



Minnesota K-12 Integrated Computer Science Benchmarks

Introduction

The Minnesota K-12 Academic Standards set the expectations for achievement in every content area (Physical Education, The Arts, Science, English Language Arts, Social Studies, and Mathematics) for K-12 students in Minnesota. Beginning in 2017 computer science was identified as an important skill and each standard development committee has used the Minnesota Information and Technology Educators of Minnesota (ITEM) Standards, The K-12 Computer Science Framework, and the Computer Science Teachers Association K-12 Computer Science Standards to explore connections to their respective content area. Computer science content and practices are integrated at the benchmark level.

The Minnesota Academic Standards define the content that students must learn but do not define the context. There are many opportunities to integrate computer science in the context of how students are meeting the standards and benchmarks.

Minnesota K-12 Academic Standards Review Schedule

Minnesota's K-12 academic standards are reviewed in one content area per year, following the schedule specified in Minnesota Statutes, section 120B.021, subdivision 4. The Academic Standards review schedule can be found on the Academic Standards website.

How to Use this Document

This document is intended to be used as a planning tool with the Minnesota K-12 Academic Standards in all the content areas and only includes those benchmarks that each standards committee identified as computer science aligned. Teachers, district leaders, and curriculum development committees can use this document to look at computer science across all content areas and grade levels.

Structure

The K-6 benchmarks are organized by grade level, and the 7-12 benchmarks by content area. There is a sample below.

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
K				LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.		With prompting and support, create an individual or shared multimedia work for a specific purpose (e.g., to share lived or imagined experiences, to present information, to entertain, or as artistic expression), considering digital footprint.*
1	English Language Arts	ELA	Listening, Speaking, Viewing, and Exchanging Ideas	4. Revise and complete original artistic work.	0.3.3.2	
	Arts	1. Dance	2. Create		1.1.2.4.2	2. Document many types of movements by drawing pictures, using <i>symbols</i> , or utilizing technology.**

Grades K-6 Integrated Computer Science Standards

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
K	Arts	1. Dance	2. Create	4. Revise and complete original artistic work.	1.0.2.4.2	2. Document a dance or movement by drawing a picture, using a <i>symbol</i> , or utilizing technology.
K	Science	Earth and Space Science	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.1.1 Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables.	0E.2.1.1.2	Make daily and seasonal observations of local weather conditions to describe patterns over time. (P: 4, CC: 1, CI: ESS2) <i>Examples of qualitative observations may include descriptions of the weather (such as sunny, cloudy, rainy, and warm). Examples of quantitative observations may include numbers of sunny, windy, and rainy days in a month. Examples of patterns may include that it is usually cooler in the morning than in the afternoon and that different months have different numbers of sunny days versus cloudy days in different months.</i>
K	Science	Life Science	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.1.1 Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables.	0L.2.1.1.3	Record and use observations to describe patterns of what plants and animals (including humans) need to survive. (P: 4, CC: 1, CI: LS1) <i>Examples of patterns may include that animals need to take in food, but plants do not; different animals need different kinds of food; plants require light; and that all living things need water.</i>

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
K	Science	Physical Science	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	0P.2.2.1.1	Identify and describe patterns that emerge from the effects of different strengths or different directions of pushes and pulls on the motion of an object. (P: 5, CC: 2, CI: PS2) <i>Emphasis is on different relative strengths or different directions, but not both at the same time. Examples of pushes or pulls may include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.</i>
K	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	0.3.3.1	Create written, oral, and digital content that communicates knowledge and ideas in a variety of presentation styles, with prompting and support.

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
K	English Language Arts (ELA)	ELA	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	0.3.3.2	With prompting and support, create an individual or shared multimedia work for a specific purpose (e.g., to share lived or imagined experiences, to present information, to entertain, or as artistic expression), considering digital footprint.
1	Arts	1. Dance	2. Create	4. Revise and complete original artistic work.	1.1.2.4.2	2. Document many types of movements by drawing pictures, using <i>symbols</i> , or utilizing technology.
1	Arts	4. Theater	2. Create	4. Revise and complete original artistic work.	4.1.2.4.3	3. Select different <i>design</i> and technical (using available technology) choices for a guided drama experience .
1	Science	Physical Science	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.1.1 Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables.	1P.2.1.1.1	Identify and describe patterns obtained from testing different materials and determine which materials have the properties that are best suited for producing and/or transmitting sound. (P: 4, CC: 1, CI: PS1, ETS1) <i>Examples of materials may be wood, paper, string, plastics, cloth, etc.</i>

