



Ohio

Ohio's Model Curriculum for Computer Science

Grade 5

ADOPTED SEPT. 2022

Strand	Computing Systems
Topic	Devices
<p>CS.D.5.a Explore the internal parts of the computing system and their function to understand and describe the role they play in a computer system.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students developed their understanding of what external components are used to share information. In grade 5, students develop their understanding of the internal parts of the computer and how they play a role in the computer system. In grade 6, students will apply knowledge to identify the benefits and limitations of devices.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Different internal parts of a computer have different purposes. • Each internal component has a different function in a computer system. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Identify key internal components (i.e., parts) such as RAM, hard drive, CPU, motherboard, etc. • Describe the function of each of the key internal components. • Describe the internal components of the selected device. <p>Content Elaborations</p> <p>CLARIFICATIONS Internal components (i.e., parts) at this grade level focus on RAM, hard drive, CPU and the motherboard. Students do not need to have an in-depth understanding of these.</p> <p>CONTENT FOCUS The focus should be on students understanding the role major internal components (i.e., parts) play in a computing system. Unlike external components which are not all needed for a device to function, internal components are critical to the device running properly.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 2. Collaborating Around Computing</i> 4. Evaluate and select technological tools that can be used to collaborate on a project.</p>

Strand	Computing Systems
Topic	Hardware/Software
<p>CS.HS.5.a Evaluate digital learning tools/devices to support planning, implementing and reflecting across curricular areas.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students continued to select learning tools/devices and used them to aid in planning, implementing and reflecting on given tasks. In grade 5, students use and evaluate the digital learning tools and devices they've chosen and consider the planning, implementation and reflection across curricular areas. In grade 6, students will look at the ways hardware and software components come together in a computer system to complete a task.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Software and hardware need to be chosen and evaluated to ensure they support the task. • Learning tools should be used for planning, implementing and reflecting across curricular areas. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Verbally evaluate the tools and devices chosen to accomplish tasks for their usefulness in planning, implementing and reflecting. • Use and verbally evaluate tools across curricular areas. <p>Content Elaborations</p> <p>CLARIFICATIONS Students should recognize if the tool or device they have chosen is appropriate for the task. For example, if the assignment is to make a presentation, a word processing program would not be the best selection. Tasks should be cross-curricular (i.e., blending math, science and computer science, or tasks that require an analysis of data from science or social studies).</p> <p>CONTENT FOCUS The focus is on students using and evaluating tools in cross-curricular tasks.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 2. Collaborating Around Computing</i> 4. Evaluate and select technological tools that can be used to collaborate on a project.</p>

Strand	Computing Systems	
Topic		Troubleshooting
<p>CS.T.5.a Diagnose problems and develop strategies to resolve technology issues.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students focused on diagnosing and describing potential hardware and software problems. In grade 5, students work to diagnose problems, describe the problem, and develop strategies to resolve technology issues. In grade 6, the problems will become more advanced. It will require a combination of critical thinking skills and basic knowledge of computing hardware and software to identify the problem.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Multiple troubleshooting strategies exist for each issue. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Diagnose problems in hardware and software. • Apply a solution for the problem. • Describe the problem and reason for the problem in detail. <p>Content Elaborations</p> <p>CLARIFICATIONS Students are working on diagnosing problems, describing them and applying a solution where appropriate. Students should be able to describe the problem to a peer or adult. Students should be able to troubleshoot their problems. Problems may include an unplugged computer, a computer not connecting to the network or a program not loading. Troubleshooting should also occur within individual programs, such as a block-based coding environment or a word processing program.</p> <p>CONTENT FOCUS The focus is on students diagnosing problems, describing them and applying a potential fix.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 6. Testing and Refining Computational Artifacts</i> 2. Identify and fix errors using a systematic process.</p>	

Strand	Networks and the Internet
Topic	Networking
<p>NI.N.5.a Model how information is broken down to be transmitted and then reassembled to help students gain a better understanding of the internet and networks.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students described how information is broken apart, sent, and received over the internet. In grade 5, students demonstrate how information is broken apart, sent and reassembled when received over the internet. In grade 6, students will explore the protocols (i.e., rules) in transmitting data across the internet.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Manipulating a URL (i.e., web address) can change what information is accessed. • Information is broken into packets (i.e., parts) at the sending point and reassembled at the receiving point. • Information is sent to specific places based on web addresses. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Modify a URL (i.e., web address) to access the content. • Demonstrate what occurs when a URL is modified. • Use a metaphorical example to describe how information is broken down into parts and reassembled. <p>Content Elaborations</p> <p>CLARIFICATIONS Students begin manipulating a URL to access desired information within a site. Students begin using applications to shorten web addresses for ease of access.</p> <p>An example of a metaphorical connection that students could make to describe how information is transmitted would be a roller coaster ride. The track could be seen as the internet connection and the cars, and the people are the information traveling through the connection.</p> <p>CONTENT FOCUS The focus is on students modifying a URL, or web address, to reach a specific site and describing how the modification impacts the information accessed. Students model how information is transmitted.</p>

Strand	Networks and the Internet
Topic	Networking
	<p>COMPUTER SCIENCE PRACTICES <i>Practice 4. Developing and Using Abstractions</i> 4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes.</p>

Strand	Networks and the Internet	
Topic		Networking
<p>NI.N.5.b Apply knowledge of network addresses, names and rules (i.e., protocols) to discuss real-world scenarios.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students described how different naming techniques are related to the type of information accessed. In grade 5, students apply this knowledge by interacting with networks appropriately and apply these concepts to real-world scenarios. In grade 6, students will continue to apply this knowledge to more advanced concepts of networks.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> Information is broken into parts and reassembled at the endpoint. The endpoint is identified by an IP address. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> Use knowledge of top-level naming rules (.com, .edu, .gov) as it relates to the reliability of information. Explain the fundamental workings of the internet using appropriate terminology (e.g., packets, IP address). <p>Content Elaborations</p> <p>CLARIFICATIONS Students need to explain the steps required to transmit information over the internet. Students should explain that information is broken into packets, transmitted to another place identified by an IP address and reassembled at the end site, similar to a puzzle being taken apart, given to other people, and assembled somewhere else. The IP address serves as the location where information is sent like a mailing address and a letter. No discussion on IP address components (i.e., parts) is needed at this level.</p> <p>CONTENT FOCUS The focus is on explaining the fundamental workings of the internet.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none"> Model phenomena and processes and simulate systems to understand and evaluate potential outcomes. 	

