Ohio’s Standards and Model Curriculum

Computer Science Grade 4

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Ohio | Department of Education

Computer Science Model Curriculum for Grade 4

Strand	Computing Systems
Topic	**Devices**

CS.D.4.a Explore external components (i.e., parts) of a computing system and their function to understand and describe the role they play in a computer system.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students developed an understanding that the device they selected for a specific task has components that all play a role in the computer system. In grade 4, students develop their understanding of what external components are used to share information. In grade 5, students will develop their understanding of the internal parts of the computer and how they play a role in the computer system.

IMPORTANT CONCEPTS

- External devices are used to input, store and transfer data into the computer
- Different devices have different purposes
- Each external component (i.e., part) has a different function in a computer system

KEY SKILL/PROCEDURES

- Identify key external components (i.e., parts) such as USB port, HDMI, network cable, power supply, etc.
- Select appropriate device to accomplish a task
- Describe the components of the selected device

Content Elaborations

CLARIFICATIONS

External components (i.e., parts) in this grade level may focus upon things plugged-in or attached to the computer.

External components can include a USB port and drive, power supply, network cable, or HDMI port. Depending on the device, some of these components may or may not exist. For example, on some tablets a USB port is not available. Mobile devices do not always require the device to be plugged in to the power source.

Strand	Computing Systems	
Topic	**Devices**	
		CONTENT FOCUS The focus should be upon students understanding the components (i.e., parts) of the device that they select for their task. For example, if they select a networked computer, this can allow them to communicate with others globally. If their computer is not connected to a network, their communication is limited. **COMPUTER SCIENCE PRACTICES** *Practice 2.* Collaborating Around Computing 4. Evaluate and select technological tools that can be used to collaborate on a project.

Strand	Computing Systems
Topic	**Hardware and Software**

CS.HS.4.a Select and use digital learning tools/devices to support planning, implementing and reflecting upon a defined task.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students selected learning tools or devices in order to plan, implement, and reflect upon tasks. In grade 4, students continue to select learning tools/devices and use them to aid in planning, implementing, and reflecting on given tasks. In grade 5, students will use and evaluate the digital learning tools and devices they've chosen and consider the planning, implementation, and reflection across curricular areas.

IMPORTANT CONCEPTS

- Different types of software and hardware can be used to accomplish a task
- Learning tools should support the planning, implementing, and reflecting of a task

KEY SKILL/PROCEDURES

- Select and use a tool such as a presentation software program, document, graphic design program, video creating software to accomplish a given task
- Select and use an appropriate device, such as a tablet, laptop, or desktop to accomplish a given task

Content Elaborations

CLARIFICATIONS

Tools should begin to extend to apps and programs beyond basic programs provided on selected device. Selection and use of a variety of devices such as tablets, desktops, laptops should be included.

CONTENT FOCUS

The focus is on students selecting and using their own tools or devices. Tasks should increase in complexity from third grade and focus on specific curricular goals in subject content.

COMPUTER SCIENCE PRACTICES

Practice 2. Collaborating Around Computing

4. Evaluate and select technological tools that can be used to collaborate on a project.

Strand	Computing Systems
Topic	**Troubleshooting**

CS.T.4.a Diagnose problems and select an appropriate solution from a list of problems and solutions to resolve hardware and software issues.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students began to move beyond trial and error to apply more strategic troubleshooting techniques to fix their problems. In grade 4, students focus on diagnosing and describing potential hardware and software problems. In grade 5, students will work to diagnose problems, describe the problem, and develop strategies to resolve technology issues.

IMPORTANT CONCEPTS

- Troubleshooting strategies can be used to solve hardware and software issues

KEY SKILL/PROCEDURES

- Diagnose problems in hardware and software
- Select a solution for the problem from a given list

Content Elaborations

CLARIFICATIONS

Students should describe the reason for the problem. For example, if the computer does not turn on, maybe the battery is dead. If the program does not work, maybe the username or password is wrong. If needed, students should be able to select solutions from a list of potential solutions.
Students should be exposed to specific problems so they can develop the skills to troubleshoot in the future (i.e., disconnecting a computer from the network so that students are able to see what this looks like).