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
1	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	1.3.3.2	Create and share work using a teacher-selected digital tool, articulating the advantages and limitations of the tool, related to task, purpose, and audience, considering digital footprint.
2	Arts	1. Dance	2. Create	4. Revise and complete original artistic work.	1.2.2.4.2	2. Document shapes and actions of dance by drawing a picture, using <i>symbols</i> , or utilizing technology.
2	Arts	3. Music	2. Create	3. Create original artistic work.	3.2.2.3.1	1. Preserve personal <i>rhythmic</i> or <i>melodic patterns</i> using a system of <i>notation</i> or recording technology.
2	Arts	3. Music	4. Respond	7. Analyze and construct interpretations of artistic work.	3.2.4.7.1	1. Identify repeating patterns and expressive elements while listening to and interacting with a variety of music.
2	Arts	4. Theater	2. Create	2. Generate and develop original artistic ideas.	4.2.2.2.3	3. Identify ways voice, sounds , and technology may be used to create or retell a story .
2	Arts	4. Theater	2. Create	4. Revise and complete original artistic work.	4.2.2.4.2	2. Use and adapt sounds (using available technology) and movements for a guided drama experience .
2	Arts	4. Theater	2. Create	4. Revise and complete original artistic work.	4.2.2.4.3	3. Experiment with <i>design</i> and technical (using available technology) choices for an improvised or scripted work .

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
2	Science	Earth and Space Science	4 Communicating reasons, arguments and ideas to others	4.2.1 Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats.	2E.4.2.1.2	Obtain and use information from multiple sources, including electronic sources, to describe climates in different regions of the world. (P: 8, CC: 1, CI: ESS2) <i>Emphasis of the practice is on learning how to use electronic sources to integrate and evaluate content. Examples of information may include data on an area's typical weather conditions and how these patterns are considered climate.</i>
2	Science	Physical Science	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	2P.2.2.1.1	Identify and predict quantitative patterns of the effects of balanced and unbalanced forces on the motion of an object. (P: 5, CC: F412, CI: PS2) <i>Examples may include an unbalanced force on one side of a ball can make it start moving; and balanced forces pushing on a box from both sides will not produce any motion at all. Data displays may include pictographs and bar graphs.</i>

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
2	Science	Physical Science	3 Developing possible explanations of phenomena or designing solutions to engineering problems	3.1.1 Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others.	2P.3.1.1.1	Develop a simple diagram or physical model to illustrate how some changes caused by heating or cooling can be reversed and some cannot. (P: 2, CC: 2, CI: PS3) <i>Examples of reversible changes may include materials such as water and butter at different temperatures. Examples of irreversible changes may include cooking an egg, freezing a plant leaf, and heating paper. Examples of diagrams may include a flow chart.</i>
2	English Language Arts	ELA	Reading	R4 Read critically to comprehend, interpret, and analyze themes and central ideas in complex literary and informational texts.	2.1.4.4	Describe the connection between a series of events, concepts, or steps in a procedure, in informational text.
2	English Language Arts	ELA	Writing	W8 Media Literacy in Writing: Support writing with evidence from sources, correctly citing those sources, and demonstrating an understanding of the rights and obligations of using intellectual property.	2.2.8.1	Demonstrate a basic understanding of and respect for the rights and obligations of using and sharing intellectual property and avoiding plagiarism. (e.g., What work is yours? What work is someone else's?)

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
2	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 1 Exchange ideas in discussion and collaboration, as listener, speaker, and participant, A) including the voices and perspectives of Dakota and Anishinaabe people as well other perspectives, identities, and cultures like and unlike their own, and B) expressing one's own ideas, stories, and experiences.	2.3.1.3	Demonstrate ability to receive and act on feedback from others and self-reflection.
2	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	2.3.3.2	Create and share work, choosing a digital tool from teacher-provided lists, and critique effectiveness of chosen tool regarding the task, purpose, and audience, (e.g., to create or integrate knowledge, to share experiences or information, to persuade, to entertain, or as artistic expression.) demonstrating understanding of digital footprint.
3	Arts	1. Dance	2. Create	4. Revise and complete original artistic work.	1.3.2.4.2	2. Document spatial elements of a <i>dance phrase</i> by drawing a picture, using <i>symbols</i> , or utilizing technology.
3	Arts	3. Music	2. Create	3. Create original artistic work.	3.3.2.3.1	1. Organize chosen musical patterns into phrases using a system of notation or recording technology.