Strand	Networks and the Internet	
Topic	Cybersecurity	
<p>NI.C.5.a Demonstrate password creation techniques to develop and use a strong password used on personal accounts.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students described personal information and how passwords are used to protect that information. In grade 5, students create, implement, and store secure passwords to protect personal information. In grade 6, students will understand the concerns that information needs to be protected.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Students demonstrate password creation techniques. • Apply personally created passwords to personal accounts. • Protection techniques of passwords for personal accounts. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Create secure passwords utilizing password creation techniques. • Build a strong password using password creation techniques. • Apply password protection techniques. <p>Content Elaborations</p> <p>CLARIFICATIONS Explain alpha-numeric, symbols and non-dictionary words. Use alpha-numeric, symbols and non-dictionary words to build a secure password. Students often misuse password storage techniques. They need to understand the difference of using an online password storage system, saving passwords on the computer, writing down passwords or remembering them and the benefits of types of passwords and storage techniques.</p> <p>CONTENT FOCUS The focus is on students building strong, secure passwords using password creation techniques and protecting passwords using different protection techniques.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none"> 1. Identify complex, interdisciplinary, real-world problems that can be solved computationally. 3. Evaluate whether it is appropriate and feasible to solve a problem computationally. 	

Strand	Networks and the Internet
Topic	Cybersecurity
<p>NI.C.5.b Explore and utilize safe online services such as web, email, video, gaming, cloud services and network attached storage devices.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students describe the effects of malicious content. In grade 5, students analyze the use of online services. In grade 6, students will recognize the effects of malicious content and other online threats.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Students utilize online services such as web, email, video, gaming, networked drives and cloud services. • There are appropriate levels of information sharing appropriate to different online services. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Understand the use of devices and software in connected environments. • Explore the use of different tools and uses of computing systems. • Explore the need for security for these systems. <p>Content Elaborations</p> <p>CLARIFICATIONS Students should understand that using websites, email, video gaming, cloud services and networked drives adds to the need for security practices.</p> <p>CONTENT FOCUS Explore and experiment with different uses of devices, software and connected systems. Students should discuss the information each of these systems stores and what they share with other systems. Students should also understand how the information in the systems is secured.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 2. Collaborating Around Computing</i></p> <ol style="list-style-type: none"> 4. Evaluate and select technological tools that can be used to collaborate on a project. <p><i>Practice 5. Creating Computational Artifacts</i></p> <ol style="list-style-type: none"> 2. Create a computational artifact for practical intent, personal expression or to address a societal issue. 3. Modify an existing artifact to improve or customize it. C.5.b Explore and utilize various online services such as web, email, video, gaming, Cloud Services and networked drives.

Strand	Networks and the Internet
Topic Internet of Things	
<p>NI.IOT.5.a Learn and model how information is broken down to be transmitted by smart devices to help students visualize how information transfers over the internet.</p> <p>NI.IOT.5.b Explore the benefits of the IoT with regards to convenience, safety and health to gain an appreciation of the risks involved in using devices, including data theft, identity theft, tracking and other forms of criminality.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students recognize how smart and intelligent devices communicate over the internet and see how network communication can be traced. In grade 5, students explore how information is transmitted over the internet and identify the risks and benefits of using the internet. In grade 6, students will define the term blockchain to recognize how every bit of information shared over networks is personally identifiable. They will similarly explore the weaknesses in networks that allow programmers, both legitimate and illegitimate, to access that personal information.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • There are benefits and risks to using devices connected to the internet. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Model and engage in safety practices while using the internet to reduce and avoid risks. • Explain how information is transmitted over the internet in packets. <p>Content Elaborations</p> <p>CLARIFICATIONS Explain how data is transmitted across the Internet, and that anyone is allowed to look at it. Discuss that the act of sending information implies that the sender is giving permission for anyone who can see the data stream to examine its contents.</p> <p>Explore methods that students can implement to reduce the risk of data theft.</p> <p>CONTENT FOCUS Apply the knowledge of networks to assess the risk factors, benefits and convenience when using smart devices.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none"> 4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 3. Articulate ideas responsibly by observing intellectual property rights and giving appropriate attribution.

Strand	Data and Analysis
Topic	Data Collection and Storage
<p>DA.DCS.5.a Gather and organize multiple quantitative data elements using a tool to perform various tasks.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students built upon the use of tools from grade 3 to collect data from multiple sources within a singular topic over time. In grade 5, students begin to select appropriate tools to collect data from multiple sources within a singular topic over time. In grade 6, students will begin to evaluate the validity of data collection tools.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Keeping an organized record of data from multiple sources, over time, is critical to analyzing data. • Different tools are used to collect different types of data. • Tools impact the accuracy of data. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Select and use appropriate tools to collect and organize data. • Maintain accurate data from multiple sources, using multiple tools, within a singular topic over a period of time. • Collect data from multiple sources within a singular topic, by making repeated observations over time. <p>Content Elaborations</p> <p>CLARIFICATIONS Tools that may be explored are digital thermometers, GPS sensors, calculators, scales, digital forms (survey tools), length measurement tools, a stopwatch, etc. Data can be organized by using various digital and non-digital tables and charts. Digital organizational resources could include spreadsheets, online graphing programs, etc. An example of collecting data from multiple sources within a singular topic could be collecting the height of students in three different classes, throughout the school year. Students should select the most appropriate tool for data collection. Students could choose between an online form, table or simple document.</p> <p>CONTENT FOCUS The focus is on students selecting an appropriate data collection tool to improve the accuracy of data.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 1. Select, organize and interpret large data sets from multiple sources to support a claim.

