Ohio’s Standards and Model Curriculum

Computer Science Grade 3

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Ohio | Department of Education

Computer Science Model Curriculum for Grade 3

Strand	Computing Systems
Topic	**Devices**

CS.D.3.a Explore common 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 2, students began selecting devices with a purpose in mind. In grade 3, students develop an understanding that the device they selected for a specific task has components (i.e., parts) that play a role in the computer system. In grade 4, students will develop their understanding of what external components are used to share information locally and globally.

IMPORTANT CONCEPTS

- External devices are used to input 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 components (i.e., parts) such as keyboard, trackpad/mouse, monitor, printer, tablet, etc.
- Select an appropriate device to accomplish a task
- Describe the components of the selected device

Content Elaborations

CLARIFICATIONS

Different devices may include a personal computer, tablet, laptop, or smartphone.
External components (i.e., parts) include a keyboard, mouse/trackpad, monitor/screen, USB port and drive.
Sometimes, a component (part) on a device can have multiple functions. For example, a screen can have multiple functions when the screen also serves as the trackpad or keyboard.

CONTENT FOCUS

The focus should be upon students understanding the components (i.e., parts) of the device that they select for their task. If they selected a tablet, students should understand that various parts may perform multiple tasks. For example, the screen serves as a monitor and input device with keyboard.

Strand	Computing Systems	
Topic	**Devices**	
		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.3.a Identify and use digital learning tools/devices to support planning, implementing and reflecting upon a defined task.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students began selecting devices with a purpose in mind. In grade 3, students select learning tools or devices in order to plan, implement, and reflect upon tasks. In grade 4, students will continue to select learning tools and devices and will use them to aid in planning, implementing, and reflecting upon given tasks.

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, or video editing 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 can range from basic programs, such as word processing and presentation software to other online tools.

CONTENT FOCUS

The focus is on students selecting and using a tool or device to accomplish a task. Students should be given opportunities to self-select a tool to accomplish a task.

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.3.a Apply troubleshooting strategies given problems and solutions to resolve hardware and software problems.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students continued to work on their use of problem-solving. In grade 3, students begin to move beyond trial and error to apply more strategic troubleshooting techniques to fix their problems. In grade 4, students will focus on diagnosing and describing potential hardware and software problems.

IMPORTANT CONCEPTS

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

KEY SKILL/PROCEDURES

- Use a troubleshooting technique to solve a given problem

Content Elaborations

CLARIFICATIONS

Examples of problems to troubleshoot at this level may be a computer not connecting to the network or not turning on. Students should state what the problem is instead of just referring to the problem as "the computer is broken."

CONTENT FOCUS

The focus is on students using targeted troubleshooting techniques to solve given problems.

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.3.a Describe how communication occurs when information is sent and received over physical or wireless paths to explain communication systems (e.g., sending an email or visiting a website).

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students described what a network was, devices we use to network, how devices can be identified, and how they can be connected together. Additionally, students networked using devices to access and retrieve information within a global community. In grade 3, students explore how information is sent and received over the internet. In grade 4, students will elaborate on how information is broken down and transmitted before it is received.

IMPORTANT CONCEPTS

- A web address or URL has a different function than searching for content
- Information is communicated through a wired or wireless connection

KEY SKILL/PROCEDURES

- Enter a precise address to reach a site
- Recognize whether or not a network (i.e., internet) connection is present
- Conduct basic troubleshooting techniques based on network connectivity

Content Elaborations

CLARIFICATIONS

Students often confuse the address bar for the search bar when attempting to access a website. Students should understand that these have two different functions and a web address should be accessed through an address bar. The web address should be typed in exactly to access the site they are attempting to reach.

Students should understand that online information cannot be accessed without a network connection. They should be able to recognize whether a network connection is present.

Basic troubleshooting techniques for network connectivity could include restarting a device, refreshing a webpage, or attempting to reconnect to the network.

CONTENT FOCUS

The focus is on students entering a precise URL (web address) into the address bar to reach a site and recognizing that reaching this site cannot be done without a network connection.

Strand	Networks and the Internet
Topic	**Networking**
	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 Internet
Topic	**Networking**

NI.N.3.b Recognize that every device on a network has a unique identifier to share or receive information from the global community.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students described what a network is, devices we use to network, how devices can be identified, and how they can be connected together. Additionally, students networked using devices to access and retrieve information within a global community. In grade 3, students continue to build an understanding of how information is shared, received, and stored. In grade 4, students will build their vocabulary around these concepts.

