expertise and developmental needs.

OPERATIONS

- Manage and supervise the school's financial resources, including the preparation and disbursement of the school's budget and internal accounts.
- Establish and manage student accounting and attendance procedures at the school.
- Coordinate and manage the extra curricular student activities and funds at the school.
- Show positive trends in the achievement of improvement goal results in the areas of Operation, business practices (efficiency) and customer satisfaction.
- Demonstrate readiness and confidence in making and/or sharing decisions with those involved in a timely fashion.
- Employ an improvement cycle for operational problems that analyzes results, identifies root causes and takes corrective action.
- Supervise and monitor the accurate completion of data collection and submit resulting reports according to timelines.
- Coordinate school maintenance and facility needs and monitor progress toward meeting those needs.
- Identify quality requirements of materials/services and communicate this information to parents, community and suppliers.
- Access Sponsor and community resources to meet school needs.
- Coordinate plant safety and facility inspections at the assigned school

- Monitor the maintenance at the school to ensure a safe, clean, and healthy, learning environment.
- Coordinate the school food service program at the school including the free and reduced food service requirements.
- Supervise transportation services at the school.
- Write and disseminate newsletters, memos, letters, press releases, agendas, and other materials using proper grammar and punctuation.
- Provide leadership in the effective use of technology in the classroom and in school administration.

JOB DESCRIPTION

POSITION TITLE: Assistant Principal

CONTRACT YEAR: Twelve Months

QUALIFICATIONS

EDUCATION: An earned Master's Degree or higher from an accredited institution. Certifications: Valid Florida Certification in Educational Leadership, Administration, Administration & Supervision, School Principal or Professional School Principal at the appropriate grade level for the school.

EXPERIENCE

REQUIRED: Three (3) years teaching experience at a school site. Demonstrated ability to communicate effectively in both oral and written forms.

PREFERRED: 1-3 years of administrative experience at a school site.

REPORTS TO: School principal and school Board of Directors

SUPERVISES: Instructional and Service Personnel assigned by the principal.

POSITION GOAL: To assist the Principal in providing vision and leadership to develop, administer and monitor educational programs that optimize the human and material resources available for a successful and safe school program for students, staff and community.

SKILLS AND ABILITIES: The Assistant School Principal will effectively perform the performance responsibilities using the following skills and abilities:

- read, interpret and implement the appropriate state and federal statutes and policies, Sponsor's Policies and school board policies and procedures
- use group dynamics within the context of cultural diversity and be knowledgeable of Florida educational reform, accountability and effective school concepts
- demonstrate knowledge and practice of current educational trends, research and technology

- understand the unique needs, growth problems and characteristics of school students
- train, supervise and evaluate personnel
- demonstrate effective communication and interaction skills with all stakeholders

ESSENTIAL PERFORMANCE RESPONSIBILITIES:

The Assistant School Principal shall:

LEADERSHIP

- Use collaborative leadership style and quality process to involve stakeholders in establishing and achieving the school's mission and goals.
- Assist the principal in providing leadership and direction for all aspects of the school's operation.
- Assist in establishing and monitoring a school mission and goals that are aligned with the Board's mission and goals.
- Exercise proactive leadership in promoting the vision and mission of the Board's Strategic Plan.
- Maintain an active involvement in the school improvement planning process.
- Assist with establishing and monitoring procedures for an accreditation program and monitor standards to ensure they are met.
- Provide for the articulation of the school's instructional program among school personnel.
- Assist in the managing and developing the implementation and assessment of the instructional program at the school so as to ensure all students the opportunity to learn.
- Use quality improvement principles and processes in daily administration of school.
- Assist in developing and maintaining a safe school atmosphere conducive to learning and student achievement.
- Maintain visibility and accessibility on the school campus and at school related activities and events.
- Assist in conducting staff meetings to discuss policy changes, instructional programs, potential problems and resolution of existing problems.
- Build teams to accomplish plans, goals and priorities.
- Assist in the establishment of procedures used in the event of school crisis and/or civil disobedience and provide leadership in the event of such incidents.
- Act quickly to stop possible breaches of safety, ineffective procedures, or interference with operations.
- Anticipate difficult situations and develop plans to handle them.
- Serve as arbitrator for serious discipline problems in accordance with School policies, board and Sponsor's policies and state statutes.
- Communicate effectively both orally and in writing with supervisors, parents, students, teachers and the community.