Strand	Data and Analysis
Topic	Data Collection and Storage
	<p>Career Connections</p> <p>CAREER AWARENESS With guidance, students will compare quantitative job data (such as salary and number of yearly job openings) using the OhioMeansJobs Career Cluster tool and create an artifact to display the data. Students draw conclusions from that data and present their findings.</p>
<p>DA.DCS.5.b Compare and contrast file formats to demonstrate the advantages and disadvantages of each.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students began to gain an understanding that different file types may require different storage. In grade 5, students discuss the advantages and disadvantages of different file types. In grade 6, students will make choices about their file formats to organize data.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Different file types can be different sizes. • Different file types have different purposes. • How data is stored impacts accessibility. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Store data as a specific file type. • Locate and retrieve data on a computing device (i.e., computer). • Consider file size when sharing and saving data. <p>Content Elaborations</p> <p>CLARIFICATIONS Examples of file types would be image (i.e., .jpg, .png, .gif, .bmp), document (e.g., .doc, .docx, .pages, .txt), multi-media (e.g., .mov, mp4, .wmb) and presentation (e.g., .ppt, .pptx, .key). For example, when creating a presentation, use slides instead of a document.</p> <p>Examples of data storage could include saving to a device, local network or the cloud. An example of file size impacting storage is the inability to download an app on a tablet due to lack of storage.</p> <p>Accessibility refers to the ability to retrieve data. Students should understand that data saved to a device will not be accessible without that same device. Accessibility also refers to the ability to open file formats on different devices.</p> <p>Information refers to data, which could include pictures, audio, video and documents.</p>

Strand	Data and Analysis
Topic	Data Collection and Storage
	<p>CONTENT FOCUS The focus is on different file types accomplishing different tasks. There are pros and cons to using various file types.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none">1. Select, organize and interpret large data sets from multiple sources to support a claim.

Strand	Data and Analysis
Topic Visualization and Communication	
<p>DA.VC.5.a Organize and present collected data using visual or other types of representations to highlight relationships and support a claim.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students interpreted data in self-created graphs to present insights. In grade 5, students use graphs created to highlight and support a claim they have made. In grade 6, students will look for patterns and communicate relationships between data sets.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Data from a graph can be used to gain insights or solve a problem. • The way data is interpreted and highlighted from a graph can support or disprove a claim. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Record data, with several categories, on a scaled bar graph or picture graph. • Determine the appropriate scale for data given. • Interpret and answer questions regarding data presented in a bar or picture graph. • Use a visual representation of data (e.g., picture/bar graph, line plot) to support a claim. <p>Content Elaborations</p> <p>CLARIFICATIONS An important concept for students to begin to understand is that a scale is chosen based on the data available. Students should begin understanding that data is used to solve problems. For example, if many people report they do not recycle due to lack of recycling bins, we can conclude that providing recycling bins to people will increase recycling and improve the environment.</p> <p>CONTENT FOCUS The focus is on students using a representation of data they have created to support a claim they have made.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 1. Select, organize and interpret large data sets from multiple sources to support a claim. 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Data and Analysis
Topic Inference and Modeling	
<p>DA.IM.5.a Utilize data to propose cause and effect relationships and predict outcomes.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students determined if adequate data had been collected and ran simulations to explore outcomes. In grade 5, students run simulations to test theories and make predictions about how larger data sets affect outcomes. In grade 6, students will validate or invalidate a prediction about a collection of data.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Sample size affects outcomes. • Trends can be found by analyzing data sets. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Use data to highlight or propose cause and effect relationships Predict outcomes using a data set. • Manipulate data and explain outcomes. <p>Content Elaborations</p> <p>CLARIFICATIONS Students explain patterns in data and identify missing values. They begin to manipulate data and reflect on how the quantity of data affects outcomes. Students will use software tools, such as spreadsheets to manipulate the quantity of data and reflect on changes that occur.</p> <p>CONTENT FOCUS The focus is on students identifying patterns in data to find missing values. They predict outcomes to continue patterns. They manipulate the quantity of data and reflect on changes that occur.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none"> 1. Extract common features from a set of interrelated processes or complex phenomena.

Strand	Algorithmic Thinking and Programming
Topic	Algorithms
<p>ATP.A.5.a Evaluate a multi-step process to diagram the proper steps to solve a problem.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students refined an algorithm to accomplish a given task. In grade 5, students compare and refine algorithms with a focus on the result. In grade 6, students will evaluate a multi-step process to diagram the proper steps to find the most efficient solution.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • An algorithm is a series of steps to complete a process or task. • Once algorithms are created and written, they need to be tested and possibly revised based on the results. • Pseudocode and flowcharts can be used to create and modify an algorithm. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Utilize logical patterns of progression within an algorithm to modify and refine the algorithm to efficiently accomplish a given task. • Utilize pseudocode and flow charts to assist with communicating, creating and modifying an algorithm to accomplish a given task. <p>Content Elaborations</p> <p>CLARIFICATIONS Students will utilize processes of computational thinking (i.e., logical thought) to sort through, identify errors, and modify algorithms. They will need to utilize communication techniques (i.e., pseudocode, flowcharts) to document the potential errors and solutions.</p> <p>CONTENT FOCUS The focus is on students determining the necessity of decomposition, abstraction, modification and reassembly of the algorithm with an emphasis on the resulting algorithm. Students should utilize communication strategies to further refine their algorithms.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i> 2. Decompose real-world problems.</p>