IMPORTANT CONCEPTS

- Similar to a personal mailing address, every device has a unique address for sending or receiving information

KEY SKILL/PROCEDURES

- Recognize that every device has a unique network address

Content Elaborations

CLARIFICATIONS

Students should understand that their device has a unique address. This is similar to his or her personal mailing address in the sense that the information knows where to travel based on the address.

CONTENT FOCUS

The focus is on students recognizing that devices have unique web 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 Internet
Topic	**Cybersecurity**

NI.C.3.a Explore digital safety concepts in order to explain that information can be both public and private, to determine what information can safely be shared and to know how to use passwords to protect information.

Expectations for Learning

LEARNING PROGRESSION

In K-2, students have had experience identifying private and public information. In grade 3, students explore and understand personal information and how passwords are used to protect that information. In grade 4, students will describe the importance of using a secure password to protect personal information.

IMPORTANT CONCEPTS

- Personal information is valuable and both private and sharable
- Personal (private) information should be protected by passwords

KEY SKILL/PROCEDURES

- Explain private vs. public information and that this is called personal information
- Explain why passwords are used

Content Elaborations

CLARIFICATIONS

Students struggle with what to share or not to share, which is private or public information. They should make the connection between that and personal information.

Students often think it is okay to share their passwords with their peers. They need to connect passwords with something that needs to be private.

CONTENT FOCUS

The focus is on students exploring and understanding different types of personal and public information and why passwords are important.

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.3.a Collect quantitative data over time from multiple sources to perform various tasks.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students had experience collecting, sorting and organizing data. In grade 3, students collect, record and maintain data over time using various tools, such as a thermometer, ruler, scale and survey. In grade 4, students will begin to explore various computational tools for collecting data from multiple sources over time.

IMPORTANT CONCEPTS

- Keeping an organized record of data over time is critical to analyzing data
- Various tools can be used to collect 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 over a period of time
- Collect data by making repeated observations over time

Content Elaborations

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. Digital organizational resources could include spreadsheets and online graphing programs.

CONTENT FOCUS

The focus is on students collecting, recording, maintaining and organizing data over time, rather than communicating data through graphs and charts.

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.3.b Identify different types of information to store in different formats.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students had experience collecting, sorting, and organizing data. In grade 3, students can use different software tools to access data and store it in different locations. In grade 4, students will begin to gain an understanding that different file types may require different storage.

IMPORTANT CONCEPTS

- Data is stored in different locations on a computing device
- Data can be stored locally, on a computing device or online
- Where data is stored impacts accessibility

KEY SKILL/PROCEDURES

- Store, 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, and documents.

CONTENT FOCUS

The focus is that data storage impacts the accessibility of information.

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	**Visualization and Communications**

DA.VC.3.a Create a chart or graph to inform a target audience about observations and data collected.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students continued to analyze data in various visual formats. In grade 3, students extend their knowledge by creating scaled picture and bar graphs. They will also create line plots using scales that include whole numbers and fractions (e.g., halves and fourths). In grade 4, students will interpret data in self-created graphs to present insights.

IMPORTANT CONCEPTS

- A symbol on a graph (e.g., picture, bar) 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

KEY SKILL/PROCEDURES

- Record data with several categories on a scaled bar graph or picture graph
- Determine appropriate scale for data given

Content Elaborations

CLARIFICATIONS

An important concept for students to begin understanding is that the visual representation of their data impacts how that data will be interpreted. For example, on a bar graph, the bars must be the same size and symbols on a picture graph should be evenly spaced.

CONTENT FOCUS

The focus is on students taking data they have collected and using a visual representation to communicate the data.

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.3.a Utilize data to make predictions and discuss whether there is adequate data to make reliable predictions.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students interpreted and analyzed graphs. In grade 3, students analyze and explain relationships or patterns and predict an unknown. In grade 4, students will determine if adequate data has been collected and run simulations to explore outcomes.

IMPORTANT CONCEPTS

- Data from a graph can be used to determine patterns
- Data can be used to make predictions about outcomes or to find missing value

KEY SKILL/PROCEDURES

- Explain patterns in a data set and determine missing values
- Analyze patterns and make predictions about outcomes
- Create a model to identify patterns and essential elements

Content Elaborations

CLARIFICATIONS

Students explore data and look for patterns. A mathematical connection would be to use in/out (function) machines to find missing values. They solve and make predictions. They begin to discover a pattern cannot continue without a significant number of occurrences.

CONTENT FOCUS

The focus is on students manipulating data to explore patterns and make predictions.

