



Ohio

Ohio's Model Curriculum for Computer Science Kindergarten

ADOPTED SEPT. 2022

| Strand | Computing Systems | |
|---|--|---------|
| Topic | | Devices |
| <p>CS.D.K.a With guidance, identify and label commonly used devices and their components, explaining their connection to different tasks, to perform a variety of tasks.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, with guidance, students name and use common devices and their components to perform a variety of tasks. In grade 1, students will begin operating the devices independently.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Every device has a unique identifier. • Different devices perform different tasks. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • With guidance, name devices used by students and their components. <p>Content Elaborations</p> <p>CLARIFICATIONS Students will name devices' main components (e.g., tablet, computer, monitor, mouse, printer) and explain the connection between device components and different tasks. They will recognize and name software.</p> <p>CONTENT FOCUS The focus is on identifying devices and using the correct terminology for hardware and software.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. | |

| Strand | Computing Systems | |
|---|--|--|
| Topic | Hardware/Software | |
| <p>CS.HS.K.a With guidance and support, identify and use hardware and software necessary for accomplishing a task.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, with teacher support, students name and use hardware and software to perform functions. In grade 1, students will begin comparing hardware and software and their functions.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> Identify hardware and software and the functions they perform. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> With guidance and support, identify the differences between hardware and software, their functions and purpose. Use hardware and software to perform functions. <p>Content Elaborations</p> <p>CLARIFICATIONS Students will classify and sort hardware and software. They will label software and hardware and their functions.</p> <p>CONTENT FOCUS The focus is on the identification of hardware and software and their function.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. | |

| Strand | Computing Systems |
|---|---|
| Topic Troubleshooting | |
| <p>CS.T.K.a With guidance and support, use problem-solving strategies to troubleshoot a problem.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, with teacher support, students use a problem-solving process to identify problems and begin troubleshooting. In grade 1, they will continue using a problem-solving process.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • There are a variety of problem-solving processes. A problem-solving process typically includes identifying the problem, brainstorming solutions, making a plan, testing solutions and revising. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • With guidance and support, apply a problem-solving process, using appropriate terminology to solve a problem. • Introduce the concept of troubleshooting. <p>Content Elaborations</p> <p>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.</p> <p>CONTENT FOCUS The focus is on solving a problem using a problem-solving process.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 6. Testing and Refining Computational Artifacts</i></p> <ol style="list-style-type: none"> 2. Identify and fix errors using a systematic process. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. |

| Strand | Computing Systems |
|--------|--|
| Topic | Troubleshooting |
| | <p>Career Connections</p> <p>CAREER AWARENESS</p> <p>Students may not be aware of the career options available to them. Using digital tools to learn about career options is a wonderful way to begin introducing the world of work to students. One way to do this would be to have students watch "ABC Jobs Song for Kids" and identify three to five careers unfamiliar to them where troubleshooting is a component. The teacher can then lead discussions on how troubleshooting is a component of all careers.</p> |

| Strand | Networks and the Internet |
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| Topic | Networking |
| <p>NI.N.K.a With guidance and support, 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).</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students are introduced to the idea of what a network is and how people use it. In grade 1, students will begin to develop an understanding of concepts of networking and unique identifiers within a global community. They will 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 will recognize that computing devices with unique identifiers can be connected to access and retrieve information.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Users of the internet communicate with a global community. • A variety of information can be communicated electronically. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Identify communications that can be transmitted electronically with guidance. <p>Content Elaborations</p> <p>CLARIFICATIONS The internet is global. Students will identify the devices we use to communicate using the internet.</p> <p>CONTENT FOCUS The focus is on introducing students to networks and electronic communication.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 1. Fostering an Inclusive Culture</i></p> <ol style="list-style-type: none"> 1. Include the unique perspectives of others and reflect on one's perspectives when designing and developing computational products. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. |