- Use appropriate interpersonal styles and methods to guide individuals or groups to task accomplishment.
- Model and maintain high standards of professional conduct while setting high standards and expectations for self, others, and school.

INFORMATION & ANALYSIS

- Address the diverse needs of the school population
- Assist in providing leadership and direction for the implementation and evaluation of curriculum and instruction at the school.
- Use current research, performance data, and feedback from students, teachers, parents and community to assist in making decisions related to improvement of instruction.
- Analyze and use data for decision-making or to improve actions, plans and process.
- Access, analyze, interpret and use data in decision-making.
- Use benchmarks and comparison data in the analysis of results and make data accessible to all stakeholders.

OPERATIONS

- Assist with managing and supervising the school's financial resources including the school's internal accounts.
- Assist with establishing and managing student accounting and attendance procedures at the school.
- Supervise and monitor the accurate completion of data collection and submit resulting reports according to timelines.
- Assist with the coordination of school maintenance and facility needs and monitor progress toward meeting those needs.
- Assist with coordinating plant safety and facility inspections at the school.
- Assist in coordinating the school food service program at the school, including the free and reduced food service requirements.
- Assist with the supervision of all extracurricular programs at the school.
- Provide leadership in the effective use of technology in the classroom and in school administration.
- Assist with the writing and dissemination of newsletters, memos, letters, press releases, agendas, and other materials using proper grammar and punctuation.
- Perform other tasks consistent with the goals and objectives of this position as assigned by the Principal.

STRATEGIC PLANNING

- Assist with facilitating and coordinating the development of the School Improvement Plan.
- Assist in communicating overall School Improvement Plan requirements to all staff each employee can understand how the goals and plans relate to his/her own work.

- Assist in allocating resources consistent with the implementation of the School Improvement Plan.
- Collect input and analyze data to develop goals.
- Assist in the selection and acquisition of instructional materials and equipment.
- Assist with establishing and coordinating procedures for student, teacher, parent, and community evaluation of curriculum.
- Assist with facilitating the horizontal and vertical articulation of curriculum within the school.
- Develop the master schedule and assign teachers according to identified needs.
- Assist with providing recognition and celebration for student, staff, and school accomplishments.
- Set high goals and standards for self, others and the organization.

COMMUNITY ENGAGEMENT

- Develop positive relationships with all stakeholders (students, parents, teachers, community).
- Assist with facilitating a program of family and community involvement.
- Develop and maintain positive school/community relations and act as liaison between the two.
- Assist in promoting/marketing the school and its priorities to the community.
- Assist in providing leadership to support community involvement programs and business partnerships at the school level.
- Assist in directing and developing the recruitment of Business Partners to benefit the school and community.
- Assist with the development of activities with business partners that promote student achievement.
- Assist in facilitating, coordinating, and monitoring the implementation of Student Education programs and services.
- Work with parents to resolve complaints or concerns.
- Interact with government and service agencies relative to student welfare.
- Take appropriate reporting and/or referral actions whenever abuse situations are recognized.
- Assist in supervising the implementation of the school's student services (including guidance, health services, and attendance) and other related areas.

HUMAN RESOURCES

- Manage issues, including hiring, evaluation, staff deficiencies and retention; appropriately and professionally personnel.
- Assist with interviewing and selection of qualified personnel to be recommended for appointment.

- Assist with difficult personnel decisions when necessary including dealing with ineffective teacher or staff performance.
- Delegate responsibilities to appropriate staff members.
- Assign tasks and supervise personnel in task accomplishment including special projects.
- Assist with the development and implementation of an effective staff development program.
- Assist in analyzing data and information to plan staff development to accomplish school goals.
- Assist with providing staff development opportunities and feedback to school personnel.
- Participate, successfully, in the staff development programs offered to increase the individual's skill and proficiency related to the assignment.
- Review current developments, literature and technical sources of information related to job responsibility.
- Use team approaches in solving problems and improving processes and provides frequent feedback to those involved in improvement efforts.
- Contribute to positive staff morale through flexibility, support and recognition of groups and individuals working toward school improvement.
- Provide feedback on professional performance and offer assistance to strengthen weaknesses in performance.

