**Montclair State University**

**K12 Computer Science Education Curriculum Map**

| **Grades K-2** | | **Performance Range** | | | **Instructional Resources** |
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| **NJ Core Concept** | **Standards** | **Introduction** | **Familiar** | **Proficient** |
| **Computing Systems**  People 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. | Individuals use computing devices to perform a variety of tasks accurately and quickly. Computing devices interpret and follow the instructions they are given literally.  Performance Expectation:  8.1.2.CS.1: Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences. | Identify and operate common computing devices and external hardware in different environments by name (mobile device, desktop computer, laptop computer, mouse, keyboard, wearable, etc.) to perform a specific function. | Identify and operate common computing devices and external hardware in different environments by name (mobile device, desktop computer, laptop computer, mouse, keyboard, wearable, etc.), and describe their function, and operate the device. | Identify and operate common computing devices, external hardware (e.g.printers, scanners), internal components (e.g., hard drive, memory, motherboard), and their essential functions. Name, explain,and operate the device and external storage (e.g., cloud storage). | **Resources for Teachers:**  How Computers Work, Compilation video: <https://youtu.be/Rv73ki6fTuo>  Inside Your Computer video: <https://youtu.be/AkFi90lZmXA>  Everyday Computing:  <http://everydaycomputing.org/public/visualization/>  **Resource for students:**  Technology I - Vocabulary for Kids: <https://youtu.be/AkFi90lZmXA> |
| A computing system is composed of software and hardware.  Performance Expectation:  8.1.2.CS.2: Identify common computing devices and external hardware in different environments by name (mobile device, desktop computer, laptop computer, mouse, keyboard, wearable, etc.). | Identify common computing devices and external hardware in different environments by name (mobile device, desktop computer, laptop computer, mouse, keyboard, wearable, etc.). | Identify and describe functions of common computing devices and external hardware (e.g., mobile devices, desktop computer, laptop computer, mouse, keyboard, printer, wearables) and software. | Identify internal and external components of a computer system and their basic functions (e.g., hard drive and memory) as well as peripherals (e.g., printers, scanners, external hard drives) and external storage features and their uses (e.g., cloud storage). |  |
| Describing a problem is the first step toward finding a solution when computing systems do not work as expected. Performance Expectation:  8.1.2.CS.3: Describe basic hardware and software problems using accurate terminology. | Identify basic hardware or software problems using correct terminology. Students should be able to communicate problems using correct terminology (e.g. app or program not working as expected, device not turning on, sound not working, etc.). | Describe basic hardware and software problems that may occur during use (e.g. app or program not working as expected, device not turning on, sound not working, etc.) Communicate using technical terms. | Explain basic hardware and software problems that may occur during use (e.g. app or program not working as expected, device not turning on, sound not working, etc.) Communicate using technical terms. Summarize troubleshooting techniques to solve basic hardware problems. |  |
| **Networks and the Internet**  Computing 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. | Computer networks can be used to connect individuals to other individuals, places, information, and ideas. The Internet enables individuals to connect with others worldwide.  Performance Expectation:  • 8.1.2.NI.1: Model and describe how individuals use computers to connect to other individuals, places, information, and ideas through a network.  • 8.1.2.NI.2: Describe how the Internet enables individuals to connect with others worldwide. | 8.1.2.NI.1: Recall how individuals use computers to connect to other individuals, places, information, and ideas through a network.  8.1.2.NI.2: Recognize that when a device is connected to the Internet, it enables individuals to connect with others worldwide. | 8.1.2.NI.3: Explain that information is shared between devices that are connected to each other. Recognize the need for security to keep information safe.  8.1.2.NI.2: Explain how to access the Internet to connect with others everywhere. | 8.1.2.NI.1: Model and explain that information can be shared when your computing device is connected to other devices (e.g. printers, scanners, internet, displays).  Identify the difference between strong and weak passwords and the importance of choosing strong passwords to protect your device and information from unauthorized users.  8.1.2.NI.2: Describe how networks connect to other networks on the Internet to connect with others worldwide. | Teacher Resources:  World Science Festival: A Packet’s Tale  <https://youtu.be/ewrBalT_eBM>  Vox: How does the internet work? Glad you asked.  <https://youtu.be/TNQsmPf24go> |
