**Montclair State University**

**K12 Computer Science Education Curriculum Map**

| **Grade 3-5** | **Performance Range** |
| --- | --- |
| **NJ Core Concept** | **Standards** | **Introduction** | **Familiar** | **Proficient** |
| Computing SystemsPeople interact with a wide variety of computing devices that collect, store, analyze, and act upon information in ways that can affect human capabilities both positively and negatively. The physical components (hardware) and instructions (software) that make up a computing system communicate and process information in digital form. | Computing devices may be connected to other devices to form a system as a way to extend their capabilities.Performance Expectation: 8.1.5.CS.1: Model how computing devices connect to other components to form a system.  | Identify the external and internal parts of a system and explain their respective functions.  | Describe how external and internal parts of a system function separately and together.  | Describe and model how external hardware (e.g.printers, scanners), internal components (e.g., hard drive, memory, motherboard), form a system.  |
| Software and hardware work together as a system to accomplish tasks (e.g., sending, receiving, processing, and storing units of information). Performance Expectation: 8.1.5.CS.2: Model how computer software and hardware work together as a system to accomplish tasks.  | Identify how computer software and hardware can work together to accomplish tasks.  | Describe how computer software and hardware work together. Identify how the software and hardware connect and work together as a system.  | Model and explain how computer software and hardware work together as a system to accomplish tasks.  |
| Shared features allow for common troubleshooting strategies that can be effective for many systems. Performance Expectation: 8.1.5.CS.3: Identify potential solutions for simple hardware and software problems using common troubleshooting strategies.  | Identify common hardware and software problems that test different strategies to find a solution.  | Identify common hardware and software problems that can occur and apply different strategies to find a solution.  | Identify common hardware and software problems that can occur and apply different strategies as troubleshooting strategies.  |
| Networks and the InternetComputing devices typically do not operate in isolation. Networks connect computing devices to share information and resources and are an increasingly integral part of computing. Networks and communication systems provide greater connectivity in the computing world. | Information needs a physical or wireless path to travel to be sent and received.Performance Expectation: 8.1.5.NI.1: Develop models that successfully transmit and receive information using both wired and wireless methods. Distinguishing between public and private information is important for safe and secure online interactions. Information can be protected using various security measures (i.e., physical and digital). Performance Expectation: 8.1.5.NI.2: Describe physical and digital security measures for protecting sensitive personal information.  | 8.1.5.NI.1: Recognize how information is decomposed and transmitted to devices that receive information using both wired and wireless methods. 8.1.5.NI.2: Identify when a device is connected to the Internet, it enables individuals to connect with others worldwide.  |  8.1.5.NI.1: Explain how information is decomposed into packets that are transmitted to devices.8.1.5.NI.2: Explain how to access the Internet to connect with others worldwide. | 8.1.5.NI.1: Model how information is decomposed into packets that are transmitted to devices that receive information using both wired and wireless methods. 8.1.5.NI.2: Describe how the Internet enables individuals to connect with others worldwide. |
| Impacts of ComputingComputing affects many aspects of the world in both positive and negative ways at local, national, and global levels. Individuals and communities influence computing through their behaviors and cultural and social interactions, and, in turn, computing influences new cultural practices.  | The development and modification of computing technology is driven by an individual's needs and wants and can affect individuals differently. Performance Expectation: • 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes. • 8.1.5.IC.2: Identify possible ways to improve the accessibility and usability of computing technologies to address the diverse needs and wants of users. | 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live.8.1.5.IC.2: Recall one wayways to improve the accessibility and usability of computing technologies. | 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe one way it helps what they do in everyday life. 8.1.5.IC.2: Describe one way to improve the accessibility and usability of computing technologies to address the diverse needs and wants of users. | 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that had a positive and negative influence on their everyday life. 8.1.5.IC.2: Identify more than one way to improve the accessibility and usability of computing technologies to address the diverse needs and wants of users. |
| Data & AnalysisComputing systems exist to process data(text, images, sound, and video). The amount of digital data generated in the world is rapidly expanding, so the need to process data effectively is increasingly important. Data is collected and stored so that it can be analyzed to better understand the world and make more accurate predictions. | Data can be organized, displayed, and presented to highlight relationships. Performance Expectation:8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.  | 8.1.5.DA.1: With support, collect, organize, display, and present data in various ways in order to communicate insights gained from different views of the data. | • 8.1.5.DA.3: Collect, organize, display, and present data in order to communicate insights gained from different views of the data.  | 8.1.5.DA.1: Collect, organize, display, and present data in various ways in order to communicate insights gained from different views of the data. |
| The type of data being stored affects the storage requirements. 8.1.5.DA.2: Compare the amount of storage space required for different types of data.  | 8.1.5.DA.2: Observe and identify that different kinds of information can be stored in different formats such as paper or on the computer (e.g., file type, file size, file compression). | 8.1.5.DA.2: Recognize how to store different data and information for unique purposes (file type, file size, file compression, etc). Compare data to types of data storage. | 8.1.5.DA.2: Store and convert unique types of information to be used into various formats across multiple software/hardware.  |