JOB DESCRIPTION

POSITION TITLE: Exceptional Student Education (ESE) Teacher

CONTRACT YEAR: Ten (10) Months

QUALIFICATIONS

EDUCATION: An earned bachelor's or master's degree from an accredited institution. Master's Degree in Exceptional Student education is preferred; Appropriate State of Florida Teaching Certifications in Special Education.

EXPERIENCE

REQUIRED: A minimum of three (3) years of combined successful work experience, which includes a minimum of two (2) years teaching experience in special education.

SUPERVISES: Special Education Teacher, teachers and clerical personnel, as assigned.

POSITION GOAL: To develop, implement, coordinate and monitor Special Education curriculum for students assigned to the Special Education program.

ESSENTIAL PERFORMANCE RESPONSIBILITIES:

The Special Education Teacher shall:

- Assist in the management of Individual Education Plans (IEP) and ensure the implementation of all IEPs and Section 504 Plans
- Coordinate and attend IEP meetings and communicate with parents.
- Provide ESE services to students within the General Education setting
- Provide curriculum support for students and teachers
- Coordinate and facilitate Response to Intervention for struggling students
- Develop and monitor Behavior Intervention Plans
- Coordinate the identification, assessment and placement of students in the School's ESE Program
- Coordinate the ordering of materials and equipment needed to implement ESE Program services
- Coordinate with school-site, district, and contracted personnel in the provision of ESE services to students
- Develop and assist to implement the school's ESE program in alignment with District and federal guidelines
- Coordinate testing for Students with Disabilities and monitor student IEPs

- Coordinate the internal and external evaluation to maintain an effective feedback monitoring system in coordination with Program Evaluation
- Coordinate activities with early intervention programs to provide services for ESE students
- Serve as a consultant on the matters pertinent to the ESE program
- Assist with interviews of potential ESE teachers
- Participate successfully, in the training programs offered to increase the skill and proficiency related to the assignment
- Review current developments, literature and technical sources of information related to job responsibility
- Ensure adherence to good safety procedures
- Perform other duties as assigned by the Principal

JOB DESCRIPTION

POSITION TITLE: English for Speakers of Other Languages (ESOL)

Coordinator/Teacher

CONTRACT YEAR: Ten (10) Months - Annual Contract

QUALIFICATIONS

EDUCATION: An earned bachelor's degree or higher from an accredited institution and Appropriate State of Florida Teaching Certification Endorsement in ESOL

EXPERIENCE

REQUIRED: A minimum of four (4) years of combined successful work experience, which includes a minimum of two (2) years teaching experience in ESOL/bilingual education.

PREFERRED: Preferred degree major in Education or related field. Bilingual in English, Spanish and/or Creole preferred. Computer skills as required for the position.

SUPERVISES: ESOL Teachers, teachers and clerical personnel, as assigned.

POSITION GOAL: To develop, implement, coordinate and monitor ESOL curriculum for students assigned to the ESOL program.

ESSENTIAL PERFORMANCE RESPONSIBILITIES: The ESOL Coordinator/teacher shall:

- Coordinate the development of bilingual/ESOL curriculum guides and performance objectives for grades all grades at the school.
- Coordinate the identification, assessment and placement of students in the bilingual/ESOL program.
- Coordinate the ordering of materials and equipment needed to implement the bilingual/ESOL program.
- Develop and assist to implement the school's bilingual/ESOL program.
- Coordinate and attend LEP meetings and communicate with parents.
- Coordinate testing for ESOL and monitor student LEPS
- Work with principals, teachers and personnel in the bilingual/ESOL program.
- Coordinate the internal and external evaluation to maintain an effective feedback monitoring system in coordination with Program Evaluation.
- Coordinate activities with early intervention programs to provide services for English Language Learners (ELLs).
- Serve as a consultant on the matters pertinent to the bilingual/ESOL program.

- Assist with interviews of potential bilingual/ESOL teachers.
- Participate successfully, in the training programs offered to increase the individual's skill and proficiency related to the assignment.
- Review current developments, literature and technical sources of information related to job responsibility.
- Ensure adherence to good safety procedures.
- Perform other duties as assigned by the Principal.

