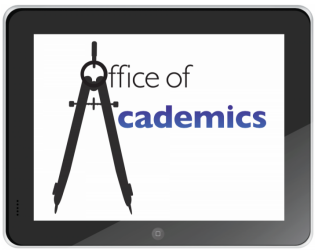

INNOVATION CONFIGURATION

Computer Science

2017 – 2020

Chief: Daniel Gohl

Director: Susan Cantrick

Course Group Number: 39001252

Purpose

BCPS is a national model for STEM+C (science, technology, engineering, math and computer science). The STEM+C Program supports computer science (CS) instructors in teaching of computational thinking, computer science principles, and programming. Participating teachers, guidance counselors and administrators will exhibit the desired outcomes of the Innovation Configuration.

In 2013, BCPS became the first school district in the nation to partner with Code.org to increase access to computer science courses, curriculum and resources in schools. Since then, BCPS has also been named a Regional Partner with Code.org, which provides additional funding to build a community for computer science.

Needs Assessment

Computing has become an integral part of the practice of in modern science, technology engineering, and mathematics (STEM) fields. As a result, the STEM+Computing (STEM+C) program seeks to integrate the use of computational approaches in K-12 STEM teaching and learning and understand how this integration can improve STEM learning, engagement, and persistence.

As a Regional Partner with Code.org, the District is building a community for CS, creating a cohort of 20 master teacher trainers and increasing the number of computer science trained K-12 teachers from 500 to over 1,000. Through the District's #BrowardCodes initiative, in 2016/17 more than 50,000 students were positively impacted by computer science offerings at 100 percent of K-12 schools. The goal of the #BrowardCODES initiative is to sustain and broaden participation and enrollment by hosting clubs, computer science fairs and app challenges/codefests, in partnership with events and initiatives within BCPS that are not typically related to computer science.

Desired Outcomes

The tables on the following pages describe the Desired Outcomes for professional learning in support of each role associated with this Innovation Configuration. A summary of Desired Outcomes is below:

1.0 Teacher/Individual (pp. X – X)

- 1.1 Computational Thinking, and Knowledge of Problem Solving and Algorithms. Desired Outcome: Enable students to better conceptualize, analyze, and solve problems by selecting and applying appropriate strategies and tools both in the virtual and physical world.
- 1.2 Collaboration. Desired Outcome: Provide opportunities for students to work cooperatively with fellow students, using technology.
- 1.3 Computing Practice, Programming, and Pedagogy. Desired Outcome: Use computational tools and have knowledge of computer programming.
- 1.4 Computer and Communications Devices. Desired Outcome: Understand the elements of modern computer and communication devices and networks
- 1.5 Community, Global, and Ethical Impacts. Desired Outcome: Practice the norms of ethical use.

Desired Outcomes and Performance Indicators

1.0 Teacher/Individual			
1.1 Computational Thinking, and Knowledge of Problem Solving and Algorithms. Desired Outcome: Enable students to better conceptualize, analyze, and solve problems by selecting and applying appropriate strategies and tools both in the virtual and physical world.			
Performance Indicators			
Level 4	Level 3	Level 2	Level 1
Teachers use strategies to enable student computational thinking used across all disciplines to solve problems. Provide an environment where students create new knowledge, tools, and processes. Promote student reflection and understanding of the power and limitations of computing in the modern age Provide situations for students to solve problems by selecting and applying appropriate strategies and tools, virtually and in the real world. Distinguishes between classes of algorithmic constructs (sequence, decision, iteration) Distinguish between data structure types.	Teachers provide scaffolding and practice opportunities to enable students (you do) to master computational thinking used. Teachers provide an environment for students to discuss and solve problems in the virtual as well as the physical world. Collaborate with colleagues face-to-face and virtually to promote knowledge construction Trace an algorithm and predict outputs for given output Identify appropriate and efficient search algorithms for linear structures (sequential, binary).	Teachers explain (we do) processes necessary to solve a problem. Teachers provide an environment for students to discuss and solve problems in the physical world. Distinguishes between object-oriented and procedural programming paradigms. Identifies problems appropriate for a computer solution. Distinguishes between instance, class and local method variables in an object oriented program.	Teachers model (I do) processes necessary to solve a problem. Identify stages of software development process (problem definition, analysis, design, implementation, testing, maintenance) Identify appropriate algorithm for given problem. Identify minimum set of data necessary for testing a computer solution. Identify key features of object oriented programs.

