Ohio's Model Curriculum for Computer Science
Grade 1

ADOPTED SEPT. 2022

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Strand	Computing Systems
Topic	**Devices**

| CS.D.1.a Operate commonly used devices and their components to perform a variety of tasks. | **Expectations for Learning**

LEARNING PROGRESSION
In kindergarten, students named and used common devices with guidance. In grade 1, students begin operating the devices independently. In grade 2, students will begin selecting devices with a purpose in mind.

IMPORTANT CONCEPTS
• Different devices operate in different ways.

KEY SKILL/PROCEDURES
• Operate teacher-selected devices for a specific task.
• Navigate digital learning tools.

Content Elaborations

CLARIFICATIONS
Students will recognize software/hardware and operate digital learning tools.

CONTENT FOCUS
The focus is on the student operating devices and software/hardware.

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. |

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Strand	Computing Systems
Topic	**Hardware/Software**

CS.HS.1.a With guidance, describe and use hardware and software necessary for accomplishing a task.	## Expectations for Learning **LEARNING PROGRESSION** In kindergarten, students named and used hardware and software with teacher support to perform functions. In grade 1, with guidance, students begin comparing hardware and software and their functions. In grade 2, students will use their knowledge of hardware and software to select what is needed to perform a task. **IMPORTANT CONCEPTS** - Identifiy hardware and software, and the function they perform. - Hardware and software interact to work together. **KEY SKILL/PROCEDURES** - With guidance, identify the differences between hardware and software, their functions and purpose. - With guidance, identify hardware and software interactions. ## Content Elaborations **CLARIFICATIONS** Students will compare and contrast hardware and software and their interactions. **CONTENT FOCUS** The focus is on the characteristics, functions and interactions of hardware and software. **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.

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Strand	Computing Systems
Topic	**Troubleshooting**

CS.T.1.a With guidance, use problem-solving strategies to troubleshoot a problem.	## Expectations for Learning
	
	LEARNING PROGRESSION
	In kindergarten, students used a problem-solving process with teacher support to identify problems and begin troubleshooting. In grade 1, with guidance, and in grade 2, they will continue using a problem-solving process to troubleshoot.
	
	IMPORTANT CONCEPTS
	• There are a variety of problem-solving processes. A problem-solving process typically includes identifying the problem, brainstorming solutions, planning, testing solutions and revising.
	
	KEY SKILL/PROCEDURES
	• With guidance, apply a problem-solving process, using appropriate terminology to solve a problem.
	
	## Content Elaborations
	
	CLARIFICATIONS
	Students will identify problems (e.g., left-click or right-click, no audio, no power, navigating windows) and attempt to solve them using a problem-solving process.
	
	CONTENT FOCUS
	The focus is on solving a problem using a problem-solving process.
	
	COMPUTER SCIENCE PRACTICES
	Practice 6. Testing and Refining Computational Artifacts
	    2. Identify and fix errors using a systematic process.
	
	Practice 7. Communicating About Computing
	    2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

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Strand	Networks and the Internet
Topic	Networking

NI.N.1.a Create a list of ways information can be shared electronically to gain a deeper understanding of how information is transmitted (e.g., email, social media).

NI.N.1.b Recognize that computing devices can be connected to retrieve information from the global community.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students were introduced to the idea of what a network is and how people use it.

In grade 1, students begin to develop an understanding of concepts of networking and unique identifiers within a global community. They also begin to develop an understanding of what devices people use to network and how each device people network with has a unique identifier. In addition, students recognize that computing devices with unique identifiers can be connected to access and retrieve information.

In grade 2, students will describe what a network is, the devices we use to network, how devices can be identified, and how they can be connected. Additionally, students can network using devices to access and retrieve information within a global community.

IMPORTANT CONCEPTS
- Users of the internet communicate with a global community.
- All devices that are connected to the network have a unique identifier.
- A variety of information can be communicated electronically.

