Please submit one signed, hard copy of all forms and attachments, as well as email the electronic version, to: Manager, Course Code Directory Office of Articulation Florida Department of Education 325 West Gaines Street, Suite 1401 Tallahassee, Florida 32399-0400 Phone: (850) 245-9543 Email: articulation@fldoe.org	# Course Code Directory ## Request to Add a New Course

DATE: 7/7/20	**SCHOOL DISTRICT:** Broward
CONTACT NAME/TITLE:	**CONTACT PHONE:**
Dr. Lisa Milenkovic Supervisor, STEM + Computer Science	754-321-2623
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COURSE TITLE:	**SUBJECT AREA:**	**SUB-SUBJECT AREA:**
Data Science Honors	Computer Science	

GRADE LEVEL(S):	**COURSE LEVEL:**	**CREDIT:**	**MEETS THE FOLLOWING HIGH SCHOOL SUBJECT AREA GRADUATION REQUIREMENT:**
☐ K-5 ☐ Middle/Junior 6-8 X 9-12/Adult ☐ Other: _____	☐ Level 1 (remedial) ☐ Level 2 (regular) X Level 3 (rigorous)	☐ 0.5 X 1.0 ☐ Multiple ☐ No value	Meets Mathematics requirement for graduation

RECOMMENDED EDUCATOR CERTIFICATION(S):

Mathematics (Grades 6-12), Middle Grades Mathematics (Middle Grades 5-9), Computer Science (K-12)

COURSE DESCRIPTION:	Please attach a course description for the recommended course that identifies the Major Concepts/Content, Special Notes, and the Course Requirements aligned with the appropriate state standards available at www.cpalms.org. See example at: http://www.cpalms.org/Public/PreviewCourse/Preview/1723
LOCAL APPROVAL:	Please attach documentation of your School Board approval of this recommended course.

PLEASE DESCRIBE THE NEED FOR THE NEW COURSE, INCLUDING THE REASON WHY AN EXISTING COURSE WILL NOT SERVE THE NEED. Requests could be supported with data indicating the need for the course. Other considerations should include existing courses that might duplicate content or credits.

According to Florida Statute **1007.2616**
(6) High school students must be provided opportunities to take computer science courses and earn technology-related industry certifications to satisfy high school graduation requirements as provided in s. 1003.4282(3). Computer science courses and technology-related industry certifications that are identified as eligible for meeting mathematics or science requirements for high school graduation must be included in the Course Code Directory.

This course is an integrated Mathematics and Computer Science course for high school students. This Data Science Honors course includes an integration of standards from both mathematics and computer science. This integration of computer science with applications in mathematics will engage students in math as it is done in academic research and the workforce, better preparing students for college and career. This Data Science course is to be a problem-based, project-based course that utilizes local partnerships and resources to teach math through various applications. Most of the 9-12 mathematics standards, as well as applicable 9-12 computer science standards have been included. Contextual learning through project-based instruction will provide opportunities for full integration of the computer science standards while developing a deep and full understanding of the mathematics standards in ways that are both rigorous and relevant.

By signing, requestor is acknowledging that the information provided as a part of this *Request to Add a New Course* is true and accurate.

_____ _____

Signature of Superintendent or Designee Date

Data Science Course Description
General Course Information and Notes

Data Science is a field of study that combines computer science (programming, databases, and algorithms) and statistical methodology, both with a strong mathematical foundation, to apply to diverse areas in ethical ways. Data scientists work in many areas, including business, economics, medicine, epidemiology, agriculture, environmental sciences, sports, and all aspects of government. With the increasing digitization and networking of society, data have become ever more ubiquitous, further expanding the demand for data scientists and their expertise in the collection, management, and analysis of data.

Students who enroll in this Data Science Honors course will:

- understand how data are used by professionals to address real-world problems;
- understand that data are used in all facets of modern life;
- understand how data support science to identify and tackle real-world problems in our communities;
- analyze statistical graphics to identify patterns in data and to connect these patterns back to the real world;
- understand that by treating photos, words, numbers, and sounds as data, we can gain insight into the real world;
- learn to analyze data, including posing questions that can be answered by considering relations among variables in a data set, using collected data to generate hypotheses for future data collection, critically evaluating shortcomings and strengths in the data and the data collection process, and informally evaluating hypotheses using data at hand.