Strand	Algorithmic Thinking and Programming
Topic	Variables and Data Representation
<p>ATP.VDR.5.a Create a variable, a placeholder for storing a value, to understand how it is used in a multi-step process (i.e., algorithm).</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students expanded on defining and identifying variables. In grade 5, students create variables to store and modify data. In grade 6, students will identify unknown values that need to be represented by a variable within a multi-step process.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Variables are placeholders for values that can be used in an algorithm. • Data can be stored in the variable. • Variables can represent multiple pieces of information from multiple lines. • Coding language places the variable at the front of the algorithm. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Use logical variable representations (i.e., letter or symbol). • Write or edit an algorithm that substitutes a variable for a value. • Edit the variable to show how it changes the algorithm's result. • Determine if a variable is needed within an algorithm. <p>Content Elaborations</p> <p>CLARIFICATIONS Symbols such as letters are used in programming to hold values. Students need to learn that the syntax (i.e., the order of symbols in the equation) may impact the success of a program. Students can explore what happens when the data stored in a variable is changed. For example, using a repetitive nursery rhyme (e.g., Five Little Monkeys), students can create a variable to change the number of monkeys. Here, the changing value is the number of monkeys.</p> <p>Students are not expected to only use the formal terms of "variable" and "algorithm."</p> <p>CONTENT FOCUS The focus is on students being able to define and identify variables as symbols such as letters and understand how they are used in algorithms to store data. Students should begin using variables within equations. Students should explore how variables store data and modify equations.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none"> 1. Extract common features from a set of interrelated processes or complex phenomena.

Strand	Algorithmic Thinking and Programming
Topic	Control Structures
<p>ATP.CS.5.a Create a program using sequences, events, loops and conditionals to solve a problem.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students refined their programming skills using established structures, such as loops and conditionals. In grade 5, students apply these new skills in increasingly complex ways and will continue to refine these to work towards programming efficiency. In grade 6, students will identify decisions and loops in programs to solve problems.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Loops are statements that repeat and make programming more efficient for the computer and the programmer. • Conditionals are typically in the form of "if/then" statements and enable the program to follow different paths. • Events are structures that programmers can use to explain how the program will react when the user interacts. • Proper sequencing of steps within the program ensures efficiency. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Insert a loop in a program to avoid typing a command several times. • Insert a conditional in a program to make the program more powerful by creating several paths (if/then or if/then/else). • Create an event in the format "When (action), then (result) occurs". • Diagram the flow of a program to demonstrate the sequence of its events and products. • Combine statements within other statements (nesting) to make compound statements. <p>Content Elaborations</p> <p>CLARIFICATIONS Loops can occur in programming by having the robot or pen repeat a motion several times, such as going forward ten paces and then turning thirty degrees. In an algorithm, students can program to have a number added several times.</p> <p>Conditionals occur in a program by inserting a command to complete when a condition is met. For instance, if a condition states "If n=5," when the value n=5 is achieved, then the program will execute the command given.</p> <p>Events can be thought of as an action because of an action. Such as, "When I click the mouse, the image rotates."</p>

Strand	Algorithmic Thinking and Programming
Topic	Control Structures
	<p>Sequencing of events and commands is an important part of programming when creating a program from scratch or remixing an existing one.</p> <p>Students can diagram or describe the steps of a program using a flowchart or other graphic organizer.</p> <p>CONTENT FOCUS</p> <p>The focus is on using a loop to eliminate several redundant commands, using a conditional to add complexity to a program and to program efficiently, creating an event in the format "When (action), then (result) occurs," and diagramming or describing the flow of a program. The complexity of the loops, conditionals, events and sequences continues to increase from the prior grade level.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none">1. Extract common features from a set of interrelated processes or complex phenomena.

Strand	Algorithmic Thinking and Programming
Topic	Modularity
<p>ATP.M.5.a Decompose (i.e., break down) the steps needed or not needed (i.e., abstraction) into precise sequences of instructions to design an algorithm.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students refined the decomposition, abstraction and algorithm creation process. In grade 5, students begin to use abstraction to further refine and design an algorithm. In grade 6, students will utilize decomposition, abstraction, modification and creation of an algorithm to accomplish a given task.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> Modularity refers to components of a program that complete a procedure or task. Modules within a program may need to be evaluated, refined and/or copied. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> Regroup or redesign sets of a decomposed algorithm to modify the result of the algorithm in the most efficient manner possible. Determine if the logic of an algorithm requires decomposition, abstraction or modification to efficiently accomplish a given task. Utilize pseudocode and flow charts as related to the algorithm. <p>Content Elaborations</p> <p>CLARIFICATIONS Processes of logical thought should include the dissection of a whole into its parts. Solving smaller sections of a larger equation to determine its functionality toward the end goal. Ensure that sets of instructions include all needed parts to modify the result to reach the end goal. These instructions can be written in code, pseudocode, real language or flowcharts related to the language of the algorithm.</p> <p>CONTENT FOCUS The focus is on students utilizing processes of logical thought, decomposing the algorithm and abstracting, modifying, and reassembling it to accomplish a given task in the most efficient means possible. Students need to utilize communication strategies to document and reduce the algorithm to the most efficient result.</p>

Strand	Algorithmic Thinking and Programming
Topic	Modularity
	<p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none">2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. <p><i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none">3. Create modules and develop points of interaction that can apply to multiple situations and reduce complexity. <p><i>Practice 7. Communicating about Computing</i></p> <ol style="list-style-type: none">1. Select, organize and interpret large data sets from multiple sources to support a claim.