KEY SKILL/PROCEDURES
- Interact with the global community.
- Create communications that could be transmitted electronically.
- Match devices with unique identifiers.

Content Elaborations

CLARIFICATIONS

Students will communicate and retrieve information. They will identify the devices we use to communicate.

The internet is global. Each device has a unique identifier. This is not limited to IP addresses. A person's phone number can serve as a metaphor for a unique identifier. For example, two people can exchange information using their phones providing they call or connect to the correct phone number.

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Strand	Networks and the Internet
Topic	**Networking**

CONTENT FOCUS
The focus is on understanding networks, unique identifiers and electronic communication.

COMPUTER SCIENCE PRACTICES
Practice 1. Fostering an Inclusive Culture
1. Include the unique perspectives of others and reflect on one's perspectives when designing and developing computational products.

Practice 7. Communicating About Computing
2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Career Connections

CAREER AWARENESS
The teacher describes the ways they share information electronically in their workplace and then students discuss the ways they share information at school. Students ask a trusted adult about what types of digital information they share in their workplace and how that information is shared. Students create an artifact with examples they discovered to share with the class.

Strand	Networks and the Internet
Topic	Cybersecurity

| NI.C.1.a Identify and use secure practices (e.g., passwords) to protect private information. | **Expectations for Learning**

LEARNING PROGRESSION
In kindergarten through grade 2, students work on being able to explain why it is important to use technology in a responsible way to make decisions about its use. Students also work to demonstrate how to use technology appropriately and safely and how to protect login information.

IMPORTANT CONCEPTS
• Use technology to make a decision.

KEY SKILL/PROCEDURES
• Create and use passwords appropriately.
• Log in and out of apps and devices.

Content Elaborations

CLARIFICATIONS
In grade 1, some students may still require assistance with their passwords. Focus on the importance of passwords staying in the classroom. This provides peer assistance with passwords but allows the teacher to focus on the importance of not sharing passwords.

CONTENT FOCUS
The focus is on using passwords and devices appropriately.

COMPUTER SCIENCE PRACTICES
Practice 7. Communicating About Computing
   3. Articulate ideas responsibly by observing intellectual property rights and giving appropriate attribution. |

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Strand	Networks and the Internet
Topic	**Cybersecurity**

NI.C.1.b Identify, use and discuss examples of how devices can be used with good and bad intentions.	**Expectations for Learning** **LEARNING PROGRESSION** Building on NI.C.1.a, students will discover the use of devices, specifically that devices can be used with both good and bad intentions. This concept will progress through grade 5. **IMPORTANT CONCEPTS** • Exhibit decision-making when using technology. • There are intended and unintended consequences of device use. **KEY SKILLS/PROCEDURES** • Use devices appropriately. • Log in and out of applications (apps) and devices. **Content Elaborations** **CLARIFICATIONS** In grade 1, students may still require assistance with their passwords and online navigation. Focus on the names and purposes of different devices and their uses. Students should be able to recognize bad intentions, such as taking unwanted photos and sharing personal information. **CONTENT FOCUS** The focus is on appropriate device intentions and use. Students will begin to use devices and digital resources as a natural part of their educational experience. **COMPUTER SCIENCE PRACTICES** *Practice 7.* Communicating About Computing 3. Articulate ideas responsibly by observing intellectual property rights and giving appropriate attribution.

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Strand	Networks and the Internet
Topic	**Internet of Things**

NI.IOT.1.a Identify what smart devices are and how they connect to the internet. **NI.IOT.1.b** Recognize how devices connect and exchange data over the internet to demonstrate how information is shared.	**Expectations for Learning** **LEARNING PROGRESSION** In kindergarten, with guidance, students were introduced to the idea of what smart devices are and how to identify them. In grade 1, students begin to develop an understanding of smart devices. In grade 2, they will explain how devices connect and exchange data. Additionally, they will explore different network connectivity. **IMPORTANT CONCEPTS** • Smart devices connect to the internet using Wi-Fi or mobile networks. • Information over a network is broken down into small chunks. **KEY SKILLS/PROCEDURES** • Recognize if a smart device is connected to the internet to access shared information. **Content Elaborations** **CLARIFICATIONS** Networks can be demonstrated unplugged using ideas like the telephone game or a string to simulate information getting shared. **CONTENT FOCUS** Smart devices get their information from the internet and other devices. **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.