JOB DESCRIPTION

POSITION TITLE: Guidance Counselor (Budgeted under contracted services)

CONTRACT YEAR: 10-12 Months

QUALIFICATIONS

EDUCATION: An earned master's degree from an accredited institution; Florida certification in Guidance and Counseling. Bilingual skills preferred. Computer skills as required for the position.

REPORTS TO: Principal or designee

POSITION GOAL: To implement a process to help students discover and develop their best talents for personal happiness and social usefulness.

ESSENTIAL PERFORMANCE RESPONSIBILITIES:

The Guidance Counselor shall:

- meet with parents/students prior to and during the registration process, inform the students of classes relative to course selection and assist the administration in the registration and scheduling process.
- Assist in development of the school's master schedule
- conduct follow-up meetings after the master schedule is developed to make any necessary changes in students' schedules.
- conduct orientation meetings to provide information regarding class offerings and registration procedures.
- provide individual counseling for students regarding scheduling upon request of
- the student or his/her parent/guardian.
- counsel students on personal and academic concerns and notify parents as deemed necessary.
- evaluate credits from outside sources
- provide training to teachers, parents and students on pupil progression plan
- provide materials and suggestions for classroom oriented guidance activities.
- arrange student, parent and teacher conferences.
- acquaint students new to the school with teachers, facilities and programs to help them adjust to their new environment.
- assist in the early identification of students for proper educational placement, such as exceptional child, federal and bilingual programs.
- work with parent groups in the area of child growth, development and discipline.

- meet with teachers to present and explaining the results of various testing programs.
- assist teachers in effective utilization of test results.
- identify community and school system resources and when advisable, refer student situations to the proper agencies.
- keep records of conferences and send reports within the limits of confidentiality, to the principal, administrative assistants, and/or teachers as requested.
- gather information from all faculty members having contact with a student being considered for referral.
- review current developments, literature and technical sources of information related to job responsibility.
- ensure adherence to good safety procedures.
- participate in professional growth activities and complete a professional development plan.
- attend professional conferences and workshops related to the overall guidance program.
- perform other duties as assigned by the Principal.
- follow School, Board, and Sponsor policies as well as federal and state laws

JOB DESCRIPTION

POSITION TITLE: Registrar

QUALIFICATIONS

EDUCATION: Standard high school diploma or satisfactory completion of an approved General Educational Development (GED) Testing Program.

SKILLS: A well-rounded knowledge of clerical methods, procedures, and business office practice; must be computer literate. Computer skills as required for the position. The hiring administrator may specify preferred, appropriate additional qualifications as may be related to the job.

EXPERIENCE: One (1) year of previous school work experience which demonstrated an expertise to perform various procedures and applications of a repetitive and routine nature following standard practices.

REPORTS TO: Administrator/Principal or designee

POSITION GOAL: To perform a wide variety of clerical duties with respect to registering students, processing and maintaining student records, and otherwise working with student schedules and data in a responsible and accurate manner.

ESSENTIAL PERFORMANCE RESPONSIBILITIES: The School Registrar shall:

- Process required forms and information to enroll new students and discuss the process with students and parents.
- Maintain cumulative folders and permanent record cards in a secure manner.
- Prepare various lists and reports in regard to student ranking, grade averages, graduation, reassignments, etc.
- Process withdrawal and transfer of students and verify that student obligations are settled.
- Assist in determining credits and corresponding grade levels.
- Receive and mail transcripts and other requested records, as authorized, and prepare related correspondence.
- Follow instructions and established policies and procedures to perform specialized registrar duties referring questionable matters to the Guidance Director.
- Review students' immunization forms to verify adherence to governmental requirements.

- Operate standard office equipment such as any generation of typewriter, calculator, microcomputer, word processor, etc., as well as equipment developed or advanced from future technology as required by the job.
- Interact effectively with the general public, staff members, students, teachers, parents, and administrators, using tact and good judgment.
- Participate, successfully, in the training programs offered to increase the individual's skill and proficiency related to the assignment.
- Review current developments, literature and technical sources of information related to job responsibility.
- Ensure adherence to good safety procedures.
- Perform other duties as assigned by the Principal or designee.