| Strand | Networks and the Internet | |
|---|---|--|
| Topic | Cybersecurity | |
| <p>NI.C.K.a With guidance and support, identify and use secure practices (e.g., passwords) to protect private information.</p> | <p>Expectations for Learning</p> <p>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.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Students, with guidance will make decisions when using technology. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • With guidance and support, students create and use passwords appropriately. • With guidance and support, students log in and out of apps and devices. <p>Content Elaborations</p> <p>CLARIFICATIONS Realize that kindergartners require assistance with their passwords initially. 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.</p> <p>CONTENT FOCUS The focus is on using passwords and devices appropriately.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 3. Articulate ideas responsibly by observing intellectual property rights and giving appropriate attribution. | |

| Strand | Networks and the Internet |
|--|---|
| Topic Internet of Things | |
| <p>NI.IOT.K.a With guidance and support, identify what smart devices are to recognize what devices can connect to the internet.</p> <p>NI.IOT.K.b With guidance and support, recognize how devices connect and exchange data over the internet to demonstrate how information is shared.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In Kindergarten, with guidance, students are introduced to the idea of what smart devices are and identify them. In grade 1, students will begin to develop an understanding of smart devices.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • A smart device (such as a virtual assistant) is a device that has connectivity, captures useful data and presents it. • A basic technological device (such as a remote control) is missing at least one of these abilities. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Identify smart devices. • Differentiate between basic technological devices and smart devices. <p>Content Elaborations</p> <p>CLARIFICATIONS A student could sort devices into groups of smart devices and basic technological devices.</p> <p>CONTENT FOCUS Introduce students to the concept of smart devices.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. |

| Strand | Data and Analysis |
|--|---|
| Topic | Data Collection and Storage |
| <p>DA.DCS.K.a Identify data to collect and sort.</p> <p>DA.DCS.K.b With guidance and support, demonstrate how data can be collected and stored in a variety of ways.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students develop an understanding of what data is. With teacher support, students collect and sort data using a variety of methods. In grade 1, students will begin storing and retrieving data.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • 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 collected and represented in a variety of ways. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Identify what data is. • With guidance and support, sort data in multiple ways (e.g., paper-pencil). • With guidance and support, represent data through a variety of media. <p>Content Elaborations</p> <p>CLARIFICATIONS Students can address this content with or without a computing device. A variety of media would include paper-pencil, manipulatives and physical models.</p> <p>CONTENT FOCUS The focus is on data identification, collection and organization.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 4. Developing and Using Abstractions</i> 2. Evaluate existing technological functionalities and incorporate them into new designs.</p> |

| Strand | Data and Analysis |
|---|---|
| Topic Visualization and Communication | |
| <p>DA.VC.K.a With guidance, organize and present data in various formats to make observations.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students are presenting data in various formats. In grade 1, they will continue presenting data in various formats.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Data can be sorted by attributes. • Data can be presented in a variety of formats. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Sort data by different attributes. • Describe attributes of data. • Explain sorting to peers. <p>Content Elaborations</p> <p>CLARIFICATIONS Students can address this content with or without a computing device. Kindergarteners are working with physical objects and concrete manipulatives. Various formats can include</p> <ul style="list-style-type: none"> • graphic organizers, • categorical sort, • modeling, • drawings and • sorting by different attributes. <p>CONTENT FOCUS The focus is on the representation of data.</p> |

| Strand | Data and Analysis |
|--------|--|
| Topic | Visualization and Communication |
| | <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 5. Creating Computational Artifacts</i></p> <ol style="list-style-type: none">1. Plan the development of a computational artifact using an iterative process that includes reflection on and modification of the plan, considering key features, time and resource constraints and user 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. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none">1. Select, organize and interpret large data sets from multiple sources to support a claim.2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. |

| Strand | Data and Analysis |
|---|---|
| Topic | Inference & Modeling |
| <p>DA.IM.K.a With guidance, create a model of an object or process to identify patterns.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students are modeling data and identifying patterns with guidance. In grade 1, students will continue to model data and identify patterns and begin explaining their model.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Data can be represented through modeling. • Patterns within the data can be discovered. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • With guidance, model data to discover and identify patterns. <p>Content Elaborations</p> <p>CLARIFICATIONS Students can address this content with or without a computing device.</p> <p>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.</p> <p>CONTENT FOCUS The focus is on modeling data and simple pattern detection.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 5. Creating Computational Artifacts</i></p> <ol style="list-style-type: none"> 1. Plan the development of a computational artifact using an iterative process that includes reflection on and modification of the plan, considering key features, time and resource constraints and user 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. <p><i>Practice 6. Testing and Refining Computational Artifacts</i></p> <ol style="list-style-type: none"> 1. Systematically test computational artifacts by considering all scenarios and using test cases. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 1. Select, organize and interpret large data sets from multiple sources to support a claim. 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. |