CONTENT FOCUS

The focus is on students diagnosing and describing problems. Students should be able to select solutions.

COMPUTER SCIENCE PRACTICES

Practice 6. Testing and Refining Computational Artifacts
2. Identify and fix errors using a systematic process.

Strand	Networks and the Internet
Topic	**Networking**

NI.N.4.a Describe how information is broken down to be transmitted over a network to help students gain a better understanding of the internet and networks.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students explored how information is sent and received over the internet. In grade 4, students explain how information is broken apart, sent and received over the internet. In grade 5, students will demonstrate how information is broken apart, sent and received over the internet.

IMPORTANT CONCEPTS

- Manipulating a URL (i.e., web address) even slightly can change what information is accessed
- Information is broken into parts at the sending point and reassembled at the receiving point

KEY SKILL/PROCEDURES

- Modify a URL (i.e., web address) to access content
- Describe what occurs when a URL is modified
- Use a metaphorical example to describe how information is broken down into parts and reassembled

Content Elaborations

CLARIFICATIONS

Students should understand that altering a URL will change the information that is displayed.
An example of a metaphorical connection 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.

CONTENT FOCUS

The focus is on students modifying a URL to reach a specific site and describing how the modification impacts the information accessed. Students communicate how information is transmitted.

COMPUTER SCIENCE PRACTICES

Practice 4. Developing and Using Abstractions

4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes.

Strand	Networks and the Inernet
Topic	**Networking**

NI.N.4.b Describe network addresses, names and rules (i.e., protocols) to share or receive information from the global community.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students have developed an understanding of how information is shared, received and stored. In grade 4, students identify that different naming techniques are related to the type of information accessed. In grade 5, students will continue applying this knowledge.

IMPORTANT CONCEPTS

- Different types of rules for naming a web address identify different types of sites
- The search terms or web address is converted to a format that the computer can read to reach the desired site

KEY SKILL/PROCEDURES

- Identify the reliability of a site based on the naming rule (e.g., top level domain)
- Use search techniques (Boolean) to allow the computer to understand what is being searched

Content Elaborations

CLARIFICATIONS

Students identify reliability based on the top-level domain naming such as ".edu" for education purposes, ".com" for commercial purposes, ".gov" for government purposes, and ".org" for organizations.

Boolean searches use " ", *and, or*, etc.

CONTENT FOCUS

The focus is on identifying informational reliability and making a connection between search terms and website addresses.

COMPUTER SCIENCE PRACTICES

Practice 4. Developing and Using Abstractions

4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes.

Strand	Networks and the Inernet
Topic	**Cybersecurity**

NI.C.4.a Describe what information should be protected and the importance of a secure password to protect information.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students explored and understood personal information and how passwords are used to protect information. In grade 4, students describe types of private information and the importance of protecting that information. In grade 5, students will create secure passwords to protect personal information and store them securely.

IMPORTANT CONCEPTS

- Personal information should be protected by secure passwords
- Potential consequences of personal information being unsecure

KEY SKILL/PROCEDURES

- Describe why personal information needs to be protected
- Describe what could happen if personal information is unsecure

Content Elaborations

CLARIFICATIONS

Students often only associate the worst-case scenario of sharing information. They need to understand real-world dangers of personal information being shared in an unsecure environment.
Students need to know what a secure password looks like and why they should use a secure password.

CONTENT FOCUS

The focus is on students identifying why information needs to be protected and being aware of consequences related to unsecure information.

COMPUTER SCIENCE PRACTICES

Practice 3. Recognizing and Defining Computational Problems

1. Identify complex, interdisciplinary, real-world problems that can be solved computationally.

Strand	Data and Analysis
Topic	**Data Collection and Storage**

DA.DCS.4.a Gather and organize multiple quantitative data elements using a tool to perform various tasks.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students collected, recorded and maintained data over time using various tools, such as a thermometer, ruler, scale and survey. In grade 4, students build upon the use of tools from grade 3, to collect data from multiple sources within a singular topic over time. In grade 5, students will select appropriate tools to collect data from multiple sources within a singular topic over time.