TERMS OF EMPLOYMENT: 12 months - hourly

JOB DESCRIPTION

POSITION TITLE: Teacher

CONTRACT YEAR: Ten-Month Salaried - Annual Contract

QUALIFICATIONS

EDUCATION: Bachelor's degree from an accredited college or university; Certifications: valid Florida certification in the subject area.

EXPERIENCE PREFERRED: Experience - Two (2) years of successful classroom experience in the appropriate subject area.

REPORTS TO: Principal

POSITION GOAL: To create and maintain a classroom atmosphere that generates high expectations and enthusiasm for learning by infusing critical thinking skills, application skills, interpersonal skills, and technology into an aligned curriculum and assessment process, resulting in measurable student achievement gains for all students.

SKILLS AND ABILITIES

The teacher shall:

- Posses knowledge curriculum and sunshine state standards in the appropriate subject area.
- Be able to adapt, design and implement curriculum to meet the needs of the individual students.
- Be able to suggest educational and classroom management strategies, materials and techniques to parents and other support personnel working with students.
- Be able to use observation techniques for identification, ongoing re-evaluation and planning for students.

ESSENTIAL PERFORMANCE RESPONSIBILITIES

The teacher shall:

DEMONSTRATE PROFICIENCY

- Demonstrate mastery of all state competencies
- Demonstrate mastery of all twelve of the teacher practices benchmarks for the 21St century at the professional and eventually the accomplished level

- Demonstrate knowledge and understanding of the subject matter
- Foster students' achievement gains from baseline assessment levels to be evident in pre/post test comparison results, standardized test scores, and portfolios
- Assist the administration and staff to develop and implement a school-wide behavior management system aligned to the Board's policies and procedures.
- Provide supportive classroom management and academic strategies to teachers, students, and parents.

DEMONSTRATE INITIATIVE

- Demonstrate efficiency
- Demonstrate punctuality
- Demonstrate consistent attendance
- Review current developments, literature and technical sources of information related to job responsibility.
- Initiate and present innovative ideas for special projects, school functions, field trips, extracurricular activities, and clubs
- Initiate opportunities for professional development
- Provide supplemental instruction

PARTICIPATE IN CONTINUED PROFESSIONAL DEVELOPMENT

- Demonstrate oral and written proficiency
- Participate, successfully, in the training programs offered to increase the individual's skill and proficiency related to the assignments.
- Pursue further education and supplemental credentials

UNDERSTAND AND EMPLOY A VARIETY OF EDUCATIONAL TECHNOLOGIES, STRATEGIES, AND TEACHING STYLES

- Employ differentiated instructional strategies to maximize learning
- Role model using the state competency checklist
- Consistently maintain portfolios (dating and ordering each piece)

SERVE AS ROLE MODELS FOR STUDENTS AND FUTURE TEACHERS

- Role model using the state competency checklist
- Administer student surveys twice yearly
- Promote problem-solving skills and character education
- Promote and enforce school rules

ADVISE PARENTS

- Keep parents updated through interim reports, report cards, phone calls, and notes home
- Encourage and facilitate parental and community involvement promoting student achievement
- Document parent phone calls, conversations, and conferences

- Work as partners to create behavior modification plans and create Progress Monitoring Plans (PMP) for students
- Maintain flexibility and frequent contact with parents about student progress and school events

DEMONSTRATE AWARENESS OF EACH STUDENT'S EDUCATIONAL NEEDS

- Continually assess students' development (psychological and academic) through clearly defined rubrics
- Establish, maintain, assess, and (if needed) modify individual student progression plans
- Identify those students who exhibit exceptional thinking styles and behaviors and implement and/or accommodate those exceptional needs
- Assist in data collection and preparation of reports including individualized educational plans of instruction for students.