| Strand | Algorithmic Thinking and Programming |
|---|---|
| Topic | Algorithms |
| <p>ATP.A.K.a With guidance and support, model a real-world process by constructing and following step-by-step directions (i.e., algorithms) to complete tasks.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, with teacher support, students will construct and/or follow directions to complete a task in a real-world context verbally and pictorially. In grade 1, students will construct and follow directions through pictures and words.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Step-by-step directions can be constructed to complete a real-world task. • Directions can be given verbally or visually. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • With guidance and support, construct and complete a verbal and/or visual task in two steps. <p>Content Elaborations</p> <p>CLARIFICATIONS Students will listen to directions to complete a task. Students should express their steps verbally or through pictures. During the learning process, students will understand that steps (i.e., algorithms) are required in various processes in their daily lives. Algorithms are commonly implemented using a precise language that computers can interpret.</p> <p>CONTENT FOCUS The focus is on three-step directions and the sequence of steps to complete a task.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none"> 4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes. <p><i>Practice 6. Testing and Refining Computational Artifacts</i></p> <ol style="list-style-type: none"> 2. Identify and fix errors using a systematic process. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. |

| Strand | Algorithmic Thinking and Programming |
|---|---|
| Topic | Variables and Data Representation |
| <p>ATP.VDR.K.a Recognize that a group of items (e.g., numbers, symbols or pictures) can be used to represent data.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students recognize that numbers, symbols and pictures represent information. In grade 1, students will use numbers, symbols and pictures to represent information.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Numbers, symbols and/or pictures can be recognized as a representation of information. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • Interchange information with a number, symbol or picture. <p>Content Elaborations</p> <p>CLARIFICATIONS Information in the real world can be represented in computer programs. (K-12 Computer Science Framework, 2016)</p> <p>Recognize that attributes can be used to identify information and interchange them with numbers, symbols or pictures.</p> <p>CONTENT FOCUS The focus is on representing data using numbers, symbols and/or pictures.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none"> 4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. |

| Strand | Algorithmic Thinking and Programming |
|--|---|
| Topic | Control Structures |
| <p>ATP.CS.K.a With guidance and support, model a sequence of instructions (i.e., program) with a beginning, middle and end to solve a problem or express an idea.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, with teacher support, students will model simple sequences and order steps of a sequence to solve a problem or express an idea. In grade 1, with guidance, students will extend their experiences with sequencing to involve loops (i.e., repetition) within their sequence.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • An algorithm is a sequence of steps. • Programs may be modeled to express an idea or solve a problem. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • With guidance and support, model sequences to follow at least a three-step process (e.g., beginning, middle, end). <p>Content Elaborations</p> <p>CLARIFICATIONS Students can address this content with or without a computing device. Sequences should be in logical order: beginning, middle and end. Modeling can be done visually or verbally.</p> <p>CONTENT FOCUS The focus is on sequencing, process (i.e., steps) and problem-solving.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none"> 4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. |

| Strand | Algorithmic Thinking and Programming |
|--|---|
| Topic | Program Development |
| <p>ATP.PD.K.a With guidance and support, plan or create an artifact to illustrate thoughts, ideas and problems in a sequential (step-by-step) manner (e.g., story map, storyboard, sequential graphic organizer).</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, with teacher support, students plan and/or create an artifact to illustrate thoughts, ideas and problems sequentially. In grade 1, with guidance, students will continue to plan and create, as well as begin to debug an artifact to sequentially illustrate thoughts, ideas and problems.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> Artifacts illustrate thoughts, ideas and problems in a sequential manner. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> With guidance and support, plan and create an artifact to sequentially illustrate thoughts, ideas and problems. <p>Content Elaborations</p> <p>CLARIFICATIONS An artifact is anything created by a human. An artifact could be a visual program, story map, storyboard or sequential graphic organizer.</p> <p>CONTENT FOCUS The focus is on creating artifacts and programs.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 5. Creating a Computational Artifact</i></p> <ol style="list-style-type: none"> 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. Create a computational artifact for practical intent, personal expression or to address a societal issue. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. |