IMPORTANT CONCEPTS

- Keeping an organized record of data over time is critical to analyzing data
- Various tools can be used to generate data
- Different tools are used to collect different types of data

KEY SKILL/PROCEDURES

- Use appropriate tools to collect data
- Use appropriate tools to organize data
- Maintain accurate data from multiple sources within a singular topic over a period of time
- Collect data from multiple sources within a singular topic, by making repeated observations over time

Content Elaborations

CLARIFICATIONS

Tools that may be explored are digital thermometers, GPS sensors, calculators, scales, digital forms (i.e., 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.

CONTENT FOCUS

The focus is on students collecting, recording, maintaining and organizing data from multiple sources within a singular topic over time.

Strand	Data and Analysis
Topic	**Data Collection and Storage**
	COMPUTER SCIENCE PRACTICES *Practice 7*. Communicating About Computing 1. Select, organize, and interpret large data sets from multiple sources to support a claim.

Strand	Data and Analysis
Topic	**Data Collection and Storage**

DA.DCS.4.b Identify techniques and formats to store, process and retrieve different types of information.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students used different software tools to access data and store it in different locations. In grade 4, students begin to gain an understanding that different file types may require different storage. In grade 5, students will use their knowledge of file types to explore how file size impacts storage.

IMPORTANT CONCEPTS

- Different data is stored in different ways on a computing device
- Data can be stored locally, on a computing device or online
- How data is stored impacts accessibility

KEY SKILL/PROCEDURES

- Store data as a specific file type
- Locate and retrieve data on a computing device

Content Elaborations

CLARIFICATIONS

Examples of data storage could include saving to a device, local network or the cloud.
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.
Information refers to data, which could include pictures, audio, video, or documents.
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).

CONTENT FOCUS

The focus is that data storage impacts the accessibility of information and that different data types are stored in different formats.

COMPUTER SCIENCE PRACTICES

Practice 7. Communicating About Computing

1. Select, organize, and interpret large data sets from multiple sources to support a claim.

Strand	Data and Analysis
Topic	Data Collection and Storage
Strand	Data and Analysis
Topic	Visualization and Communication

DA.VC.4.a Organize data into subsets to provide different views or commonalities and present insights gained using visual or other types of representations.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students extended their knowledge by creating scaled picture and bar graphs. They also created line plots using scales that include whole numbers and fractions (e.g., halves and fourths). In grade 4, students interpret data in self-created graphs to present insights. In grade 5, students will use graphs created to highlight and support a claim they have made.

IMPORTANT CONCEPTS

- A symbol on a graph (picture, bar, etc.) can represent more than one item
- A key on a graph indicates how many items a symbol represents
- A scale on a bar graph varies depending on the data available
- Symbols used in picture graphs should be evenly spaced to present visually accurate data
- Data from a graph can be used to gain insights or solve a problem

KEY SKILL/PROCEDURES

- Record data with several categories on a scaled bar graph or picture graph
- Determine appropriate scale for data given
- Interpret and answer questions regarding data presented in a bar or picture graph

Content Elaborations

CLARIFICATIONS

An important concept for students to begin to understand is that a scale is chosen based on data available.
Students should begin understanding that data is used to solve problems. For example, if the majority of 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.

Strand	Data and Analysis
Topic	**Data Collection and Storage**
	CONTENT FOCUS The focus is on students using a visual representation to communicate the data they have collected and interpreting the data to answer questions. **COMPUTER SCIENCE PRACTICES** *Practice 7.* Communicating About Computing 1. Select, organize, and interpret large data sets from multiple sources to support a claim.