WORK COOPERATIVELY AND PRODUCTIVELY WITH CO-WORKERS

- Interact with maturity and professionalism among administration, staff, a students at all times
- Take initiative to implement projects, programs, and/or compensate for shortcomings within your classroom and/or the school environment
- Exhibit congeniality among co-workers, students, and parents
- Show assertiveness delegate when necessary to help others help you
- Be a team player while respecting others differences
- Separate professional and personal spheres
- Be flexible always have a back-up plan
- Be willing to help where help is needed

FOLLOW GUIDELINES REGARDING SAFETY AND EDUCATION

- Supervise student recreation (having at least one person in the classroom at all times)
- Complete and maintain accident reports (keeping one in a permanent file and sending one copy to parents)
- Keep emergency numbers at hand and a stocked first aid kit accessible in classroom
- Maintain up-to-date lesson plans within the guidelines of the Ben Gamla Charter High curriculum
- Complete, distribute, and maintain files of all behavior and homework referrals as required (one in permanent folder, one sent home)
- Complete and maintain files of all report cards, interim reports, and county test records
- Follow safety requirements regarding aisles, doorways, fire alarms, and fire extinguishers at all times
- Participate in monthly fire and other safety drills
- Keep dangerous objects (knives, rocks, etc.) and toxic substances (ammonias, medicines, etc.) out of the reach of children at all times

• Follow appropriate County medication guidelines for all students (remember never to give Tylenol, cough drops, or any prescription medications without the written consent of the parent and administrator and accompanied by the appropriate medical forms)

PARTICIPATE ACTIVELY IN SCHOOL FUNCTIONS

- Attend parent/teacher meetings and conferences
- Plan and participate in special events
- Perform other duties as assigned by the Principal.

PHYSICAL REQUIREMENTS: Light work: Exerting up to 20 pounds of force occasionally, and/or up to 10 pounds of force as frequently as needed to move objects.



Sample Parent/Guardian Contract

I, the unpolicies	ndersigned parent/guardian of, hereby agree to abide by the following and procedures of
•	Absences: In accordance with School and M-DCPS Daily Attendance Policies, students must be physically present in school for a minimum of 2 hours in order to be counted as present for attendance purposes each day. For each day a student is absent, Parents/guardians must submit supporting documentation explaining the reason for the absence. Documentation submitted more than 3 days (72 hours) after the student's return to school will not be accepted, and the absence(s) will be deemed unexcused. Students with excessive absences will be referred to the administration/Attendance Review Committee. Referrals will be issued after reaching the school's maximum allowance, and may result in the student's report card reflecting insufficient attendance for receiving a grade. Please be advised: for students in grades 9-12, five (5) or more unexcused absences in a semester course or ten (10) or more in
•	an annual course, may result in the withholding of a student's grade. Arrival: Arrival time is from am to am. Students must be in their seats at the commencement of homeroom in the morning. Any student arriving after the commencement of homeroom will receive a tardy pass. Students arriving or departing outside of the School's designated times may be enrolled in a before-care program, where available, including all applicable fees. Please be advised: The School is not responsible for students who arrive more than thirty (30) minutes prior to the start of school, except for those who are enrolled in and pay fees to the before-care program.
•	<u>Tardies:</u> All tardies are unexcused. If students arrive after the commencement of school, please do not send the student to class. Students arriving after the commencement of school must report directly to the School's designated office/area. Students with excessive tardies will be referred to the administration/Attendance Review Committee.
•	<u>Dismissal:</u> Dismissal time ispm. Students departing outside of the School's designated times may be enrolled in an after-care program, where available, including all applicable fees. Please be aware that all charges must be resolved in full by the last day of school. Please be advised that The School is not responsible for students remaining on campus after the school's dismissal times, except for those who are enrolled in and pay fees to the after-care program.

- Early Dismissal: For a student to be dismissed early, parents must report to the designated office/area. Students who wish to be dismissed early (on a regular school day) are required to provide documentation. Documentation submitted more than 72 hours after an early dismissal will not be accepted, and the early dismissal will be deemed unexcused. Students with excessive unexcused early dismissals, will be referred to the administration/Attendance Review Committee. Students will not be dismissed 30 minutes prior to dismissal time without previous written notice. There are NO EXCEPTIONS!
- <u>Unauthorized Items Policy:</u> Please note that students are <u>not allowed</u> to bring any <u>toys</u>, <u>electronic devices</u>, <u>pets</u>, <u>or animals</u> to school. Cell phones may not be turned on inside of the School building at any time. Cell phones may not be visible at any time during the School day, may not be displayed during School, and must be left in the Students bag. The School will confiscate any unauthorized items a student may bring to school. Confiscated items will only be returned to parents at which time a parent/student conference may be required. The school may keep any such unauthorized items until the end of the school year. Continued violations of this policy may result in further penalties, and may subject the student to disciplinary action and/or referral to the School's administration/discipline review committee. While the School will take every measure to protect such items, the School shall not be