General Notes

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Mathematics. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area

concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: http://www.cpalms.org/uploads/docs/standards/eld/MA.pdf

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Standard 1: Interpreting Data		
FLORIDA STANDARD CODE	**BEST STANDARD CODE ALIGNMENT**	**MAFS STANDARD LANGUAGE**
MAFS.912.S-ID.1.1	MA.912.DP.1.1	Represent data with plots on the real number line (dotplots, histograms, and boxplots)
MAFS.912.S-ID.1.2	MA.912.DP.2.1	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
MAFS.912.S-IS.2.5	1. MA.912.3.1 2. MA.912.DP.3.2 3. MA.912.DP.3.3	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
MAFS.912.S-ID.2.6	MA.912.DP.2.3	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

Standard 2: Making Inferences and Justifying Conclusion		
FLORIDA STANDARD CODE	**BEST STANDARD CODE ALIGNMENT**	**MAFS STANDARD LANGUAGE**
MAFS.912.S-ID.1.2 MAFS.912.S-ID.1.3	MA.912.DP.2.1	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
MAFS.912.S-ID.1.4	MA.912.DP.2.2	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Understand that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
MAFS.912.S-IC. 1.2	1. MA.912.DP.1.1 2. MA.912.DP.5.12	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation

MAFS.912.S-IC.2.6	MA.912.DP.5.12	Evaluate reports based on data.* *This standard is woven throughout the course. It is a recurring standard for every unit**
MAFS.912.S-CP.1.2	1. MA.912.DP.4.4 2. MA.912.DP.4.5 3. MA.912.DP.4.6 4. MA.912.DP.4.6	Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
MAFS.912.S-CP.2.9	1. MA.912.DP.4.9 2. MA.912.DP.4.10	Use permutations to perform [informal] inference. *This standard will be addressed in the context of data science.

Standard 3: Probability		
FLORIDA STANDARD CODE	**BEST STANDARD CODE ALIGNMENT**	**MAFS STANDARD LANGUAGE**
MAFS.912.S-IC.1.1	MA.912.DP.5.2	Understand statistics as a process for making inferences about population parameters based on a random sample from that population
MAFS.912.S-IC.2.3	1. MA.912.DP.5.5 2. MA.912.DP.5.6	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
MAFS.912.S-IC.2.6	MA.912.DP.5.12	Evaluate reports based on data.* *This standard is woven throughout the course. It is a recurring standard for every unit**

Standard 4: Algebra in RStudio		
FLORIDA STANDARD CODE	**BEST STANDARD CODE ALIGNMENT**	**MAFS STANDARD LANGUAGE**
MAFS.912.S-IC. 1.2	1. ALG 2 and H 2. LAM 1 3. Prob and Stat H	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model*

MAFS.912.S-ID.2.6	MA.912.DP.2.3	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★ a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.* b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.
MAFS.912.S-ID.3.7	MA.912.DP.2.3	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
MAFS.912.S-ID.3.8	MA.912.DP.2.5	Compute (using technology) and interpret the correlation coefficient of a linear fit

MAFS.K12.MP.1.1:	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
MAFS.K12.MP.2.1:	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of

creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

MAFS.K12.MP.3.1:

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

MAFS.K12.MP.4.1:

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

MAFS.K12.MP.5.1:

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are

	able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.
MAFS.K12.MP.6.1:	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MAFS.K12.MP.7.1:	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
MAFS.K12.MP.8.1:	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.
LAFS.1112.RST.1.3:	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LAFS.1112.RST.2.4:	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 11–12 texts and topics.
LAFS.1112.RST.3.7:	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.SL.1.1:	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. A. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. B. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. C. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. D. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.
LAFS.1112.SL.1.2:	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
LAFS.1112.SL.1.3:	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
LAFS.1112.SL.2.4:	Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
LAFS.1112.WHST.1.1:	Write arguments focused on *discipline-specific content.* E. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. F. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. G. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. H. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

I. Provide a concluding statement or section that follows from or supports the argument presented.

LAFS.1112.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LAFS.1112.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
ELD.K12.ELL.MA.1:	English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.
ELD.K12.ELL.SI.1:	English language learners communicate for social and instructional purposes within the school setting.