Strand	Data and Analysis
Topic	**Inference and Modeling**

DA.IM.4.a Utilize data to make predictions and discuss whether there is adequate data to make reliable predictions.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students analyzed and explained relationships or patterns and predicted an unknown. In grade 4, students determine if adequate data has been collected and run simulations to explore outcomes. In grade 5, students will run simulations to test theories and make predictions about how larger data sets effect outcomes.

IMPORTANT CONCEPTS

- Data from a graph can be used to determine patterns
- Patterns can be analyzed to determine a missing value and predict outcomes
- A data set can be modified to manipulate outcomes
- Analyze trends based on quantity of data sets
- Key Skill/Procedures
- Answer questions about missing variables in a data set
- Use data to make predictions about outcomes
- Manipulate data and explain how quantity affects outcomes

Content Elaborations

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.

CONTENT FOCUS

The focus is on students identifying patterns in data to find missing values. They predict outcomes to continue patterns.

COMPUTER SCIENCE PRACTICES

Practice 4. Developing and Using Abstractions

1. Extract common features from a set of interrelated processes or complex phenomena.

Strand	Algorithmic Think and Programming
Topic	**Algorithms**

ATP.A.4.a Construct and refine an algorithm to accomplish a given task.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students experienced designing algorithms. In grade 4, students refine an algorithm to accomplish a given task. In grade 5, students will compare and refine algorithms with a focus on efficiency.

IMPORTANT CONCEPTS

- 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

KEY SKILL/PROCEDURES

- Utilize logical patterns of progression within an algorithm to modify it to accomplish a given task
- Recognize and identify errors within an algorithm to modify it to accomplish a given task
- Utilize pseudocode and flow charts to assist with creating and modifying an algorithm to accomplish a given task

Content Elaborations

CLARIFICATIONS

Processes of computational thinking (i.e., logical thought) or beginning, middle, end to create organized steps should be emphasized in order to decompose, abstract, and reassemble an algorithm. Use proper editing for modifying algorithms (i.e., conditional, loops). Computational thinking also needs to be emphasized to identify where an error has occurred and the process needed to fix it. This can be written in code, pseudocode, real language, or flowcharts.

CONTENT FOCUS

The focus is on students modifying the algorithm to fix it and reconstruct it to accomplish a given task.

COMPUTER SCIENCE PRACTICES

Practice 3. Recognizing and Defining Computational Problems
2. Decompose real-world problems.

Strand	Algorithmic Think and Programming
Topic	**Variables and Data Representation**

ATP.VDR.4.a Identify and use a variable, a placeholder for storing a value, to understand how it works in a multi-step process (i.e., algorithm).

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students defined and identified variables to understand how they are used in algorithms. In grade 4, students further expand on defining and identifying variables and begin to use them. In grade 5, students will create a variable to store and modify data.

IMPORTANT CONCEPTS

- Letters or symbols are used to represent a variable within an algorithm
- Data can be stored in the variable
- Variables represent a changing value

KEY SKILL/PROCEDURES

- Explain and identify variables within algorithms
- Write an algorithm that substitutes a variable for a value
- Edit the algorithm to show how it changes the algorithm's result

Content Elaborations

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, a cloze activity allows students to choose varying words for a single blank within a passage. Students would examine how this changes the meaning of the passage. This is a variable (i.e., a placeholder that can change).

Students are not required to know and recognize the formal terms "variable" and "algorithm."

Strand	Algorithmic Think and Programming
Topic	**Variables and Data Representation**
	CONTENT FOCUS The focus is on students being able to define and identify unknown variables as symbols, such as letters, and understanding how they are used in algorithms to store data. Students should begin using variables within equations. **COMPUTER SCIENCE PRACTICES** *Practice 4*. Developing and Using Abstractions 1. Extract common features from a set of interrelated processes or complex phenomena.

Strand	Algorithmic Think and Programming
Topic	**Control Structures**

ATP.CS.4.a Create a program using sequences, events, loops and conditionals to solve a problem.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students built upon their skills and knowledge to create programs with more refined strategies, such as loops and conditionals, and considered the components of an event. In grade 4, students continue to refine their programming skills using established structures such as loops and conditionals. In grade 5, students will apply these new skills in increasingly complex ways and will continue to refine these to work towards programming efficiency.