- responsible for loss or damage to any unauthorized items which have been confiscated. Any items not claimed by the last day of school shall be disposed of without further liability to the School.
- <u>Uniform Policy:</u> Official School uniforms must be worn every day. Students who arrive to school without proper uniform may be referred to the administration and may not return to class until in proper uniform. Students with repeated violations of this policy will be referred to the administration/Discipline Review Committee.
- <u>Volunteer Hours</u>: Parental/Guardian involvement is a critical component of your child's educational success. The school prides itself on the success of our students and therefore requires that parents/guardians become active stakeholders in their child's future. All parents/guardians are asked to complete thirty (30) volunteer hours, per academic year. All parent/guardian volunteer hours must be completed prior to the last day of school.
- Academic Recovery: If the School identifies your student as requiring additional instruction and/or remediation including but not limited to: mandatory tutoring, summer school, etc., attendance at and successful completion of same shall be required. Alternative and/or make-up sessions may be scheduled at the discretion of the administration.
- <u>Outstanding Fees:</u> Failure to pay all outstanding fees may result in the loss and/or suspension of extracurricular activity privileges. Fees may include but shall not be limited to: lost books, late library fees, lunch accounts, before/after care fees, and any and all fees which may accrue in the normal course of the school year.
- Internet and Media Use Policy: No recording, either photographic or audio/visual in nature may be made on school property without the express authorization of the administration. No document or media existing now or in the future and which impacts the School and/or disrupts the learning environment, relating to the School, its staff or students, including but not limited to photographs, letters, yearbooks, and other material may be published in any public forum or media without the express authorization of the administration. Furthermore, the unauthorized use of the school's name and/or any of its logos is expressly prohibited. For purposes of this section, the term "public forum or media includes but shall not be limited to publicly accessible websites and web forums, newspapers, print and other media sources.
- Miami-Dade County Public Schools: Please note: all students enrolled in the charter school are students of Miami-Dade County Public Schools, subject to applicable policies.

We understand the policies set forth in this Parent/Guardian Contract and will abide by them. Failure to adhere to the policies as stated in the Parent/Guardian Contract will result in a violation of the contract.

Student's Nam	e:	
Grade:	Date:	
Parent Name:		
X		
Parent Sig	nature	

Ctudent's Names



June 19, 2013

RE: Sports Leadership and Management Foundation, Inc.

To whom it may concern:

Building Hope is a non-profit foundation based in Washington, DC that works to close the educational achievement gap by giving students access to high quality public charter schools in cities across the country. We support the expansion of academically successful schools with the capacity to grow their enrollments in order to catalyze change across their local public education systems by providing technical and financial assistance related to capital projects. Our services may also include grants to pay for professional fees associated with a project (i.e., architect, engineering), or other project-specific needs and sponsoring school fundraising events to support the academic program.

Building Hope is committed to support the **Sports Leadership and Management Foundation, Inc.** in securing a long-range plan for the opening of the above-referenced charter school. In order to ensure that the charter school is able to secure working capital for opening, Building Hope can offer a number of different services including facility and working capital financing. Building Hope may provide such financial assistance to the charter school by:

- Lending funds to for facilities acquisitions and/or improvements at below-market rates.
- Guaranteeing, insuring, and reinsuring debt used to assist charter schools to acquire, renovate, or construct school facilities.
- Guaranteeing or insuring leases of personal or real property that are needed to begin or continue the operation of the charter schools.
- Facilitating financing by potential lenders.
- Facilitating the issuance of bonds by charter schools or other public entities for the benefit of charter schools.
- Credit Enhancement Program

In addition, if the charter school is unable to secure a start-up grant, Building Hope can secure a line of credit for the school to help with the startup costs. Building Hope provides loan guarantees to make facilities financing more affordable for public charter schools throughout the United States. Guarantees range in size from \$250,000 to \$1 million. They have a five-year term with a 1% commitment fee and a 1% annual guaranty fee.

Sincerely,

S. Joseph Bruno President