Strand	Algorithmic Thinking and Programming	
Topic	Modularity	
<p>ATP.M.5.b With grade appropriate complexity, modify, remix or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students modified and elaborated the portions of code used in their programs. In grade 5, students use portions of code to develop something new based on a given problem. In grade 6, students will be able to identify the parts of the program they designed.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Smaller portions of code should be grouped so the result will complete a task. These small portions should accomplish a task from start to finish independently of any other sections of code. These sections of code can then be reused to create a new program to solve a problem. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Break down steps into repeatable chunks. • Use chunks to repeat steps to accomplish a given task. • Create a program using chunked code. <p>Content Elaborations</p> <p>CLARIFICATIONS Chunks of code can be grouped, named, and used as a module (method, class, function) to build a new or modified version of a program (i.e., grouping a set of code used to accomplish the task of climbing stairs into a module that can be used anytime stairs need to be climbed).</p> <p>CONTENT FOCUS The focus is on students using chunks of code (i.e., modules), repeating and reorganizing them to create a new program to solve a different problem.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none"> 2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. <p><i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none"> 3. Create modules and develop points of interaction that can apply to multiple situations and reduce complexity. <p><i>Practice 7. Communicating about Computing</i></p> <ol style="list-style-type: none"> 1. Select, organize and interpret large data sets from multiple sources to support a claim. 	

Strand	Algorithmic Thinking and Programming
Topic	Program Development
<p>ATP.PD.5.a Use a design process to plan and develop a program that includes multiple steps and end user preferences.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students designed and created a program for a multi-step problem. In grade 5, students design and create a program that addresses a multi-step problem and the preferences of the end user. In grade 6, students will advance in designing and creating their own code-based program using block-based languages. Students may begin using text-based coding to program.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • A flow chart is one type of organizational tool that can be used to plan a program considering the sequence of its features. • An algorithm can be used to build a program. • Programs can execute multiple steps. • The end user's preferences can be considered in the creation of a program. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Design a program that can solve a problem. • Use the design process when planning a program. • Create a program for a multi-step problem. • Incorporate the preferences of the end-user into the program. <p>Content Elaborations</p> <p>CLARIFICATIONS Programs can be designed in a plugged (i.e., using a computer) or unplugged environment (i.e., not using a computer).</p> <p>Programs can be designed using a block-based environment.</p> <p>Programs should address a multi-step problem.</p> <p>A flow chart is a type of organizational tool that can be used to plan a program.</p> <p>End-user preferences are additional components included in the problem.</p>

Strand	Algorithmic Thinking and Programming	
Topic	Program Development	
	<p>CONTENT FOCUS The focus is on designing a program that can solve a problem with 3 or more steps and incorporating the preferences of the end-user.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 5. Creating Computational Artifacts</i></p> <ol style="list-style-type: none"> 1. Plan the development of a computational artifact using an iterative process that includes reflection on and modification of the plan, considering key features, time and resource constraints and user expectations. 2. Create a computational artifact for practical intent, personal expression or to address a societal issue. 	
<p>AI.ML.5.a Compare three different machine learning approaches to solve a problem.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students explained three types of machine learning. In grade 5, students compare three different machine learning approaches to solve a problem. In grade 6, students will contrast the unique characteristics of human learning with the ways machine learning systems operate to identify the limitations of machine learning.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Compare how the machine learning approaches would look for a given problem. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Give problems Artificial Intelligence (AI) encounter and which machine learning might work best to see the limitations of AI. <p>Content Elaborations</p> <p>CLARIFICATIONS Machine Learning is the study of computer algorithms that improve automatically through experience. Applications range from data-mining programs that discover general rules in large data sets to information filtering systems that automatically learn users' interests.</p> <p>CONTENT FOCUS Different types of machine learning can produce different outcomes.</p>	

Strand	Algorithmic Thinking and Programming
Topic	Program Development
	<p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none">1. Identify complex, interdisciplinary, real-world problems that can be solved computationally.2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures.3. Evaluate whether it is appropriate and feasible to solve a problem computationally.

Strand	Artificial Intelligence
Topic	Machine Learning
<p>AI.ML.5.b. Describe how algorithms and machine learning can exhibit biases to be aware of how humans introduce bias into algorithms and machine learning.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students explained how machine learning can create a bias. In grade 5, students describe how algorithms and machine learning can exhibit biases. In grade 6, students will contrast the unique characteristics of human learning with the ways machine learning systems operate to identify the limitations of machine learning.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> Algorithms created by humans create biases in machine learning. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> Give examples of bias (sample bias, exclusion, bias, recall bias, observer bias, racial bias, association bias, etc.) found in machine learning to see how computers can create a bias. <p>Content Elaborations</p> <p>CLARIFICATIONS Algorithmic bias describes systematic and repeatable errors in a computer system that create unfair outcomes, such as privileging one arbitrary group of users over others.</p> <p>CONTENT FOCUS Humans create algorithms that machines use to learn. These algorithms can be unintentionally biased.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none"> Identify complex, interdisciplinary, real-world problems that can be solved computationally. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. Evaluate whether it is appropriate and feasible to solve a problem computationally.

Strand	Artificial Intelligence	
Topic	Machine Learning	
<p>AI.ML.5.c Describe tasks where AI outperforms human tasks and when it does not and propose possible ways to have AI perform more human tasks.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students described tasks where Artificial Intelligence (AI) outperforms humans' tasks and when it does not. In grade 5, students describe tasks where AI does and does not outperform human tasks. In grade 6, students will individually and collaboratively compare language-processing algorithms to solve a problem based on given criteria.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> List tasks AI performs that are better or worse than the performance of a human. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> Research a specific type of AI and follow its history, for example, self-driving cars. List the pros and cons of that AI to show how it can outperform human tasks. <p>Content Elaborations</p> <p>CLARIFICATIONS AI can perform tasks that humans once did. As AI grows, it can take over more human tasks like driving cars.</p> <p>CONTENT FOCUS AI takes time to develop and as it improves it can take over more human tasks like driving.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none"> Identify complex, interdisciplinary, real-world problems that can be solved computationally. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. Evaluate whether it is appropriate and feasible to solve a problem computationally. 	