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Strand	Data and Analysis
Topic	Data Collection and Storage

DA.DCS.1.a With guidance, collect and organize data to retrieve for later use.

DA.DCS.1.b With guidance, demonstrate how data can be collected and stored in a variety of ways.

Expectations for Learning

LEARNING PROGRESSION
In kindergarten, students collected and sorted data in a variety of ways with teacher support.
In grade 1, students begin storing and retrieving data with guidance. In grade 2, students will begin to retrieve data to modify.

IMPORTANT CONCEPTS
- Data is information. When using technology, data is often quantities, characters or symbols that are the inputs and outputs of computer programs (see Code.org).
- Data can be organized, collected, stored and retrieved in a variety of ways.

KEY SKILL/PROCEDURES
- Use appropriate tools to organize data.
- Use appropriate tools to collect data with guidance.
- With guidance, store, retrieve and save data.

Content Elaborations

CLARIFICATIONS
Students can address this content with or without a computing device.

Students can create and, with guidance, retrieve files. Students can organize files (i.e., file structure).

CONTENT FOCUS
The focus is on storing and retrieving data.

COMPUTER SCIENCE PRACTICES
Practice 4. Developing and Using Abstractions
    2. Evaluate existing technological functionalities and incorporate them into new designs.

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Strand	Data and Analysis
Topic	**Visualization and Communication**

DA.VC.1.a Organize and present data in various formats to make observations.	## Expectations for Learning **LEARNING PROGRESSION** In kindergarten, students are presenting data in various formats. In grade 1, students will make observations of representations of data. In grade 2, they will continue to analyze data in various formats. **IMPORTANT CONCEPTS** • Data can be sorted by attributes. • Data can be presented in a variety of formats. **KEY SKILL/PROCEDURES** • Collect with guidance and organize data for peer understanding. • Describe and sort data by different attributes to create multiple representations of the same data sets. • Transfer data between grids to lists. ## Content Elaborations **CLARIFICATIONS** Students can address this content with or without a computing device. Various formats can include • graphic organizers, • categorical sort, • modeling, • drawings and • sorting by different attributes. **CONTENT FOCUS** The focus is to make observations on representations of data.

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Strand	Data and Analysis
Topic	**Visualization and Communication**
	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, considering key features, time and resource constraints and user experience. 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. *Practice 7.* Communicating About Computing 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.

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

DA.IM.1.a Create and explain a model of an object or process that includes patterns and key elements.	## Expectations for Learning **LEARNING PROGRESSION** In kindergarten, students modeled data and identified patterns with guidance. In grade 1, students continue to model data and identify patterns and begin explaining their model. In grade 2, students will begin interpreting models. **IMPORTANT CONCEPTS** • Data can be represented through modeling. • Patterns within the data can be discovered and explained. **KEY SKILL/PROCEDURES** • Model data to discover and identify patterns. • Explain the model and patterns discovered. ## Content Elaborations **CLARIFICATIONS** Students can address this content with or without a computing device. Students model data through representation data visually, although not necessarily using paper and pencil as in graphs. Data can be modeled using manipulatives and physical models. **CONTENT FOCUS** The focus is on modeling data, pattern detection and explanation of the model. **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, considering key features, time and resource constraints and user experience. 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. *Practice 6.* Testing and Refining Computational Artifacts 1. Systematically test computational artifacts by considering all scenarios and using test cases.

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Strand	Data and Analysis
Topic	Inference and Modeling
	Practice 7. Communicating About Computing 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.

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Strand	Algorithmic Thinking and Programming
Topic	**Algorithms**

ATP.A.1.a With guidance, model a real-world process by constructing and following step-by-step directions (i.e., algorithms) to complete tasks.