| Connecting devices to a network or the Internet provides great benefits, but care must be taken to use authentication measures, such as strong passwords, to protect devices and information from unauthorized access.  Performance Expectation:  • 8.1.2.NI.3: Create a password that secures access to a device. Explain why it is important to create unique passwords that are not shared with others.  • 8.1.2.NI.4: Explain why access to devices need to be secured. | 8.1.2.NI.3:Recall why a password helps to keep information a secret.  8.1.2.NI.4: Practice keeping passwords in a safe place.. | 8.1.2.NI.3:Create a password that secures access to a device. Describe the need to create passwords that are not shared with others.  8.1.2.NI.4: Describe why passwords cannot be shared. | 8.1.2.NI.3: Create a complex password that secures access to a device. Explain why it is important to create unique passwords that are not shared with others.  8.1.2.NI.4: Explain why access to devices need to be secured. | Resources for teachers:  Teacher Resource:  [RBC Cyber Security - Powerful Passwords](https://youtu.be/IhlXtBNNuKs) |
| **Impacts of Computing**  Computing 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. | Computing technology has positively and negatively changed the way individuals live and work (e.g., entertainment, communication, productivity tools). 8.1.2.IC.1: Compare how individuals live and work before and after the implementation of new computing technology. | 8.1.2.IC.1: Compare and contrast the impact of new computing technology in everyday life. | 8.1.2.IC.1: Compare the impact of new computing technology in everyday life. Computer technology has changed the way people live and work, for better or worse  Explain how computer technology has changed the way people live and work, for better or worse. | 8.1.2.IC.1: Compare and contrast the impact of new computing technology in everyday life. Identify the pros and cons of computing technology, and how it impacts people and their communities.  Present a possible solution to address one or more of the “cons” of computing technology. |  |
| **Data & Analysis**  Computing systems exist to process data. 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. | Individuals collect, use, and display data about individuals and the world around them.  Performance Expectation:  8.1.2.DA.1: Collect and present data, including climate change data, in various visual formats. | 8.1.2.DA.1: Practice organizing data from the world around them into visualizations, such as a bar graph, pie chart, or pictograph. | 8.1.2.DA.1: Collect and organize data from the world around them into a visualization, such as a bar graph, pie chart, or pictograph. | 8.1.2.DA.1: Collect and organize data from the world around them, including climate change data, into two or more visualizations, such as a bar graph, pie chart, or pictograph. Present and interpret the data to others.  Make a recommendation based on your analysis on what can be done to make an improvement. |  |
| Computers store data that can be retrieved later. Data can be copied, stored in multiple locations, and retrieved.  Performance Expectation:  8.1.2.DA.2: Store, copy, search, retrieve, modify, and delete data using a computing device. | 8.1.2.DA.2:  Recognize that information can be stored and processed by a computing device. | 8.1.2.DA.2: Explain the phrases: copy data, search for data, retrieve data, modify data, and delete data | 8.1.2.DA.2: Store, copy, search, retrieve, modify, and delete data using a computing device based on a real- world simulation.  Describe the reasoning behind performing any of these actions.. |  |