Body of Knowledge: COMPUTER SCIENCE - COMMUNICATION AND COLLABORATION

Standard 1: Communication and collaboration

BENCHMARK CODE	BENCHMARK
SC.912.CS-CC.1.1	Evaluate modes of communication and collaboration.
SC.912.CS-CC.1.2	Select appropriate tools within a project environment to communicate with project team members.
SC.912.CS-CC.1.3	Collect, analyze, and present information using a variety of computing devices (e.g., probes, sensors, and handheld devices).
SC.912.CS-CC.1.4	Develop a collaborative digital product using collaboration tools (e.g., version control systems and integrated development environments).
SC.912.CS-CC.1.5	Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
SC.912.CS-CC.1.6	Identify how collaboration influences the design and development of software artifacts.
SC.912.CS-CC.1.7	Evaluate program designs and implementations written by others for readability and usability.

Body of Knowledge: COMPUTER SCIENCE - COMMUNICATION SYSTEMS AND COMPUTING

Standard 1: Modeling and simulations

BENCHMARK CODE	BENCHMARK
SC.912.CS-CS.1.1	Analyze data and identify real-world patterns through modeling and simulation.
SC.912.CS-CS.1.2	Formulate, refine, and test scientific hypotheses using models and simulations.
SC.912.CS-CS.1.3	Explain how data analysis is used to enhance the understanding of complex natural and human systems.
SC.912.CS-CS.1.4	Compare techniques for analyzing massive data collections.

SC.912.CS-CS.1.5	Represent and understand natural phenomena using modeling and simulation.

Standard 3: Digital tools

BENCHMARK CODE	BENCHMARK
SC.912.CS-CS.3.1	Describe digital tools or resources to use for a real-world task based on their efficiency and effectiveness.

Body of Knowledge: COMPUTER SCIENCE - COMPUTER PRACTICES AND PROGRAMMING

Standard 1: Data analysis

BENCHMARK CODE	BENCHMARK
SC.912.CS-CP.1.1	Evaluate effective uses of Boolean logic (e.g., using “not”, “or”, “and”) to refine searches for individual and collaborative projects.
SC.912.CS-CP.1.2	Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g., qualitative interviews, surveys, prototypes, and simulations).
SC.912.CS-CP.1.3	Analyze and manipulate data collected by a variety of data collection techniques to support a hypothesis.
SC.912.CS-CP.1.4	Collect real-time data from sources such as simulations, scientific and robotic sensors, and device emulators, using this data to formulate strategies or algorithms to solve advanced problems.

Standard 2: Computer programming basics

BENCHMARK CODE	BENCHMARK
SC.912.CS-CP.2.6	Describe a variety of commonly used programming languages.

Standard 3: Programming applications

BENCHMARK CODE	BENCHMARK
SC.912.CS-CP.3.1	Create a computational artifact, individually and collaboratively, followed by reflection, analysis, and iteration (e.g., data-set analysis program for science and engineering fair, capstone project that includes a program, term research project based on program data).

Body of Knowledge: COMPUTER SCIENCE - PERSONAL, COMMUNITY, GLOBAL, AND ETHICAL IMPACT

Standard 1: Responsible use of technology and information

BENCHMARK CODE	BENCHMARK

SC.912.CS-PC.1.2	Describe and demonstrate ethical and responsible use of modern communication media and devices.
SC.912.CS-PC.1.3	Evaluate the impacts of irresponsible use of information (e.g., plagiarism and falsification of data) on collaborative projects.

Standard 2: The impact of computing resources on local and global society

BENCHMARK CODE	BENCHMARK
SC.912.CS-PC.2.1	Describe how the Internet facilitates global communication.
SC.912.CS-PC.2.12	Explore a variety of careers to which computing is central.
SC.912.CS-PC.2.13	Predict future careers and the technologies that may exist based on current technology trends.
SC.912.CS-PC.2.2	Identify ways to use technology to support lifelong learning.
SC.912.CS-PC.2.6	Describe the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization, and cloud computing).

Standard 3: Evaluation of digital information resources

BENCHMARK CODE	BENCHMARK
SC.912.CS-PC.3.1	Evaluate the quality of digital resources for reliability (i.e., currency, relevancy, authority, accuracy, and purpose of digital information).
SC.912.CS-PC.3.2	Evaluate the accuracy, relevance, comprehensiveness, appropriateness, and bias of electronic information resources.
SC.912.CS-PC.3.3	Conduct research using peer reviewed articles, newspapers, magazine articles, and online books.
SC.912.CS-PC.3.4	Analyze and evaluate public/government resources and describe how using these resources for communication can affect change.