



Ohio

Ohio's Standards and Model Curriculum Computer Science Kindergarten

DECEMBER 2018

Computer Science Model Curriculum for Kindergarten

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</p> <p>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</p> <p>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</p> <p>The focus is on identifying devices and using correct terminology for hardware and software.</p> <p>COMPUTER SCIENCE PRACTICES</p> <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	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</p> <p>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"> • Hardware and software identification and the function 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 <p>Content Elaborations</p> <p>CLARIFICATIONS</p> <p>Students will classify and sort hardware and software. They will label software and hardware and their functions.</p> <p>CONTENT FOCUS</p> <p>The focus is on the identification of hardware and software and their function.</p> <p>COMPUTER SCIENCE PRACTICES</p> <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>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</p> <p>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 <p>Content Elaborations</p> <p>CLARIFICATIONS</p> <p>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</p> <p>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	Networks and the Internet	
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</p> <p>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 of 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 the computing devices with unique identifiers can be connected together 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</p> <p>The internet is global. Students will identify the devices we use to communicate using the internet.</p> <p>CONTENT FOCUS</p> <p>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 own 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</p> <p>In kindergarten through grade 2, students work on being able to explain why it is important to use technology in a responsible way in order 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"> • Decision making when using technology <p>KEY SKILL/PROCEDURES</p> <ul style="list-style-type: none"> • With guidance and support, create and use passwords appropriately • With guidance and support, log in and out of apps and devices <p>Content Elaborations</p> <p>CLARIFICATIONS</p> <p>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</p> <p>The focus is on using passwords and devices appropriately.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 7. Communicating About Computing</i></p> <p>3. Articulate ideas responsibly by observing intellectual property rights and giving appropriate attribution.</p>

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</p> <p>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</p> <p>Students can address this content with or without a computing device.</p> <p>A variety of media would include paper pencil, manipulatives and physical models.</p> <p>CONTENT FOCUS</p> <p>The focus is on data identification, collection and organization.</p> <p>COMPUTER SCIENCE PRACTICES</p> <p><i>Practice 4. Developing and Using Abstractions</i></p> <ol style="list-style-type: none"> 2. Evaluate existing technological functionalities and incorporate them into new designs.

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</p> <p>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</p> <p>Students can address this content with or without a computing device.</p> <p>Kindergarteners are working with physical objects and concrete manipulatives.</p> <p>Various formats can include:</p> <ul style="list-style-type: none"> • graphic organizers • categorical sort • modeling • drawings • sorting by different attributes <p>CONTENT FOCUS</p> <p>The focus is on 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, taking into account 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</p> <p>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</p> <p>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</p> <p>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, taking into account 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. 	

Strand	Data and Analysis
Topic	Inference & Modeling
	<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</p> <p>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 with two steps <p>Content Elaborations</p> <p>CLARIFICATIONS</p> <p>Students will listen to directions to complete a task. Students should express 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</p> <p>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</p> <p>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</p> <p>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</p> <p>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"> 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"> 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</p> <p>In kindergarten, with teacher support, students 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</p> <p>Students can address this content with or without a computing device.</p> <p>Sequences should be in logical order: beginning, middle and end. Modeling can be done visually or verbally.</p> <p>CONTENT FOCUS</p> <p>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</p> <p>In kindergarten, with teacher support students plan and/or create an artifact to illustrate thoughts, ideas, and problems in a sequential manner. In grade 1, with guidance, students will continue to plan and create, as well as begin to debug an artifact in order to illustrate thoughts, ideas, and problems in a sequential manner.</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 illustrate thoughts, ideas and problems in a sequential manner <p>Content Elaborations</p> <p>CLARIFICATIONS</p> <p>An artifact is anything created by a human. An artifact could be a visual program, story map, story board or sequential graphic organizer.</p> <p>CONTENT FOCUS</p> <p>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, taking into account 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	Impacts of Computing	
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</p> <p>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</p> <p>Students can identify and explain the connections between their lives and technology and how technology affects their lives.</p> <p>CONTENT FOCUS</p> <p>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 own 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
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	
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</p> <p>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 use of technology available within the framework of the school's technology rules, regulations and etiquette <p>Content Elaborations</p> <p>CLARIFICATIONS</p> <p>Etiquette topics might include cyberbullying, school policy and safe privacy practices.</p> <p>CONTENT FOCUS</p> <p>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"> 1. Include the unique perspectives of others and reflect on one's own 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 7. Communicating About Computing</i></p> <ol style="list-style-type: none"> 2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose. 	

Strand	Impacts of Computing	
Topic	Safety, Law and Ethics	
<p>IC.SLE.K.a With guidance, discuss appropriate uses of technology to support informed decisions.</p>	<p>Expectations for Learning</p> <p>LEARNING PROGRESSION</p> <p>In kindergarten, with teacher support, students identify and explain basic security practices that should be applied when using the internet. With support, students identify personal information and explain why it is important to use security measures and to 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 what are 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</p> <p>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 of 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>	

Strand	Impacts of Computing
Topic	Safety, Law and Ethics
	<p>CONTENT FOCUS</p> <p>The focus is to keep students safe when using the internet.</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 own 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. <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.