| Strand | Algorithmic Thinking and Programming | |
|---|---|--|
| Topic | Machine Learning | |
| <p>AI.ML.K.a With guidance and support, use a classifier that recognizes drawings to see if a program can guess what they are drawing.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, with guidance and support, students use a classifier that recognizes drawings to see if a program can guess what they are drawing. In grade 1, students will discuss how machine learning uses classifiers to recognize drawings.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> Computers can learn from examples. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> Artificial Intelligence (AI), or the science and engineering of making intelligent machines and computer programs, can assist humans in problem-solving using a classifier. <p>Content Elaborations</p> <p>CLARIFICATIONS Demonstrate how to train a computer to recognize something.</p> <p>CONTENT FOCUS Computers can learn from data.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none"> Extract common features from a set of interrelated processes or complex phenomena. Evaluate existing technological functionalities and incorporate them into new designs. Create modules and develop points of interaction that can apply to multiple situations and reduce complexity. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes. | |

| Strand | Artificial Intelligence |
|---|---|
| Topic | Natural Interactions |
| <p>AI.NI.K.a With guidance and support, identify how computers can recognize different humans using some form of recognition software to see how computers interact with humans.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, with guidance and support, students identify how computers can recognize different humans using some form of recognition software to understand how computers interact with humans. In grade 1, students will identify attributes computers use to identify humans.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Facial recognition • Thumbprint recognition • Iris recognition • Other concepts <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Use various forms of recognition software to demonstrate Artificial Intelligence (AI) is working. <p>Content Elaborations</p> <p>CLARIFICATIONS AI can use recognition software to recognize humans.</p> <p>CONTENT FOCUS The focus of the content is how computers use recognition software to recognize humans.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none"> 1. Identify complex, interdisciplinary, real-world problems that can be solved computationally. 2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. 3. Evaluate whether it is appropriate and feasible to solve a problem computationally. |

| Strand | Artificial Intelligence | |
|--|---|--|
| Topic | Perception | |
| <p>AI.P.K.a With guidance and support, locate sensors on computers, robots and intelligent appliances to understand that devices use sensors to gather information.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students identify and are introduced to what sensors are and where they may be located. In grade 1, with guidance, students recognize sensors on computers, robots and intelligent appliances to understand their function (motion, pressure/pouch, temperature, proximity, light, sound, moisture, gases).</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Computers use sensors to get information from the world around them. • Sensors are placed in certain spots. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Identify sensors to understand why they are placed where they are placed. <p>Content Elaborations</p> <p>CLARIFICATIONS Sensors gather information and use that information to interact with us.</p> <p>CONTENT FOCUS Sensors are needed for computers to gather information.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i> 2. Create a computational artifact for practical intent, personal expression, or to address a societal issue.</p> | |

| Strand | Artificial Intelligence | |
|---|--|--|
| Topic | Perception | |
| <p>AI.P.K.b With guidance and support, access intelligent agents to demonstrate how they work.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students are introduced to intelligent agents. In grade 1, students will use intelligent agents to help answer questions.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> Intelligent agents are a form of Artificial Intelligence (AI). <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> Use intelligent agents to answer a question. <p>Content Elaborations</p> <p>CLARIFICATIONS Examples of intelligent agents are virtual assistant technology that can play music, deliver news, control smart homes and provide other information.</p> <p>CONTENT FOCUS Using an intelligent agent can help students answer simple questions like how to spell a word.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none"> Extract common features from a set of interrelated processes or complex phenomena. Evaluate existing technological functionalities and incorporate them into new designs. Create modules and develop points of interaction that can apply to multiple situations and reduce complexity. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes. | |