IMPORTANT CONCEPTS

- 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 with it
- Proper sequencing of steps within the program ensures efficiency

KEY SKILL/PROCEDURES

- Insert a loop in a program in order to avoid typing a command several times
- Insert a conditional in a program to create several paths (if/then)
- 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 to make length of code shorter (i.e. if/else/then)

Content Elaborations

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.

Strand	Algorithmic Think and Programming	
Topic	**Control Structures**	
		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. Events can be thought of as an action as a result of an action. Such as, "When I click the mouse, the image rotates." Sequencing of events and commands is an important part of programming when creating a program from scratch or remixing an existing one. Students can diagram or describe the steps of a program using a flowchart or other graphic organizer. **CONTENT FOCUS** The focus is on students using a loop, conditional, and/or event. Students should also diagram or describe the flow of a program. The complexity of the loops, conditionals, events, and sequences continues to increase from the prior grade level. **COMPUTER SCIENCE PRACTICES** *Practice 4.* Developing and Using Abstractions 1. Extract common features from a set of interrelated processes or complex phenomena.

Strand	Algorithmic Think and Programming
Topic	**Modularity**

ATP.M.4.a Decompose (i.e., break down) the steps needed or not needed (i.e., abstraction) into precise sequences of instructions to design an algorithm.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students experienced decomposing abstractions into sequences to design algorithms. In grade 4, students continue to refine the decomposition, abstraction and algorithm creation process. In grade 5, students will begin to compare and refine multiple algorithms for efficiency.

IMPORTANT CONCEPTS

- Modularity refers to components of programs that complete a procedure or task. Modules within a program may need to be evaluated, refined and/or copied

KEY SKILL/PROCEDURES

- Utilize logical patterns of progression within an algorithm to make the best use of a series of steps to decompose the algorithm into functional sections
- Regroup or redesign sets of a decomposed algorithm in order to modify the result of the algorithm
- Determine if the logic of an algorithm requires decomposition or abstraction
- Utilize pseudocode and flow charts as related to the algorithm

Content Elaborations

CLARIFICATIONS

Processes of logical thought should include dissection of a whole to its parts. Solve 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. This can be written in code, pseudocode, real language, or flowcharts related to the language of the algorithm.

CONTENT FOCUS

The focus is on students using computational thinking as they work through an algorithm and then breaking an algorithm into its smaller components (i.e., parts) and logically determining if an error has occurred somewhere within an algorithm.

Strand	Algorithmic Think and Programming	
Topic	**Modularity**	
		COMPUTER SCIENCE PRACTICES *Practice 3.* Recognizing and Defining Computational Problems 2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. *Practice 4.* Developing and Using Abstractions 3. Create modules and develop points of interaction that can apply to multiple situation and reduce complexity. *Practice 7.* Communicating about Computing 1. Select, organize and interpret large data sets from multiple sources to support a claim.

Strand	Algorithmic Think and Programming
Topic	**Program Development**

ATP.PD.4.a Use a design process to plan and develop a program that addresses a multi-step problem.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students began to design and create a program to solve a problem. In grade 4, students design and create a program for a multi-step problem. In grade 5, students will design and create a program that addresses a multi-step problem and the preferences of the end user.

IMPORTANT CONCEPTS

- 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 plan a program
- Programs can execute multiple steps

KEY SKILL/PROCEDURES

- Design a program that can solve a problem
- Use the design process when planning a program
- Create a program for a multi-step problem

Content Elaborations

CLARIFICATIONS

Programs can be designed in a plugged (i.e., using a computer) or unplugged environment (i.e., not using a computer).

Programs can be designed using a block-based environment.

Multi-step problems will ask the user to complete 2 or more tasks.

A flow chart is a type of organizational tool that can be used to plan a program.

CONTENT FOCUS

The focus is on designing a program that can solve a problem with 2 or 3 steps.