Strand	Artificial Intelligence
Topic	Natural Interactions
<p>AI.NI.5.a Describe ways that AI systems can be designed to support inclusivity.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students used Artificial Intelligence (AI) systems designed to be inclusive and learned how it affects the humans that use them. In grade 5, students describe ways that AI systems can be designed for inclusivity. In grade 6, students will illustrate the structure of a neural network to describe how its parts form a set of functions that compute an output.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Research design processes. • Explain why AI is designed for inclusivity. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Use the design process to create an inclusive software or hardware prototype to model how humans research to create inclusive design. <p>Content Elaborations</p> <p>CLARIFICATIONS AI has to be designed with the end-user in mind, including those with special needs.</p> <p>CONTENT FOCUS AI can assist in helping everyone to be included.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none"> 1. Identify complex, interdisciplinary, real-world problems that can be solved computationally. 2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. 3. Evaluate whether it is appropriate and feasible to solve a problem computationally.

Strand	Artificial Intelligence
Topic	Perception
<p>AI.P.5.a Describe how sensor inputs are converted as analog or digital signals to describe their uses.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students described the differences between analog and digital sensors. In grade 5, students describe how sensor inputs are converted as analog or digital signals. In grade 6, students will give examples of computer perception that can extract meaning and how humans combine information from multiple modalities to understand how computers use sensors.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> Describe the uses of different sensors (analog and digital). <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> Identify that computers take the input from sensors in different ways to describe how that input can be used. <p>Content Elaborations</p> <p>CLARIFICATIONS Recognize various uses of analog and digital sensors.</p> <p>CONTENT FOCUS The focus is on the two basic ways sensors gather data and the uses of different sensors.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none"> Identify complex, interdisciplinary, real-world problems that can be solved computationally. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. Evaluate whether it is appropriate and feasible to solve a problem computationally.

Strand	Artificial Intelligence	
Topic	Perception	
<p>AI.P.5.b Demonstrate a limitation of computer perception to understand how computers interact with humans.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students gave examples of how computer perception is affected by the environment. In grade 5, students demonstrate a limitation of computer perception to understand how computers interact with humans. In grade 6, students will give examples of computer perception that can extract meaning and how humans combine information from multiple modalities.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> List the limitations of current computer perception. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> Demonstrate the limitations of computer perception using data to show that limited data can affect how humans and computers interact. <p>Content Elaborations</p> <p>CLARIFICATIONS Computers only know what we tell them through data input.</p> <p>CONTENT FOCUS Data can show a bias.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none"> Identify complex, interdisciplinary, real-world problems that can be solved computationally. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. Evaluate whether it is appropriate and feasible to solve a problem computationally. 	

Strand	Artificial Intelligence
Topic	Representation & Reasoning
<p>AI.RR.5.a Create a classification system using a tree structure to demonstrate binary solutions.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students created a classification system to understand binary solutions. In grade 5, students create a classification system using a tree structure to demonstrate binary solutions. In grade 6, students will illustrate how a computer can solve a maze, create a route on a map or reason about concepts in a knowledge graph by drawing a search tree.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Creating decision trees with binary choices. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Use a flowchart to show the decision-making process. <p>Content Elaborations</p> <p>CLARIFICATIONS Decision trees help Artificial Intelligence make decisions through machine learning. For more information, see quantum computing.</p> <p>CONTENT FOCUS Decision trees in artificial intelligence are used to arrive at conclusions based on the data available from decisions made in the past.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 5. Creating Computational Artifacts</i></p> <ol style="list-style-type: none"> 1. Plan the development of a computational artifact using an iterative process that includes reflection on and modification of the plan, taking into account key features, time and resource constraints and user expectations. 2. Create a computational artifact for practical intent, personal expression, or to address a societal issue. 3. Modify an existing artifact to improve or customize it.

Strand	Artificial Intelligence	
Topic	Representation & Reasoning	
<p>AI.RR.5.b Describe how AI representations support reasoning to answer questions.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students were describing how Artificial Intelligence (AI) knowledge is used to make a reasonable answer. In grade 5, students describe how AI representations support reasoning to answer questions. In grade 6, students will illustrate how a computer can solve a maze, create a route on a map or reason about concepts in a knowledge graph by drawing a search tree.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • AI tries to give a reasonable answer based on the input. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Create a data set that would have AI bring back a reasonable answer. <p>Content Elaborations</p> <p>CLARIFICATIONS Train an AI to give a reasonable answer.</p> <p>CONTENT FOCUS AI is complex and has to make lots of decisions to differentiate between multiple meanings.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none"> 1. Identify complex, interdisciplinary, real-world problems that can be solved computationally. 2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. 3. Evaluate whether it is appropriate and feasible to solve a problem computationally. 	

Strand	Artificial Intelligence
Topic	Societal Impacts
<p>AI.SI.5.a Explore how data is influenced by bias and how it affects decision-making to defend arguments in AI</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students gave examples of bias and how it affects decision-making. In grade 5, students explore how data is influenced by bias. In grade 6, students will identify and explain how humans have agency in curating training data sets to identify bias in machine learning.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Data input for Artificial Intelligence (AI) and how it creates bias. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Explore the various types of bias based on data sets. • Give examples of bias (sample bias, exclusion, bias, recall bias, observer bias, racial bias or association bias) found in machine learning. <p>Content Elaborations</p> <p>CLARIFICATIONS The type of bias can affect the outcome of AI. For example, advertising based on corporate data pools, streaming services and social media.</p> <p>CONTENT FOCUS Bias in data input can have negative consequences.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none"> 1. Identify complex, interdisciplinary, real-world problems that can be solved computationally. 2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. 3. Evaluate whether it is appropriate and feasible to solve a problem computationally.