Expectations for Learning

LEARNING PROGRESSION
In kindergarten, students constructed and followed instructions verbally and/or pictorially with teacher support. In grade 1, students construct and follow directions with guidance to complete a task in a real-world context through pictures and written words. In Grade 2, students will construct and follow instructions to complete a task through pictorial symbols and written words.

IMPORTANT CONCEPTS
- Step by step directions can be constructed to complete a real-world task.
- Directions can be given verbally or visually.

KEY SKILL/PROCEDURES
- With guidance, complete a verbal and/or visual task with multiple steps.

Content Elaborations

CLARIFICATIONS
Students will follow multiple-step directions with precision to complete a task. Students should be able to use a task from their daily lives (e.g., brushing teeth, washing hands, getting ready for school) and create the multiple steps necessary to complete that task. Students should articulate the steps to a task using visual representations, such as simple flow charts or diagrams, and written expression. Algorithms are commonly implemented using a precise language that computers can interpret.

CONTENT FOCUS
The focus is on multi-step directions and the sequence of steps to complete a task.

COMPUTER SCIENCE PRACTICES
Practice 4. Developing and Using Abstractions
    4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes.

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

Practice 7. Communicating About Computing
    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.

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Strand	Algorithmic Thinking and Programming
Topic	Variables and Data Representation

ATP.VDR.1.a Categorize a group of items (e.g., numbers, symbols or pictures) based on the attributes or actions of each item, with or without a computing device.	## Expectations for Learning
	
	LEARNING PROGRESSION
	In kindergarten, students recognized that numbers, symbols and pictures represent information.
	In grade 1, students use numbers, symbols and pictures to represent information. In grade 2, students will model the use of numbers, symbols and pictures to manipulate and store information.
	
	IMPORTANT CONCEPTS
	• Numbers, symbols or pictures can be categorized by attributes or actions.
	
	KEY SKILL/PROCEDURES
	• Categorize numbers, symbols and/or pictures based on multiple attributes or actions.
	
	## Content Elaborations
	
	CLARIFICATIONS
	Information in the real world can be represented in computer programs. (K-12 Computer Science Framework, 2016).
	
	Students will manipulate numbers, symbols and pictures to categorize information.
	
	CONTENT FOCUS
	The focus is on categorizing data based on attributes and/or actions.
	
	COMPUTER SCIENCE PRACTICES
	Practice 4. Developing and Using Abstractions
	    4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes.
	
	Practice 7. Communicating About Computing
	    2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

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Strand	Algorithmic Thinking and Programming
Topic	Control Structures

ATP.CS.1.a With guidance, model a sequence of instructions (i.e., program) that includes repetition (i.e., loops) to solve a problem or express ideas.	## Expectations for Learning **LEARNING PROGRESSION** In kindergarten, with teacher support, students modeled simple sequences and ordered steps of an algorithm to solve a problem and express ideas. In grade 1, with guidance, students include loops in their sequence to express an idea or solve a problem. Students utilize loops in a sequence to demonstrate repetition in their sequence and to simplify the steps to create or model their algorithm. In grade 2, students will create a program that utilizes sequencing and loops. **IMPORTANT CONCEPTS** • An algorithm is a sequence of steps. • Programs may be modeled to express an idea or solve a problem. • A loop is a repeated sequence of steps. **KEY SKILL/PROCEDURES** • Identify a sequence as an algorithm. • With guidance, identify a repeated sequence as a loop. • With guidance, model algorithms and loops to follow a process. ## Content Elaborations **CLARIFICATIONS** Students can address this content with or without a computing device. Loops are repeated sequences. Modeling a program means the students are provided the program to follow; they are not creating it. Modeling can be done visually or verbally. **CONTENT FOCUS** The focus is on sequencing, process (i.e., steps), loops and problem-solving.