COMPUTER SCIENCE PRACTICES

Practice 4. Developing and Using Abstractions

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

Strand	Algorithmic Thinking and Programming
Topic	**Algorithms**

ATP.A.3.a Construct and reflect on errors in an algorithm to accomplish a given task.

Expectations for Learning

LEARNING PROGRESSION

In Grade 2, students constructed and followed directions in a real-world context through written words, statements, and visual symbols. In grade 3, students create algorithms and find errors within an algorithm (i.e., step-by-step task). In grade 4, students will begin refining their created algorithms to accomplish a task.

IMPORTANT CONCEPTS

- An algorithm is a series of steps that will complete a process
- Logical patterns of progression exist within an algorithm

KEY SKILL/PROCEDURES

- Utilize logical patterns of progression within an algorithm
- Recognize and identify errors within an algorithm
- Recognize pseudocode and flow charts

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 an algorithm. Computational thinking also needs to be emphasized to identify where an error has occurred. This can be written in code, pseudocode, real language, or flowcharts.

CONTENT FOCUS

The focus is on students using computation thinking (i.e., logical thought) as they work through an algorithm, breaking it into smaller components and determining if an error has occurred somewhere within an algorithm.

COMPUTER SCIENCE PRACTICES

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

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

ATP.VDR.3.a Define and identify a variable, a placeholder for storing a value, to understand how it is used in a multi-step process (i.e., algorithm).

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students modeled the use of numbers, symbols and pictures to manipulate and store information. In grade 3, students define and identify variables to understand how they are used in algorithms. In grade 4, students will elaborate on defining and identifying variables.

IMPORTANT CONCEPTS

- Symbols can represent a variable within an algorithm
- Data can be stored in the variable

KEY SKILL/PROCEDURES

- Use logical variable representations (symbols)
- Identify where an algorithm might include a variable instead of a value

Content Elaborations

CLARIFICATIONS

Symbols (e.g., ?, □) are used in programming to hold values. For example, a cloze activity allows students to choose varying words for a single blank within a 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."

CONTENT FOCUS

The focus is on students being able to define and identify variables as symbols with an understanding of how they are used in algorithms to store data.

COMPUTER SCIENCE PRACTICES

Practice 4. Developing and Using Abstractions

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

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

ATP.CS.3.a Create a program using sequences, events, loops and conditionals to solve a problem.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students created a program that utilizes sequencing and loops. In grade 3, students build on their skills and knowledge to create programs with more refined strategies, such as loops and conditionals, and consider the components of an event. In grade 4, students will continue to refine their programming skills using established structures, such as loops and conditionals.

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
- 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 in order 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 events and products
- Use statements that are introductory level (e.g., if/then, and/or)

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.

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.

Strand	Algorithmic Thinking and Programming
Topic	**Control Structures**
	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. **COMPUTER SCIENCE PRACTICES** *Practice 4*. Developing and Using Abstractions 1. Extract common features from a set of interrelated processes or complex phenomena.

Strand	Algorithmic Thinking and Programming
Topic	**Modularity**

ATP.M.3.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

ATP.M.3.a Decompose (break down) the steps needed or not needed (abstraction) into precise sequences of instructions to design an algorithm.

IMPORTANT CONCEPTS

- Modularity refers to smaller portions of a program that may complete their own procedure. These modules (smaller portions) may be copied and used in other programs. A program can be decomposed to find its modules. These may be used in other programs.

KEY SKILL/PROCEDURES

- Utilize logical patterns of progression within an algorithm to make the best use of a series of steps
- Utilize chunking strategies to group sets of a decomposed algorithm in order to modify the result of the algorithm
- Recognize pseudocode and flow charts

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. Chunking strategies help ensure that sets of instructions include all needed parts to reach the end goal. This can be written in code, pseudocode, real language or flowcharts.

CONTENT FOCUS

The focus is on students thinking logically as they work through an algorithm, determining if it should be decomposed, then breaking an algorithm into its smaller components and logically determining if an error has occurred somewhere within an algorithm.

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.

Strand	Algorithmic Thinking and Programming
Topic	**Modularity**
	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 Thinking and Programming
Topic	**Program Development**

ATP.PD.3.a Use a design process to plan the development of a program that solves problems.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students began to plan and create simple programs in a sequential manner using graphic organizer tools. In grade 3, students use these skills to design and create programs to solve a problem. In grade 4, students will design programs that include 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.

KEY SKILL/PROCEDURES

- Design a program that can solve a problem
- Use the design process when planning a program

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.

Programs can address a one-step problem or a more complex one.