1.2 Collaboration. Desired Outcome: Provide opportunities for students to work cooperatively with fellow students, using technology.			
Performance Indicators			
Level 4	Level 3	Level 2	Level 1
Teacher provides environment for students to use online resources and participate in collaborative problem solving activities experts as well as peer groups globally. Teacher provides multimedia and productivity tools for group learning exercises. Teacher promotes student project planning and project management.	Teacher provides environment for students to use online resources and participate in collaborative problem solving activities with peers. Organizes physical classroom layout to focus on learning. Teacher provides instruction and model for students to develop constructive criticism on peer work.	Enhance collaborative abilities by participating in teams to solve problems relevant to daily lives. Teacher provides venues and processes for student team communication. Organizes students to collaborate.	Teachers provide opportunities for students to gather information and communicate with others using a variety of devices.
1.3 Computing Practice, Programming, and Pedagogy. Desired Outcome: Use computational tools and have knowledge of computer programming.			
Performance Indicators			
Level 4	Level 3	Level 2	Level 1
Explore the use of programming in solving problems Select appropriate file and database formats for a particular computational problem Identify strengths and weaknesses of object-oriented and procedural languages. Identify and apply appropriate accommodations and adaptations for students with exceptionalities.	Use appropriate application program interfaces (APIs) Debug a program segment containing errors associated with subroutines, functions, methods and interacting objects. Use appropriate instructional strategies for teaching computer science. Use appropriate assessment strategies for teaching computer science.	Use appropriate Software tools and libraries to help solve algorithmic and computational problems Predict the output of a given program containing sequential, conditional and iteration statements. Use effective management strategies for teaching computer science.	Understand broad array of opportunities computer science knowledge can provide across fields and disciplines. Identify error types. Identify appropriate internal documentation for a group of program statements.

1.4 Computer and Communications Devices. Desired Outcome: Understand the elements of modern computer and communication devices and networks			
Performance Indicators			
Level 4	Level 3	Level 2	Level 1
Provide an environment that facilitates global communication and how to practice good global internet citizenship Distinguish between serial and data transfers Identify advantages and disadvantages of programs that are compiled or interpreted.	Demonstrate and models how to practice good global internet citizenship Explain the features and functions of productivity software. Explain why a computer translates SW into a machine-executable form	Identify advantages and disadvantages of various storage media Distinguish between various types of wired and wireless computer networks Identify advantages and disadvantages of different types of internet connectivity.	Teachers use appropriate and accurate terminology when communicating about technology Teachers identify components of a computer and network systems and their functions Teachers identify functions of a computer system Teachers identify features and functions of web browsers and search engines.
1.5 Community, Global, and Ethical Impacts. Desired Outcome: Practice the norms of ethical use.			
Performance Indicators			
Level 4	Level 3	Level 2	Level 1
Include respect for copyright, intellectual property, and the appropriate documentation of sources in teaching. Promote and model digital etiquette and responsible social interactions related to the use of technology and information Develop and model cultural understanding and global awareness by engaging with colleagues and students of other cultures using digital age communication and collaboration tools	Teach safe, legal, and ethical use of digital information and technology. Implement and evaluate learner-centered strategies to determine if all learners are receiving equitable access to digital tools and resources. Create new content on digital etiquette and responsible social interactions related to the use of technology and information. Provide opportunities for students to evaluate reliability and accuracy	Advocate and model, safe, legal, and ethical use of digital information and technology. Develop learner-centered strategies to address the diverse needs of all learners. Adapt instruction on social responsibility to incorporate digital tools and resources including network security and Software licensing. Appreciate adaptive technologies in lives of people with disabilities.	Demonstrate between appropriate and inappropriate social networking behaviors. Advocate personal privacy, safe, legal, and ethical use of digital information and technology. Identify students' interests, backgrounds, and use of and access to digital tools and resources. Transfer instruction on social responsibility to the digital environment.

Provide opportunities for students to explain the impact of computers on international communication.	of information they receive from the Internet.	Explain the positive and negative effects of computers on society.	Identify features and functions of security software.

Data Collection Plan			
Level of Measurement	Instrument/Data Type	Frequency	Person Responsible for Collecting Data
Quality of Professional Learning	Workshop participation, completion Teacher Feedback Teacher Surveys	1x/workshop	PD Standards & Support
Teacher Practices	Teacher Survey for Computer Science IC Technology Integration Matrix: Provide opportunities for students to work cooperatively using technology; use computational tools. K-12 CS Certification rate	1x/year	District Administrators
Student Learning	Student enrollment Student grades in courses AP CSP Exam participation, scores AP CS-A Exam participation, scores Demographics of enrolled students Student survey results	1x/year 2x/year 1x/year 1x/year 1x/year 2x/year	Student Assessment & Research Code.org Evaluators

Mid-Year and End-of-Year Evaluation Plan		
Quality and Fidelity of Implementation		
Level of Impact	Mid-Year Evaluation	End-of-Year Evaluation
Teacher/Individual	Workshop attendance, completion MLP Feedback Forms Code.org teacher surveys	Summary of MLP Feedback Form Data. Evaluation Summary from Code.org external evaluator Outlier
Impact on Practice		
Level of Impact	Mid-Year Evaluation	End-of-Year Evaluation
Teacher/Individual	Student enrollment in K-12 computer science individual courses and CS pathway Technology Integration Matrix Observation Tool: Provide opportunities for students to work cooperatively using technology; use computational tools. Mid-year teacher surveys	Teacher submission of evidence of implementation End-of-year teacher surveys Rate of successful K-12 Computer Science Certification
Impact on Student Achievement		
Level of Impact	Mid-Year Evaluation	End-of-Year Evaluation
Teacher/Individual	Student enrollment in K-12 computer science individual courses and CS pathway, as a whole and disaggregated by demographic variables Student participation in STEM and Computer Science activities, events and contests Mid-year student surveys distributed by Code.org	Student participation in Code Studio online activities and year-long courses Student achievement on AP Computer Science Principles, AP Computer Science A, AICE Computing AS, and AICE Computing A examinations End-of-year surveys and evaluation summary conducted by Code.org and its evaluator Outlier