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Strand	Algorithmic Thinking and Programming
Topic	Control Structures

	COMPUTER SCIENCE PRACTICES
	Practice 4. Developing and Using Abstractions
	    4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes.
	
	Practice 7. Communicating About Computing
	    2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

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Strand	Algorithmic Thinking and Programming
Topic	**Modularity**

ATP.M.1.a With guidance, break down (i.e., decompose) a series of steps and separate the necessary from the unnecessary steps to create a precise sequence of instructions to solve a problem or express an idea.	**Expectations for Learning** **LEARNING PROGRESSION** In grade 1, with guidance, students determine what information is necessary to complete a sequence or process. In grade 2, students will determine what information is necessary to complete a more complex sequence or process. **IMPORTANT CONCEPTS** • Decomposition is to break down a series of steps. • Abstraction is to determine the information that is relevant to solving a problem. **KEY SKILL/PROCEDURES** • With guidance, decompose a problem into a series of steps. • With guidance, abstract information that is relevant to solving the problem. **Content Elaborations** **CLARIFICATIONS** Students can address this content with or without a computing device. Students will start with a simple sequence of at least three steps (e.g., beginning, middle and end) and move to a more complex sequence of more than three steps. Abstraction is to determine which information is relevant or irrelevant to the problem. Decomposition is taking a problem and breaking it into steps. **CONTENT FOCUS** The focus is on decomposing and the abstraction of information in a sequence of instructions to solve a problem. **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.

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Strand	Algorithmic Thinking and Programming
Topic	Program Development

ATP.PD.1.a With guidance, plan and create an artifact to illustrate thoughts, ideas and problems in a sequential (step-by-step) manner (e.g., story map, storyboard, sequential graphic organizer).

ATP.PD.1.b With guidance, identify and fix (i.e., debug) a multi-step process that includes sequencing.

Expectations for Learning

LEARNING PROGRESSION
In kindergarten, with teacher support, students planned and/or created an artifact to illustrate thoughts, ideas, and problems in a sequential manner. In grade 1, with guidance, students continue to plan and create, as well as begin to debug an artifact to illustrate thoughts, ideas and problems sequentially.
In grade 2, students will continue to plan, create and/or debug an artifact to sequentially illustrate thoughts, ideas and problems.

IMPORTANT CONCEPTS
- Artifacts illustrate thoughts, ideas and problems in a sequential manner.
- When creating artifacts, it is important to review your artifact for errors.

KEY SKILL/PROCEDURES
- With guidance, plan and create an artifact to sequentially illustrate thoughts, ideas and problems.
- With guidance, evaluate an artifact for errors.

Content Elaborations

CLARIFICATIONS
An artifact is anything created by a human. An artifact could be a visual program, story map, storyboard or sequential graphic organizer.

Debug is defined as "to identify and fix."

CONTENT FOCUS
The focus is on creating and debugging artifacts and programs.

COMPUTER SCIENCE PRACTICES
Practice 5. Creating a Computational Artifact
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.

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Strand	Algorithmic Thinking and Programming
Topic	Program Development

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

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	Artificial Intelligence
Topic	Machine Learning

AI.ML.1.a With guidance and support, discuss how a classifier recognizes drawings to gain an understanding of how machine learning works.	## Expectations for Learning **LEARNING PROGRESSION** In kindergarten, students were introduced to machine learning through classifiers. In grade 1, students discuss how a classifier recognizes drawings to gain an understanding of how machine learning works. In grade 2, students will discuss how the machine knows what they are drawing. **IMPORTANT CONCEPTS** • Explore how Artificial Intelligence (AI) can recognize a drawing. **KEY SKILLS/PROCEDURES** • Apply the use of AI in a classifier to gain knowledge of how machine learning works. ## Content Elaborations **CLARIFICATIONS** AI can recognize human inputs. **CONTENT FOCUS** Students can address this content with or without a computing device. For example, the class can all draw the same thing and look at the differences. **COMPUTER SCIENCE PRACTICES** *Practice 3.* Recognizing and Defining Computational Problems 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.