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

The flow chart is a visual representation of decisions and directions throughout the program.

Students can design instructions for a simple game (e.g., tic-tac-toe).

CONTENT FOCUS

The focus is on designing a program that can solve a problem using 1 or 2 steps.

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

ATP.PD.3.b Using a given program known to contain errors, identify and debug errors to ensure it works.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students described their problem and came up with possible solutions. In grade 3, guided questions will be asked to help students think more strategically about how to solve a problem in their program. In grade 4, students will continue with guided questions that assist them in debugging their program.

IMPORTANT CONCEPTS

- A computer bug is a series of commands that do not properly interact with each other and cause an interruption 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" (i.e., 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.

Students might look at a set of instructions that are not in the correct order and determine the correct order to fix the debug "fix" the instructions.

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

CONTENT FOCUS

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

Strand	Algorithmic Thinking 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.3.a Identify computing technologies that have changed the world and express how those technologies influence and are influenced by cultural practice.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students compared and contrasted how technology use has changed and the impact it has had on their personal lives. In grade 3, students identify the impact technology has on everyday life in the local community. In grade 4, students will recognize the impact of technology on the global community.

IMPORTANT CONCEPTS

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

KEY SKILL/PROCEDURES

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

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 on the local 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.3.b Identify how computing devices have built-in features to increase accessibility to all users.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students compared and contrasted how technology use has changed and the impact it has had on their personal lives. In grade 3, students identify diverse user needs and how computing devices have features built in to increase accessibility. In grade 4, students will identify and anticipate diverse needs and ways to improve devices to make them more accessible to users.

IMPORTANT CONCEPTS

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

KEY SKILL/PROCEDURES

- Identify built in features to increase accessibility
- Recognize that users have diverse needs

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. Examples of built-in features to increase accessibility include voice command, text-to-speech, and magnify text.

CONTENT FOCUS

The focus is on the diverse needs of users and how those needs impact accessibility.

COMPUTER SCIENCE PRACTICES

Practice 1 Fostering an Inclusive Computing Cultures

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.3.a Collaborate and consider diverse perspectives to improve digital artifacts.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students were able to compare and contrast safe and responsible technology behaviors. In grade 3, students collaborate through feedback and reflection to improve a digital artifact and begin to explore how diverse perspectives improve artifacts. In grade 4, students will collaborate with others to share workload and increase diverse perspectives to improve a digital 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 to improve the quality of their work

KEY SKILL/PROCEDURES

- Leave thoughtful feedback for peers that will help improve their digital artifacts
- Reflect on feedback from peers to improve digital artifacts

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.

CONTENT FOCUS

The focus is on providing and reflecting on feedback to improve digital artifacts.

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.

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

IC.SLE.3.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 K-2, students were able to explain why it is important to use technology in the correct way to make decisions about appropriate use and protecting login information. In grade 3, students are 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 will be introduced to formal procedures used when sharing materials. Students will be expected to identify the type of source and give credit to the 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

KEY SKILL/PROCEDURES

- Determine whether a source can or cannot be used freely
- Express where online resources are found

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.3.b Determine whether information should be shared or kept private to protect student identity.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students have learned how to use the internet responsibly. In grade 3, students learn the importance of keeping personal information secure. In grade 4, students will start to make distinctions between what information should be shared and what information should be kept private.

IMPORTANT CONCEPTS

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

KEY SKILL/PROCEDURES

- Determine whether information should or should not be shared digitally
- 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 the difference between information that can be shared and information that 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.3.c Communicate the importance of information security to protect one's own digital footprint.

Expectations for Learning

LEARNING PROGRESSION

In grade 2, students have learned how to use the internet responsibly. In grade 3, information security and the concept of a digital footprint is introduced for the first time. In grade 4, students will spend time considering their own digital footprint and the impact of their decisions.

IMPORTANT CONCEPTS

- Every person has a digital footprint that includes all aspects of their online behavior
- Keeping information secure is important to consider when using the internet

KEY SKILL/PROCEDURES

- Define digital footprint and give examples of online activity that contributes to a person's digital footprint
- Communicate examples of ways to keep information secure (e.g., not staying logged into public computers, not sharing passwords, not sharing personal information online)

Content Elaborations

CLARIFICATIONS

At grade 3, the term "digital footprint" is first introduced. While making personal connections to this term is encouraged, instruction should be more focused on understanding what information should and should not be shared and how this impacts a person.

CONTENT FOCUS

The focus is on understanding what should be shared online and the effect of sharing different types of information.

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.