| Data can be used to make predictions about the world.  Performance Expectation:  • 8.1.2.DA.3:  Identify and describe patterns in data visualizations. | • 8.1.2.DA.3:  Identify data and describe patterns in different ways data can be represented such as bar graph, pictograph, line plot, line graph, pie graph. | • 8.1.2.DA.3: Interpret and analyze the data by dentifying patterns in data visualizations - bar graph, pictograph, line plot, line graph, pie chart. | • 8.1.2.DA.3: Identify and describe patterns in data visualizations - bar graph, pictograph, line plot, line graph, pie chart.  Create a data visualization by collecting data. Demonstrate how multiple possible analyses of the same data set can be presented. |  |
| Data can be used to make predictions about the world.  • 8.1.2.DA.4: Make predictions based on data using charts or graphs. | 8.1.2.DA.4: Make connections between data and its meaning.  Practice how to make a prediction based on data. | 8.1.2.DA.4: Look at various charts and graphs and make predictions. | 8.1.2.DA.4: Make a prediction based on the patterns in charts or graphs.  Discuss the data will help gain a better understanding and explanation of the data in order to make an informed prediction. |  |
| **Algorithms & Programming**  An 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. | Individuals develop and follow directions as part of daily life. A sequence of steps can be expressed as an algorithm that a computer can process.  Performance Expectation:  8.1.2.AP.1: Model daily processes by creating and following algorithms to complete tasks. | 8.1.2.AP.1: Identify the steps of an algorithm using a daily task to support. | 8.1.2.AP.1: Explain an algorithm used to complete a daily task. | 8.1.2.AP.1: Change to - Demonstrate and create an algorithm used to complete a daily task.  Define and explain the importance of accurately following the steps of an algorithm to complete a daily task. | Teacher Resources:  <https://studio.code.org/s/courseb-2022>  <https://www.codemonkey.com/hour-of-code/codemonkey-jr/>  <https://game.kodable.com/hour-of-code#self-guided> |
| Real world information can be stored and manipulated in programs as data (e.g., numbers, words, colors, images).  Performance Expectation:  8.1.2.AP.2: Model the way programs store and manipulate data by using numbers or other symbols to represent information. | 8.1.2.AP.2: Observe and discuss the way programs store and manipulate data by using numbers or other symbols to represent information, with support. | 8.1.2.AP.2: Model the way programs store and manipulate data by using numbers or other symbols to represent information. | 8.1.2.AP.2: Model the way programs store and manipulate data in the real world using computer programs that represent information in different ways (e.g., use thumbs up/down, arrows when writing algorithms to represent direction, or encode and decode wors using numbers, pictographs, or other symbols to represent letters or words) |  |
| Computers follow precise sequences of steps that automate tasks.  Performance Expectation:  8.1.2.AP.3: Create programs with sequences and simple loops to accomplish tasks. | 8.1.2.AP.3: Create programs with sequences and simple loops to accomplish tasks, with support. | 8.1.2.AP.3: Create programs with sequences and simple loops for repetition of a sequence of code multiple times and to complete a task. | 8.1.2.AP.3: Create programs with sequences and simple loops for repetition of a sequence of code to complete a task independently. |  |
| Complex tasks can be broken down into simpler instructions, some of which can be broken down even further. Performance Expectation:  8.1.2.AP.4: Break down a task into a sequence of steps. | 8.1.2.AP.4: Decompose a task into a sequence of steps with guidance. | 8.1.2.AP.4: Decompose a task into a sequence of steps. | 8.1.2.AP.4: Decompose a complex task into a sequence of steps. |  |
| 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:create a planning document to show the sequence of events, goals, and expected outcomes (e.g. story map, storyboard, a sequential graphic organizer) with support.  • 8.1.2.AP. use various strategies to identify a strategy to debug errors in an algorithm or program that includes sequences and simple loops, with support. | • 8.1.2.AP.5: Create a planning document to show the sequence of events, goals, and expected outcomes (e.g. story map, storyboard, a sequential graphic organizer).  • 8.1.2.AP.6: Students use various strategies to debug errors in an algorithm that includes sequences and simple loops. | • 8.1.2.AP.5: Students can create detailed planning documents to describe a program’s sequence of events. Use story maps, storyboards, or sequential graphic organizers..  • 8.1.2.AP.6: Students use various strategies to debug errors in an algorithm or a simple program that includes sequences and simple loops. |  |