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Strand	Artificial Intelligence
Topic	Natural Interactions

AI.NI.1.a Using recognition software, identify attributes that computers use for identification to explain how computers recognize humans.	## Expectations for Learning **LEARNING PROGRESSION** In kindergarten, students were introduced to recognition software. In grade 1, students use recognition software to identify attributes that computers use for identification to explain how computers recognize humans. In grade 2, students will list possible attributes used by computers to distinguish humans from each other. **IMPORTANT CONCEPTS** • Explore how Artificial Intelligence (AI) uses attributions to recognize humans. **KEY SKILLS/PROCEDURES** • Create lists of attributions AI might use to identify humans to describe how computers recognize human faces from each other. ## Content Elaborations **CLARIFICATIONS** The process of identifying a minimal set of informative features or attributes from the provided data set is called feature extraction. The performance of machine learning processes can be improved by properly choosing a meaningful set of features. **CONTENT FOCUS** The focus of the content is on how computers can recognize humans. Attributions are necessary for AI to identify humans. **COMPUTER SCIENCE PRACTICES** *Practice 4.* Developing and Using Abstractions 1. Extract common features from a set of interrelated processes or complex phenomena. 2. Evaluate existing technological functionalities and incorporate them into new designs. 3. Create modules and develop points of interaction that can apply to multiple situations and reduce complexity. 4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes.

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Strand	Artificial Intelligence
Topic	Perception

AI.P.1.a With guidance and support, recognize sensors on computers, robots and intelligent appliances to understand their function, such as motion, pressure/touch, temperature, proximity, light, sound, moisture or gases.	**Expectations for Learning** **LEARNING PROGRESSION** In kindergarten, students are introduced to sensors. In grade 1, students recognize sensors on computers, robots and intelligent appliances with guidance. In grade 2, students will relate the sensor to the function. **IMPORTANT CONCEPTS** • Computers use specific types of sensors to gather data. **KEY SKILLS/PROCEDURES** • Identify different sensors to examine the data they can gather. ## Content Elaborations **CLARIFICATIONS** Examples of data sensors that can gather data are motion (computer games, tablets), pressure/touch (temperature), proximity (self-driving car), light, sound, moisture (lawn watering) and gases. **CONTENT FOCUS** Sensors are needed for computers to gather information. **COMPUTER SCIENCE PRACTICES** *Practice 3.* Recognizing and Defining Computational Problems 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.

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Strand	Artificial Intelligence
Topic	**Perception**

AI.P.1.b With guidance and support, use intelligent agents to help answer simple questions.	## Expectations for Learning **LEARNING PROGRESSION** In kindergarten, students were introduced to intelligent agents. In grade 1, students use intelligent agents to help answer simple questions with guidance. In grade 2, they will use the intelligent agent to assist in basic research. **IMPORTANT CONCEPTS** • Intelligent agents are a form of Artificial Intelligence (AI). **KEY SKILLS/PROCEDURES** • Use intelligent agents to answer questions. ## Content Elaborations **CLARIFICATIONS** Examples of intelligent agents are virtual assistant technology which can play music, provide information, deliver news, control your smart home and give you other information. **CONTENT FOCUS** Students can use an intelligent agent to help them answer questions, for example, how to spell a word. **COMPUTER SCIENCE PRACTICES** *Practice 4.* Developing and Using Abstractions 1. Extract common features from a set of interrelated processes or complex phenomena. 2. Evaluate existing technological functionalities and incorporate them into new designs. 3. Create modules and develop points of interaction that can apply to multiple situations and reduce complexity. 4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes.