| Strand | Artificial Intelligence |
|---|--|
| Topic | Representation & Reasoning |
| <p>AI.RR.K.a With guidance and support, use a simple decision tree to decide to visually and explicitly represent decisions and decision-making.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students use a simple decision tree to decide to visually and explicitly represent decisions and decision-making. In grade 1, students will use decision trees to make decisions.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Define the meaning of a decision tree. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Use a decision tree to make a decision. <p>Content Elaborations</p> <p>CLARIFICATIONS Many types of data could be placed on a branch. For a decision tree, the data would be questions and answers.</p> <p>CONTENT FOCUS Using a decision tree can answer a question, such as what to do if your computer does not turn on or what to do if all your letters are capitalized.</p> <p>COMPUTER SCIENCE PRACTICES Practice 4. Developing and Using Abstractions</p> <ol style="list-style-type: none"> 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. |

| Strand | Artificial Intelligence |
|---|---|
| Topic: Societal Impacts | |
| <p>AI.SI.K.a With guidance and support, locate AI applications used in daily life to understand how humans use AI.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students locate Artificial Intelligence (AI) applications used in daily life to understand how humans use AI. In grade 1, students will identify an application that is used in daily life.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Explore all the ways humans use AI. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Create a list of the ways humans use intelligent devices to demonstrate that humans use AI to assist them with everyday tasks (e.g., facial recognition, self-driving cars). <p>Content Elaborations</p> <p>CLARIFICATIONS</p> <ul style="list-style-type: none"> • AI is all around us and learning from us. <p>CONTENT FOCUS Students will learn about various forms of new and emerging AI technology.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none"> 1. Identify complex, interdisciplinary, real-world problems that can be solved computationally. 2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures. 3. Evaluate whether it is appropriate and feasible to solve a problem computationally. |

| Strand | Artificial Intelligence | |
|---|--|--|
| Topic | Societal Impacts | |
| <p>AI.SI.K.b Discuss if artificial intelligence is good or bad (see impacts of computing).</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students will discuss if something is good or bad to understand the concepts. In grade 1, students will discuss if computers/technology is good or bad.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> Artificial Intelligence (AI) is a type of technology and it is a tool for humans to use. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> Create lists of how technology makes life better or worse to see differences in the use of technology. <p>Content Elaborations</p> <p>CLARIFICATIONS Technology is not always positive and sometimes non-technological ways are better.</p> <p>CONTENT FOCUS The focus of the content is on the ways that technology can help us or harm us.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 3. Recognizing and Defining Computational Problems</i> 3. Evaluate whether it is appropriate and feasible to solve a problem computationally.</p> | |

| Strand | Impacts of Computing |
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| Topic | Culture |
| <p>IC.Cu.K.a With guidance and support, identify technologies that impact one's own everyday life.</p> <p>IC.Cu.K.b With guidance and support, recognize different ways computing devices are used regularly to understand technology's impact on one's own daily life.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students identify what technology is and how it has changed and impacted their lives. In grade 1, they will recognize the different ways technology impacts and the role technology plays in their lives.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Technology can be unplugged or plugged. • Technology is constantly changing and affects how we live. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • With guidance and support, identify technology in their lives. • With guidance and support, explain how the technology impacts their life. <p>Content Elaborations</p> <p>CLARIFICATIONS Students can identify and explain the connections between their lives and technology and how technology affects their lives.</p> <p>CONTENT FOCUS The focus is on how technology has changed and the impact on students' lives.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 1. Fostering an Inclusive Computing Culture</i></p> <ol style="list-style-type: none"> 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. <p><i>Practice 2. Collaborating Around Computing</i></p> <ol style="list-style-type: none"> 1. Cultivate working relationships with individuals possessing diverse perspectives, skills and personalities. |

| Strand | Impacts of Computing |
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| Topic | Culture |
| | <p><i>Practice 3. Recognizing and Defining Computational Problems</i></p> <ol style="list-style-type: none">1. Identify complex, interdisciplinary, real-world problems that can be solved computationally. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none">2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. |

