

## CONTROLLED ENVIRONMENTAL AGRICULTURE PROJECT

### WHITE PAPER



### *An Innovative Concept in Re-Imagining Middle School Education*

In partnership with Plant4, Controlled Environmental Agriculture (CEA) program is a unique opportunity which is aligned with the District's Strategic Plan goal of ensuring high quality instruction for students. The CEA project will include a computer managed facility that integrates engineering and plant science through controlled technology. This innovative program will provide students with the opportunity to participate in research-based activities and problem-solving strategies to learn the principles and practices of sustainable commercial food crop production.

Plantation Middle School was selected for the pilot site, since it is centrally located in the District. As of the 2016- 2017 school year benchmark enrollment, there were 738 students attending and the school has capacity for 1,345 students. Plantation Middle is currently under-rolled at 54.9% of its capacity. In review of the school's enrollment, 22% of the students assigned to the school attend a charter school, 4.7% attend other Magnet programs, and 15.5% selected reassignment to another school.

Research demonstrates that students are more engaged and able to retain skills and concepts through problem based learning. Plantation Middle School will provide students with an environment that integrates the International Baccalaureate, International Business, Entrepreneurial, Language, and Leadership Academy (IBELLA) and Applied Learning real- world experiences revolving around hydroponically-based agriculture thus ensuring student success.

## KEY GOALS

- Design and implement a whole school Controlled Environmental Agriculture Program that connects students, families, and the community with a greater understanding of global resources and needs.
- Provide students with the opportunity to participate in research-based activities and problem-solving strategies to learn the principles and practices of sustainable commercial food crop production.
- Ensure teachers are provided essential professional development aligned with the curriculum and problem-based instructional strategies.
- Create a learning environment for all students that integrates the International Baccalaureate, IBELLA and Applied Learning real-world experiences revolving around hydroponically-based agriculture.

## ***What is Controlled Environmental Agriculture (CEA)?***

CEA is an advanced form of hydroponically-based agriculture. Plants are grown within a controlled environment to ensure that agriculture practices operate at optimum efficiency. Hydroponics is a technology that provides for the nutritional needs of crops and plants. The foundation of CEA is an intelligent greenhouse, “a sophisticated, precision engineered, solid-state controlled climate”, as stated by Ned Madden in the Future of Farming, Part 1: Controlling the Environment article of the Emerging Technology publication. The use of a controlled climate in the greenhouse provides optimum conditions for the growth of specific crops and plants. The combination of the intelligent greenhouse and the hydroponics system offers the best of both worlds in crop production.

## ***A Meaningful Collaborative Partnership***

Plant4, a non-profit organization under the direction of Karim Giscombe is the collaborating partner and will be responsible for funding the entire CEA project on the school site. Plant4 will cover the expenditures of professional development, curriculum development, delegated district staff, construction, operation, security, and maintenance. Plant4 will continue operation of the

facility with a subcontractor once self-sufficient. Crops will be utilized on-site for student consumption with the remaining crops sold commercially to wholesale distributors for resale within the local communities. In addition, the school will receive the revenue based upon the cost for crop production and the maintenance of the facility. The project will be rolled-out over a period of three years. In addition, a planning year will begin in 2017-2018 that includes the construction of the facility at Plantation Middle School.

### ***A Project Design That Engages Students***

CEA focuses on a computer managed facility that integrates engineering and plant science through control technology. This is a unique innovative program that will provide students with the opportunity to participate in research-based activities and problem-solving strategies to learn the principles and practices of sustainable commercial food crop production. According to the College of Agriculture and Life Sciences at Cornell University, there will be more than nine billion people inhabiting the earth by 2050. Feeding a booming global population means that agriculture must respond with increased food production for all. Students will develop an understanding of ways to produce healthy foods for the future and meet the needs of the growing global population.

Plantation Middle School curriculum will revolve around the Plant4 project while aligning with the International Baccalaureate (IB)/Middle Years Program (MYP) and IBELLA. This project aligns with the IB philosophy of international-mindedness. MYP projects promote inquiry by developing conceptual understanding within a global context. Students will explore key and related concepts through MYP including: Individuals & Society, Orientation in Space & Time, Personal & Cultural Expression, Scientific & Technical Innovation, Globalization, and Sustainability. The curriculum will be developed in collaboration with the STEM+CS Curriculum Supervisor, Civic Engagement Curriculum Supervisor from the Applied Learning Department, the school leadership team, Innovative Programs Department, and other related departments to ensure that instructional units fully integrate CEA into the core subjects aligned with the International Baccalaureate/Middle Years Project subject areas in alignment with the second tier, Reimagining Middle School, of the first goal, High Quality Instruction of the Strategic Plan.

## ***Next Steps for Program Development and the Facility***

District staff will work with key departments including but, not limited to: Applied Academics, Building Department, Information Technology, Risk Management, Facility Planning & Real Estate, Public Information Office, Innovative Programs, Teacher Professional Learning & Growth, and Safety on the logistics for the development of this project. The actual building construction will take approximately ten weeks to complete, per information received from Plant4 staff. A timeline will be developed by staff to ensure high quality planning of all aspect of this project. In addition, staff will collaborate with the City of Plantation and the school administration to ensure that community stakeholders are part of the communication and planning process.

Teachers will participate in professional development overseen by the Applied Learning Department on integration of Geo-hydroponic curriculum, agriculture in the classroom and global education. In addition, teachers will be trained in accessing and evaluating data from the Plant4 program for classroom instruction by Plant4 staff.