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Strand	Artificial Intelligence
Topic	**Representation & Reasoning**

AI.RR.1.a Use a decision tree to make a decision.	## Expectations for Learning **LEARNING PROGRESSION** In kindergarten, students were introduced to decision trees. In grade 1, students use a decision tree to make a decision. In grade 2, students will create simple decision trees. **IMPORTANT CONCEPTS** • Students can use decision trees to make decisions. **KEY SKILLS/PROCEDURES** • Identify that decision trees are ways to come up with reasonable answers. ## Content Elaborations **CLARIFICATIONS** Decision trees have binary answers. This means there are only two choices as input. **CONTENT FOCUS** The focus is to participate in creating a decision tree to solve simple technical problems. **COMPUTER SCIENCE PRACTICES** *Practice 6.* Testing and Refining Computational Artifacts 1. Systematically test computational artifacts by considering all scenarios and using test cases.

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Strand	Artificial Intelligence
Topic	Societal Impacts

| **AI.SI.1.a** Identify AI applications that are used in daily lives to predict AI use in the future. | **Expectations for Learning**

LEARNING PROGRESSION
In kindergarten, students located Artificial Intelligence (AI) applications to understand how humans use AI. In grade 1, students identify AI applications that are used in daily life. In grade 2, students will group applications as AI or not AI.

IMPORTANT CONCEPTS
• List and discuss applications that use artificial intelligence.
• Give ideas of how AI might help in the future.

KEY SKILLS/PROCEDURES
• Create a list or ideas on AI that might work in the future to demonstrate that AI is a growing and changing field.

Content Elaborations

CLARIFICATIONS
AI is a new and emerging technology that is constantly changing and adapting to humans use.

CONTENT FOCUS
The focus is on AI applications and how they are used in our daily lives.

COMPUTER SCIENCE PRACTICES
Practice 3. Recognizing and Defining Computational Problems
3. Evaluate whether it is appropriate and feasible to solve a problem computationally. |
| **AI.SI.1.b** Discuss if computers and other technology are good or bad to create a working construct. | **Expectations for Learning**

LEARNING PROGRESSION
In kindergarten, students discussed if something is good or bad in terms of computers. In grade 1, students discuss if computers and other technology are good or bad. In grade 2, students will discuss if Artificial Intelligence (AI) is good or bad.

IMPORTANT CONCEPTS
• Discuss ways technology can help or harm us.

KEY SKILLS/PROCEDURES
• Create lists of how technology makes life better or worse to see differences in the use of technology. |

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Strand	Artificial Intelligence
Topic	Societal Impacts

Content Elaborations

CLARIFICATIONS
Technology is not always positive and sometimes non-technological ways are better.

CONTENT FOCUS
AI is a type of technology and it is a tool for humans to use.

COMPUTER SCIENCE PRACTICES

Practice 3. Recognizing and Defining Computational Problems
3. Evaluate whether it is appropriate and feasible to solve a problem computationally.

Strand	Impacts of Computing
Topic	**Culture**

IC.Cu.1.a Discuss different technologies and their impact on everyday life.

IC.Cu.1.b Identify how people use and are impacted by many types of technologies in their daily work and personal lives.

Expectations for Learning

LEARNING PROGRESSION
In kindergarten, students identified what technology is and how it has changed and impacted their lives.
In grade 1, they recognize the different ways technology impacts, and the role technology plays in their lives.
In grade 2, students will compare and contrast how technology use has changed and the impact it has on their lives positively and negatively.

IMPORTANT CONCEPTS
- Technology plays a role in our everyday life.
- Technology is constantly changing and affects how we live.

KEY SKILL/PROCEDURES
- Compare past and present technology and how it affects our lives.

Content Elaborations

CLARIFICATIONS
Students can identify and explain the connections between their lives and technology and how technology affects their lives.

CONTENT FOCUS
The focus is on how technology has changed and the impact on students' lives.

COMPUTER SCIENCE PRACTICES
Practice 1. Fostering an Inclusive Computing Culture
1. Include the unique perspectives of others and reflect on one's perspectives when designing and developing computational products.
2. Address the needs of diverse end-users during the design process to produce artifacts with broad accessibility and usability.

Practice 2. Collaborating Around Computing
1. Cultivate working relationships with individuals possessing diverse perspectives, skills and personalities.