Strand	Algorithmic Thinking and Programming
Topic	Program Development
<p>ATP.PD.5.b Using guided questions, work through a program to identify errors and discuss possible solutions to repair the program.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students continued with guided questions that assisted them in debugging their program. In grade 5, students become less dependent upon guided questions and begin to debug more complex programs. In grade 6, students will modify and fix their own errors in a block-based environment and will begin the debugging process in a text-based environment.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • A computer bug is a series of commands that do not properly interact with each other and causes interruptions in the program execution (i.e., error in the program). • To "debug" is to find the error within a program and then apply an appropriate fix. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Identify errors in a program. • Apply a fix to errors in a program. <p>Content Elaborations</p> <p>CLARIFICATIONS If a program will not execute properly, programmers often refer to the issue as the program "breaks" or the program has a "bug" error. "Debugging" a program refers to scanning through the program code to find the error in the commands and then correcting or repairing that programming code.</p> <p>Guided questions are questions that prompt the programmer to think more about their error and problem solve potential solutions without being given the answer.</p> <p>CONTENT FOCUS The focus is on locating errors in a block-based environment program and determining solutions and applying the fix.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 6. Testing and Refining Computational Artifacts</i> 2. Identify and fix errors using a systematic process.</p>

Strand	Impacts of Computing
Topic	Culture
<p>IC.Cu.5.a Explain how computing technologies have changed the global community and express how those technologies influence and are influenced by cultural practices.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students recognized the impact of technology on the global community. In grade 5, students explain how technology has changed everyday life globally. In grade 6, students will develop a better understanding of how we connect to people around the world.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • People within a region use technology in various ways. • Daily life is influenced by the technology within the community. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Identify specific types of technology used globally. • Describe ways that various technology resources impact daily life. • Compare and contrast the use of technology and the impacts it has on different communities. <p>Content Elaborations</p> <p>CLARIFICATIONS New computing technology is created, and existing technologies are modified for many reasons, including to increase their benefits, decrease their risks, and meet societal needs. Students explore topics that relate to the history of technology and the changes in the world due to technology. Topics could be based on current news content, such as robotics, wireless internet, mobile computing devices, GPS systems, wearable computing or ways social media has influenced social and political changes. (CSTA K-12 Computer Science Standards, 2017)</p> <p>Students should begin to realize that the effects of technology on their community or region are not necessarily the same as the effects on other communities or regions. For example, one community may be experiencing the effects of having clean energy (e.g., solar power, wind power), whereas another community may not have the same experience.</p> <p>CONTENT FOCUS The focus is on the history and influence of technology in the world.</p>

Strand	Impacts of Computing
Topic	Culture
	<p>COMPUTER SCIENCE PRACTICES <i>Practice 1. Fostering an Inclusive Computing Culture</i> 1. Include the unique perspective of others and reflect on one's own perspectives when designing and developing computational products.</p>

Strand	Impacts of Computing	
Topic	Culture	
<p>IC.Cu.5.b Develop, test and refine digital artifacts to improve accessibility and usability.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students identified and anticipated diverse needs and ways to improve devices to make them more accessible to users. In grade 5, students are modifying artifacts to meet diverse user needs to increase accessibility. In grade 6, students will identify issues of bias and accessibility in the design of existing technologies to address equality and equity in society.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Users have diverse needs that impact accessibility. • Computing devices have built-in features to increase accessibility for all users. • Artifacts can be modified to increase accessibility for diverse users. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Locate and use built-in features to increase accessibility. • Identify the diverse needs of users. • Modify artifacts to meet diverse needs and to increase accessibility. <p>Content Elaborations</p> <p>CLARIFICATIONS Students may consider using both speech and text when they wish to convey information in a game. They may also wish to vary the types of programs they create, knowing that not everyone shares their tastes. (CSTA K-12 Computer Science Standards, 2017)</p> <p>CONTENT FOCUS The focus is on the diverse needs of users, the impact needs have on accessibility, and the modification of artifacts to improve accessibility.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 1</i> Fostering an Inclusive Computing Culture 2. Address the needs of diverse end-users during the design process to produce artifacts with broad accessibility and usability.</p>	

Strand	Impacts of Computing
Topic	Social Interactions
<p>IC.SI.5.a Collaborate and consider diverse perspectives to improve digital artifacts.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students collaborated with others to share the workload, increase diverse perspectives, and improve the artifact. In grade 5, students collaborate with others outside of the classroom to share the workload, increase diverse perspectives and improve the artifact. In grade 6, students will analyze and present the beneficial and harmful effects of communicating using technology. They will begin to examine their impacts on the global, economic, political, business and cultural interactions.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Collaborating with peers to include diverse perspectives can improve digital artifacts. • Reflecting on feedback from others can improve digital artifacts. • Providing feedback to others can help them improve the quality of their work. • Collaborating with others outside of the classroom can provide a different cultural aspect. • People use technology to work together remotely (i.e., in different buildings, cities, states, countries). <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Leave thoughtful feedback for peers that will help improve their digital artifacts. • Reflect on feedback from peers to improve digital artifacts. • Collaborate with others digitally (i.e., different buildings, cities, states, countries), to improve an artifact. <p>Content Elaborations</p> <p>CLARIFICATIONS Seeking feedback from people from diverse backgrounds and geographical areas can provide insights for improving a project.</p> <p>Students can collaborate digitally through various means, such as online video chats, online word processing programs, surveys or forms and social networking sites.</p> <p>CONTENT FOCUS The focus is on collaborating digitally with people from diverse backgrounds and geographic areas.</p>

Strand	Impacts of Computing
Topic	Social Interactions
	<p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 2. Collaborating Around Computing</i></p> <ol style="list-style-type: none">1. Cultivate working relationships with individuals possessing diverse perspectives, skills and personalities.2. Create team norms expectations and equitable workloads to increase efficiency and effectiveness3. Solicit and incorporate feedback from and provide constructive feedback to team members and other stakeholders.4. Evaluate and select technological tools that can be used to collaborate on a project.