Strand	Algorithmic Think and Programming
Topic	**Program Development**
	COMPUTER SCIENCE PRACTICES *Practice 5.* Creating Computational Artifacts 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.

Strand	Algorithmic Think and Programming
Topic	**Program Development**

ATP.PD.4.b Using guided questions, work through a program to identify errors and discuss possible solutions to repair the program.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, guided questions were asked to help students think more strategically about how to solve a problem in their program. In grade 4, students continue with guided questions that assist them in debugging their program. In grade 5, students will become less dependent upon guided questions and will begin to debug more complex programs.

IMPORTANT CONCEPTS

- 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

KEY SKILL/PROCEDURES

- Identify errors in a program
- Apply a fix to errors in a program

Content Elaborations

CLARIFICATIONS

If a program that is written 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.

Guided questions are questions that prompt the programmer to think more about their error and problem solve potential solutions without being given the answer.

Program complexity increases from grade level to grade level.

CONTENT FOCUS

The focus is on locating errors in a block-based environment program and through guided questioning determining solutions and applying the fix.

Strand	Algorithmic Think and Programming
Topic	**Program Development**
	COMPUTER SCIENCE PRACTICES *Practice 6.* Testing and Refining Computational Artifacts 2. Identify and fix errors using a systematic process.

Strand	Impacts of Computing
Topic	**Culture**

IC.Cu.4.a List examples of computing technologies that have changed the global community to express how those technologies influence and are influenced by cultural practice.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students identified the impact technology has on everyday life in the local community. In grade 4, students recognize the impact of technology on the global community. In grade 5, students will explain how technology has changed everyday life globally.

IMPORTANT CONCEPTS

- People within a local region use technology in various ways
- Daily life is influenced by the technology within the community

KEY SKILL/PROCEDURES

- Identify specific types of technology used in the global community
- Describe ways that various technology resources impact daily life in a region

Content Elaborations

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)

CONTENT FOCUS

The focus is on the impacts of technology in daily life and the influence of cultural practices within the community.

COMPUTER SCIENCE PRACTICES

Practice 1. Fostering an Inclusive Computing Culture

1. Include the unique perspective of others and reflect on one's own perspectives when designing and developing computational products.

Strand	Impacts of Computing
Topic	**Culture**

IC.Cu.4.b Identify and anticipate diverse user needs to increase accessibility to all users.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students identified diverse user needs and how computing devices have features built in to increase accessibility. In grade 4, students identify and anticipate diverse needs and ways to improve devices to make them more accessible to users. In grade 5, students will modify artifacts to meet diverse user needs to increase accessibility.

IMPORTANT CONCEPTS

- Users have diverse needs that impact accessibility
- Computing devices have built in features to increase accessibility

KEY SKILL/PROCEDURES

- Locate and use built in features to increase accessibility
- Identify the diverse needs of users

Content Elaborations

CLARIFICATIONS

Anticipating the needs and wants of diverse end users requires students to purposefully consider potential perspectives of users with different backgrounds, ability levels, points of view, and disabilities. Example of built-in feature to increase accessibility include voice command, text-to-speech, and magnify text. (CSTA K-12 Computer Science Standards, 2017)

CONTENT FOCUS

The focus is on identifying the diverse needs of users to increase accessibility.

COMPUTER SCIENCE PRACTICES

Practice 1 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.

Strand	Impacts of Computing
Topic	**Social Interactions**

IC.SI.4.a Collaborate and consider diverse perspectives to improve digital artifacts.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students collaborated through feedback and reflection to improve a digital artifact and begin to explore how diverse perspectives improve digital artifacts. In grade 4, students collaborate with others to share the workload, increase diverse perspectives, and improve a digital artifact. In grade 5, students will collaborate with others outside of the classroom to share the workload, increase diverse perspectives, and improve the artifact.