| Individuals can select, organize, and transform data into different visual representations and communicate insights gained from the data. • 8.1.5.DA.3: Organize and present collected data visually to communicate insights gained from different views of the data. • 8.1.5.DA.4: Organize and present climate change data visually to highlight relationships or support a claim.  | 8.1.5.DA.3: Organize data (numbers or text) visually in more than one way (e.g., charts, graphs, tables). Discuss with others if the visual accurately reflects the data.8.1.5.DA.4: Organize and present climate change data visually to highlight relationships or support a claim.  | 8.1.5.DA.3: Organize and present data visually to communicate insights gained from different views of the data. 8.1.5.DA.4: Organize and present climate change data visually to highlight relationships or support a claim.  | 8.1.5.DA.3: Organize, interpret, and present collected data visually to communicate insights gained from different views of the data. 8.1.5.DA.4: Organize and present climate change data visually to highlight relationships or support a claim.  |
|  | Many factors influence the accuracy of inferences and predictions. Performance Expectation: 8.1.5.DA.5: Propose cause and effect relationships, predict outcomes, or communicate ideas using data.  | 8.1.5.DA.5: Propose a cause and effect relationship, predict outcomes.  | 8.1.5.DA.5: Propose cause and effect relationships, predict outcomes with accuracy and include detail. | 8.1.5.DA.5: Propose cause and effect relationships, predict outcomes, with accuracy and include detail. Communicate ideas using data.  |
| Algorithms & ProgrammingAn algorithm is a sequence of steps designed to accomplish a specific task. Algorithms are translated into programs, or code, to provide instructions for computing devices. Algorithms and programming control all computing systems, empowering people to communicate with the world in new ways and solve compelling problems. | Different algorithms can achieve the same result. Some algorithms are more appropriate for a specific use than others. Performance Expectation: 8.1.5.AP.1: Compare and refine multiple algorithms for the same task and determine which is the most appropriate.  | 8.1.5.AP.1: Identify multiple algorithms for the same task and determine which is the most appropriate.  | 8.1.5.AP.1: Compare multiple algorithms for the same task and determine which is the most appropriate.  | 8.1.5.AP.1: Compare and refine multiple algorithms for the same task and determine which is the most appropriate.  |
| Programming languages provide variables, which are used to store and modify data. Performance Expectation: 8.1.5.AP.2: Create programs that use clearly named variables to store and modify data.  | Identify variables(e.g., numbers, words, colors, images) that are stored and converted into data.  | Define what the variable/program should do and create an if then statement to represent information.  | Create and develop computational programs to represent information between different forms of data.  |
| A variety of control structures are used to change the flow of program execution (e.g., sequences, events, loops, conditionals). Performance Expectation: 8.1.5.AP.3: Create programs that include sequences, events, loops, and conditionals.  | Identify the overall goal or task to be accomplished for a particular algorithm and program.  | Explain and analyze each step of an algorithm or program that helps accomplish tasks. l | Develop algorithms or programs that use repetition, loops, and conditionals for a specific task. |
| Programs can be broken down into smaller parts to facilitate their design, implementation, and review. Programs can also be created by incorporating smaller portions of programs that already exist.Performance Expectation: • 8.1.5.AP.4: Break down problems into smaller, manageable sub-problems to facilitate program development. • 8.1.5.AP.5: Modify, remix, or incorporate pieces of existing programs into one’s own work to add additional features or create a new program.  | • 8.1.5.AP.4: Decompose a problem into smaller, manageable sub-problems. • 8.1.5.AP.5: Modify, and remix pieces of existing programs into one’s own work.  | • 8.1.5.AP.4: Decompose problems into smaller subproblems to develop a program.• 8.1.5.AP.5: Modify and remix pieces of existing programs into one’s own work to add additional features or create a new program.  | • 8.1.5.AP.4: Decompose problems into smaller, manageable sub-problems to facilitate program development. • 8.1.5.AP.5: Modify, remix, or incorporate pieces of existing programs into one’s own work to add additional features or create a new program.  |
| People work together to develop programs for a purpose, such as expressing ideas or addressing problems. The development of a program involves identifying a sequence of events, goals, and expected outcomes, and addressing errors (when necessary). Performance Expectation: • 8.1.2.AP.5: Describe a program’s sequence of events, goals, and expected outcomes. • 8.1.2.AP.6: Debug errors in an algorithm or program that includes sequences and simple loops.  | • 8.1.2.AP.5: Identify a program’s sequence of events, goals, and expected outcomes. • 8.1.2.AP.6: Debug errors in an algorithm or program.  | • 8.1.2.AP.5: Describe a program’s sequence of events, goals, and expected outcomes. • 8.1.2.AP.6: Debug simple errors in an algorithm or program that includes sequences and simple loops.  | • 8.1.2.AP.5: Systematically describe a program’s sequence of events, goals, and expected outcomes. • 8.1.2.AP.6: Debug errors in an algorithm or program that includes sequences and simple loops.  |
|  | Individuals develop programs using an iterative process involving design, implementation, testing, and review. 8.1.5.AP.6: Develop programs using an iterative process, implement the program design, and test the program to ensure it works as intended.  | 8.1.5.AP.6: Use an iterative process to plan and implement the program design.  | 8.1.5.AP.6: Use an iterative process to plan and implement the program design, and test the program to ensure it works as intended. Use design tools to create a model of the program.  | 8.1.5.AP.6: Develop programs using an iterative process to plan and implement the program design, and test the program to ensure it works as intended and can be improved. |