Strand	Impact of Computing
Topic	Safety, Law and Ethics
<p>IC.SLE.5.a Use public domain or Creative Commons media, and refrain from copying or using material created by others without permission.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students were introduced to more formal terminology used when evaluating the sharing of resources. Students identified the type of source and give credit to the source. In grade 5, students apply proper procedures when giving credit to a source. In grade 6, students will be exposed to a broader range of resources that must be given proper credit.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Certain resources can be shared freely; some resources can be shared with proper citation and others can only be shared with permission from the creator. • Sources must be cited formally to give credit for the use of materials. • Citations should consider copyright, Creative Commons, fair use, open-source, etc. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Determine whether a source can or cannot be used freely. • Use proper format to cite online sources. <p>Content Elaborations</p> <p>CLARIFICATIONS Ethical complications arise from the opportunities provided by computing. The ease of sending and receiving copies of media on the internet (e.g., video, photos, music) creates the opportunity for unauthorized use, such as online piracy and disregard of copyrights. Students should consider the licenses on computational artifacts that they wish to use. For example, the license on a downloaded image or audio file may have restrictions that prohibit modification, require attribution or prohibit use entirely. (CSTA K-12 Computer Science Standards, 2017)</p> <p>CONTENT FOCUS The focus is on recognizing that some resources are public domain and can be used freely and other materials need to be cited properly.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 7. Communicating about Computing</i> 3. Articulate ideas responsibly by observing intellectual property rights and giving appropriate attribution.</p>

Strand	Impacts of Computing
Topic	Safety, Law and Ethics
<p>IC.SLE.5.b Communicate the effects of sharing personal information on the safety of student identity to determine how to protect students.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students started to make distinctions between what information should be shared and what information should be kept private. In grade 5, students consider the effects of sharing private information. In grade 6, students should evaluate shareable information in a broader context relating to society.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • For safety and security, personal information should be kept private. • Sharing personal information could have a positive or negative effect on a person. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Determine whether information should or should not be shared digitally. • Recognize that keeping information private protects your identity. • Recognize the consequences of sharing too much personal information online as well as the consequences of sharing others' information. • Protect the identity of others by protecting their personal information. <p>Content Elaborations</p> <p>CLARIFICATIONS Examples of information to be kept private are first and last name, birthday, addresses, phone numbers or other personal identifiers. Students should also understand that they should not share the personal information of others.</p> <p>CONTENT FOCUS The focus is on understanding and identifying the consequences of sharing personal information online.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 7. Communicating about Computing</i></p> <ol style="list-style-type: none"> 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Impacts of Computing
Topic	Safety, Law and Ethics
<p>IC.SLE.5.c Evaluate the need to keep personal information secure and protect the digital footprint.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION In grade 4, students considered how their current online behavior affects their digital footprint. In grade 5, students expand on the subject by further examining their online behaviors and how they affect others. In grade 6, students will describe tradeoffs between allowing information to be public and keeping information private and secure to inform decision-making. In addition, they will consider the effect of third parties on their personal information.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • When information is not shared properly, it can become an issue of ethics, safety and security and have an impact on your digital footprint. • Ongoing evaluation of one's digital footprint is important. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • List examples of what would be included in your digital footprint and evaluate the security of what is already a part of your footprint. <p>Content Elaborations</p> <p>CLARIFICATIONS Students should evaluate their digital footprint and consider the security of their online behavior. If needed, students should take steps to secure online information. Students should be able to evaluate the security of personal information shared online. For instance, it might be safe to share only a first name, whereas sharing a first name, last name and birthdate would not be secure or safe.</p> <p>CONTENT FOCUS The focus is on making personal connections to online security and social media privacy. Students should evaluate their online and social media activity.</p> <p>COMPUTER SCIENCE PRACTICES Practice 7. Communicating about Computing 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.</p>

Strand	Impacts of Computing
Topic Safety, Law and Ethics	
<p>IC.SLE.5.d Analyze different forms of cyberbullying and identity strategies to stop cyberbullying.</p>	<p>Expectations for Learning</p> <p>In grade 4, students learn what a cyberbully is and what to do if they feel threatened online. In grade 5, students will learn about the forms of cyberbullying and strategies to use to stop this type of behavior.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> List the forms of cyberbullying. Discuss and practice strategies to stop cyberbullying. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> Compare different forms of cyberbullying. Identify and practice strategies to stop cyberbullying. <p>Content Elaborations</p> <p>It is important to understand the different forms of inappropriate online behavior including cyberbullying. The more knowledge students have about the strategies and methods bullies use online, the quicker inappropriate activities can be identified and mitigated.</p> <p>CLARIFICATIONS</p> <p>Cyberbully tactics include, but are not limited to many different behaviors like the following:</p> <ul style="list-style-type: none"> Posting comments or rumors that are hurtful or embarrassing, Threats against themselves or others, Pretending to be someone else, and Any other form of online harassment. <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 1.</i> Fostering an Inclusive Computing Culture</p> <ol style="list-style-type: none"> Address the needs of diverse end-users during the design process to produce artifacts with broad accessibility and usability. Employ self- and peer advocacy to address bias in interactions, product design and development methods.