IMPORTANT CONCEPTS

- 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
- Sharing the workload with peers can increase productivity and improve the quality of artifacts

KEY SKILL/PROCEDURES

- Leave thoughtful feedback for peers that will help improve their digital artifacts
- Reflect on feedback from peers to improve digital artifacts
- Work with a partner or group to produce a digital artifact

Content Elaborations

CLARIFICATIONS

Teachers can support students to leave thoughtful feedback through modeling this process. Teachers should conduct whole group discussions after students have left feedback to determine if feedback was productive.

As students collaborate, they should begin to understand that group members take on agreed-upon roles to share the workload.

CONTENT FOCUS

The focus is on collaborating as a group to produce digital artifacts. Students begin to understand that feedback can be provided to improve artifacts during the creation process.

Strand	Impacts of Computing	
Topic	**Social Interactions**	
		COMPUTER SCIENCE PRACTICES *Practice 2.* Collaborating Around Computing 1. Cultivate working relationships with individuals possessing diverse perspectives, skills, and personalities. 2. Create team norms expectation and equitable workloads to increase efficiency and effectives. 3. 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	Impacts of Computing
Topic	**Safety, Law and Ethics**

IC.SLE.4.a Use public domain or Creative Commons media, and refrain from copying or using material created by others without permission.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students were introduced to the concept that some resources can be shared (e.g., public domain, Creative Commons), while others must be used only with proper citations or permission. In grade 4, students are introduced to formal procedures used when sharing materials. Students will be expected to identify the type of source and give credit to the source. In grade 5, students will apply proper procedures when giving credit to a source.

IMPORTANT CONCEPTS

- 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 can be cited formally or informally to give credit for the use of these materials

KEY SKILL/PROCEDURES

- Determine whether a source can or cannot be used freely
- Informally site sources

Content Elaborations

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)

CONTENT FOCUS

The focus is on recognizing that some resources are public domain and can be used freely and other materials needs to be cited properly.

Strand	Impacts of Computing	
Topic	**Safety, Law and Ethics**	
		COMPUTER SCIENCE PRACTICES *Practice 7.* Communicating about Computing 3. Articulate ideas responsibly by observing intellectual property rights and giving appropriate attribution.

Strand	Impacts of Computing
Topic	**Safety, Law and Ethics**

IC.SLE.4.b Explain why information should be shared or kept private to protect student identity.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students learned the importance of keeping personal information secure. In grade 4, students start to make distinctions between what information should be shared and what information should be kept private. In grade 5, students will begin to consider the effects of sharing private information.

IMPORTANT CONCEPTS

- For safety and security, personal information should be kept private

KEY SKILL/PROCEDURES

- Determine whether information should or should not be shared
- Recognize that keeping information private protects your identity

Content Elaborations

CLARIFICATIONS

Examples of information to be kept private are first and last name, birthday, addresses, phone number, or other personal identifiers.
Students should also understand that they should not share the personal information of others.

CONTENT FOCUS

The focus is on knowing why some information can be shared and some should be kept private.

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.

Strand	Impacts of Computing
Topic	**Safety, Law and Ethics**

IC.SLE.4.c Communicate the importance of protecting one's own digital footprint.

Expectations for Learning

LEARNING PROGRESSION

In grade 3, students were exposed to the vocabulary relating to information security and formed a basic understanding of a digital footprint. In grade 4, students consider how their current online behavior affects their digital footprint. In grade 5, students will expand on the subject by further examining their online behaviors and how they affect others.

IMPORTANT CONCEPTS

- Students already have a digital footprint and continue to add to it with online behavior
- Sites that students are currently using are storing personal information
- Sites that collect digital information store personal information for an infinite amount of time

KEY SKILL/PROCEDURES

- List examples of what would be included in a personal digital footprint
- Give examples of personal information that is appropriate to share
- Determine the impact of contributions to your digital footprint

Content Elaborations

CLARIFICATIONS

Students should begin to consider their own digital footprint and have discussions about the specific impacts of sharing different types of content on one's digital footprint.

CONTENT FOCUS

The focus is on considering specific examples of safe practices regarding online sharing and having students consider their own online actions.

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.