| Strand | Impacts of Computing | |
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| Topic | | Social Interactions |
| <p>IC.SI.K.a With guidance and support, identify and use safe and responsible behaviors concerning information and technology.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, students use technology responsibly and safely with teacher support. In grade 1, with guidance, students will be able to describe how to be safe and responsible using technology.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> Schools develop their own technology rules, regulations and etiquette. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> With guidance and support, demonstrate the use of the technology available within the framework of the school's technology rules, regulations and etiquette. <p>Content Elaborations</p> <p>CLARIFICATIONS Etiquette topics might include cyberbullying, school policy and safe privacy practices.</p> <p>CONTENT FOCUS The focus is on the responsible use of technology in and out of the classroom.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 1. Fostering an Inclusive Computing Culture</i></p> <ol style="list-style-type: none"> Include the unique perspectives of others and reflect on one's perspectives when designing and developing computational products. Address the needs of diverse end-users during the design process to produce artifacts with broad accessibility and usability. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. | |

| Strand | Impacts of Computing |
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| Topic | Safety, Law and Ethics |
| <p>IC.SLE.K.a With guidance, discuss appropriate uses of technology to support informed decisions.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten, with teacher support, students identify and explain basic security practices that should be applied when using the internet. With support, students identify the personal information and explain why it is important to use security measures and protect personal information. In grade 1, with guidance, students will continue to develop their understanding of private information, security practices when using the internet, and the importance of both.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> Guidelines and practices to stay safe on the internet should be discussed and practiced. Awareness of what private information is, what students should and should not share and the potential consequences of sharing private information. <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> With guidance and support, identify practices to stay safe on the internet. <p>Content Elaborations</p> <p>CLARIFICATIONS Provide students guidelines for safe navigation of the internet. Provide students opportunities to practice these guidelines by using teacher-selected internet sites.</p> <p>Provide students guidelines on what constitutes personal information and the consequences of misuse.</p> <p>Students have the opportunity to apply basic security practices as part of their activities addressing cybersecurity (NI.C.K.a).</p> <p>CONTENT FOCUS The focus is to keep students safe when using the internet.</p> <p>COMPUTER SCIENCE PRACTICES <i>Practice 1. Fostering an Inclusive Computing Culture</i></p> <ol style="list-style-type: none"> Include the unique perspectives of others and reflect on one's perspectives when designing and developing computational products. Address the needs of diverse end-users during the design process to produce artifacts with broad accessibility and usability. |

| Strand | Impacts of Computing |
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| Topic | Safety, Law and Ethics |
| | <p><i>Practice 2. Collaborating Around Computing</i></p> <ol style="list-style-type: none"> 1. Cultivate working relationships with individuals possessing diverse perspectives, skills and personalities. <p><i>Practice 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 2. Describe, justify and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. |
| <p>IC.SLE.K.b With guidance and support, 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.</p> | <p>Expectations for Learning</p> <p>LEARNING PROGRESSION In kindergarten through grade 2, student discussions should focus on examples of what to do when someone is hurtful online and what behavior should be modeled when online.</p> <p>IMPORTANT CONCEPTS</p> <ul style="list-style-type: none"> • Students should be aware of guidelines and practices to stay safe on the internet. • Students should be aware of what private information is, what students should and should not share and the potential consequences of sharing private information. <p>KEY SKILLS/PROCEDURES</p> <ul style="list-style-type: none"> • Identify appropriate and inappropriate online behavior. • Apply the concepts of online safety. <p>Content Elaborations</p> <p>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.</p> <p>Some online behavior is illegal, and students could be held responsible for their actions online.</p> <p>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.</p> |

| Strand | Impacts of Computing |
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| Topic | Safety, Law and Ethics |
| | <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 3. Recognizing and Defining Computational Problems.</i></p> <ol style="list-style-type: none">2. Decompose complex, real-world problems into manageable subproblems that could integrate existing solutions or procedures. <p><i>Practice 6. Testing and Refining Computational Artifacts.</i></p> <ol style="list-style-type: none">1. Systematically test computational artifacts by considering all scenarios and using test cases. |