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Strand	Impacts of Computing
Topic	Culture
	Practice 3. Recognizing and Defining Computational Problems 　　1. Identify complex, interdisciplinary, real-world problems that can be solved computationally. *Practice 7.* Communicating About Computing 　　2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

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Strand	Impacts of Computing
Topic	**Social Interactions**

IC.SI.1.a With guidance, describe safe and responsible behaviors for the use of information and technology.	## Expectations for Learning **LEARNING PROGRESSION** In kindergarten, students used technology responsibly and safely with teacher support. In grade 1, with guidance, students can describe how to be safe and responsible using technology. In grade 2, students will be able to compare and contrast safe and responsible technology behaviors. **IMPORTANT CONCEPTS** • Schools develop their own technology rules, regulations and etiquette. **KEY SKILL/PROCEDURES** • With guidance, describe appropriate behaviors on how to use technology and apply those rules, regulations and etiquette within the classroom. ## Content Elaborations **CLARIFICATIONS** Etiquette topics might include cyberbullying, school policy and safe privacy practices. **CONTENT FOCUS** The focus is on the responsible use of technology in and out of the classroom. **COMPUTER SCIENCE PRACTICES** *Practice 1.* Fostering an Inclusive Computing Culture 1. Include the unique perspectives of others and reflect on one's perspectives when designing and developing computational products. 2. Address the needs of diverse end-users during the design process to produce artifacts with broad accessibility and usability. *Practice 7.* Communicating About Computing 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

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

IC.SLE.1.a With guidance, discuss appropriate and ethical uses of technology to guide informed decisions.	**Expectations for Learning** **LEARNING PROGRESSION** In kindergarten, students used technology responsibly and safely with teacher support. In grade 1, with guidance, students should be able to describe how to be safe and responsible using technology. In grade 2, students will be able to compare and contrast safe and responsible technology behaviors. **IMPORTANT CONCEPTS** • Guidelines and practices to stay safe on the internet should be discussed and practiced. • Awareness of what private information is, what should and should not be shared and what are the potential consequences of sharing private information. **KEY SKILL/PROCEDURES** • With guidance, identify practices to stay safe on the internet and provide examples of situations where these practices should be applied. **Content Elaborations** **CLARIFICATIONS** Provide students guidelines for safe navigation of the internet. Provide students opportunities to practice these guidelines by using teacher-selected internet sites. Provide students guidelines on what constitutes personal information and the consequences of misuse. Students have the opportunity to apply basic security practices as part of their activities addressing cybersecurity (NI.C.1.a). **CONTENT FOCUS** The focus is to keep students safe when using the internet.

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IC.SLE.1.b Discuss examples of appropriate and inappropriate behavior online, including cyberbullying, and the steps to keep yourself and others safe and out of harm's way.	## Expectations for Learning **LEARNING PROGRESSION** In kindergarten through second grade, student discussions should focus on examples of what to do when someone is hurtful online and what behavior should be modeled when online. **IMPORTANT CONCEPTS** • Students give examples of people in authority, such as a principal, teacher or police officer with whom they might share private (privileged) information. • Students know who to contact for help when they feel unsafe or witness inappropriate online behavior. **KEY SKILLS/PROCEDURES** • Recognize when students should report observed inappropriate online behavior to those in authority. • Understand and discuss ways to keep yourself and others safe online. • Students should understand the concept of cyberbullying.

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Content Elaborations

CLARIFICATIONS
Students need to make good choices when they interact with others online. They also need to understand that in addition to interacting with others, it is important that they use websites and other apps as they were intended.

Students could be held responsible for their actions online because some online behavior is illegal.

CONTENT FOCUS
Students should understand the appropriate and inappropriate behavior to use when operating online. Students should also know who to talk to if they feel threatened or report inappropriate behavior.

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 6. Testing and Refining Computational Artifacts.
    1. Systematically test computational artifacts by considering all scenarios and using test cases.