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
3	Arts	4. Theater	2. Create	4. Revise and complete original artistic work.	4.3.2.4.3	3. Revise <i>design</i> and technical (using available technology) choices to support an improvised or scripted work .
3	Science	Earth and Space Science	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.1.1 Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables.	3E.2.1.1.1	Record observations of the sun, moon, and stars and use them to describe patterns that can be predicted. (P: 4, CC: 1, CI: ESS1). <i>Examples of patterns may include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.</i>
3	Science	Earth and Space Science	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	3E.2.2.1.1	Organize and electronically present collected data to identify and describe patterns in the amount of daylight in the different times of the year. (P: 5, CC: 1, CI: ESS1) <i>Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.</i>

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3	Science	Life Science	4 Communicating reasons, arguments and ideas to others	4.2.1 Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats.	3L.4.2.1.1	Obtain information from various types of media to support an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. (P: 8, CC: 4, CI: LS1) <i>Examples of structures may include thorns, stems, roots, colored petals, heart, stomach, lungs, brain, and skin. Examples of media may include electronic sources.</i>
3	Science	Physical Science	3 Developing possible explanations of phenomena or designing solutions to engineering problems	3.1.1 Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others.	3P.3.1.1.1	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. (P: 2, CC: 2, CI: PS4) <i>Examples of models may include diagrams, drawings, physical models, or computer programs.</i>
3	English Language Arts	English Language Arts	Reading	R4 Read critically to comprehend, interpret, and analyze themes and central ideas in complex literary and informational texts.	3.1.4.4	Describe the relationship between a series of events, concepts, or steps in a procedure, using language that pertains to time, sequence, and cause/effect, in informational text.

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
3	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 1 Exchange ideas in discussion and collaboration, as listener, speaker, and participant, A) including the voices and perspectives of Dakota and Anishinaabe people as well other perspectives, identities, and cultures like and unlike their own, and B) expressing one's own ideas, stories, and experiences.	3.3.1.3	Receive and act on feedback from others, self-reflect, and provide constructive feedback on peers' work, with guidance and support from adults.
3	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	3.3.3.2	Create and share work, using self-selected digital tools, and critique effectiveness of chosen tool regarding the task, purpose, and audience, demonstrating understanding of digital footprint.
4	Arts	1. Dance	2. Create	4. Revise and complete original artistic work.	1.4.2.4.2	2. Document timing elements of a <i>dance phrase</i> by drawing a picture, using <i>symbols</i> , or utilizing technology.
4	Arts	3. Music	2. Create	3. Create original artistic work.	3.4.2.3.1	1. Organize chosen musical phrases into a short <i>composition</i> using a system of notation or recording technology.

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
4	Arts	4. Theater	2. Create	2. Generate and develop original artistic ideas.	4.4.2.2.2	2. <i>Design</i> one or more technical theater elements (using available technology) that support the story and <i>given circumstances</i> in a <i>work</i> .
4	Arts	4. Theater	2. Create	4. Revise and complete original artistic work.	4.4.2.4.3	3. Collaborate with peers on solutions to <i>design</i> and technical challenges (using available technology) in rehearsals for a <i>work</i> .
4	Arts	4. Theater	3. Perform	6. Make artistic choices in order to convey meaning through performance.	4.4.3.6.2	2. Customize various technical elements (using available technology) for a <i>work</i> .
4	Arts	4. Theater	4. Respond	8. Evaluate artistic work by applying criteria.	4.4.4.8.1	1. Describe how technical elements or technology may support a theme or idea in a <i>work</i> .
4	Arts	5. Visual Arts	2. Create	3. Create original artistic work.	5.4.2.3.2	2. Identify issues involving copying and originality in art making.
4	Science	Earth and Space Science	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	4E.2.2.1.1	Interpret charts, maps and/or graphs of the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. (P: 5, CC: 4, CI: ESS2) <i>Emphasis is on oceans, lakes, rivers, glaciers, ground water, and polar ice caps.</i>

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
4	Science	Life Science	4 Communicating reasons, arguments and ideas to others	4.2.1 Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats.	4L.4.2.1.2	Obtain information from various media sources to determine that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. (P: 8, CC: 1, CI: LS3) <i>Emphasis of the practice is to compare and/or combine information across texts and other reliable media. Emphasis is on organisms other than humans and the patterns in traits between offspring and their parents or among siblings.</i>
4	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	4.3.3.2	Create and share work, using self-selected digital tools, and articulate how chosen tools meet the task, purpose, and audience, demonstrating understanding of digital footprint.
5	Arts	1. Dance	2. Create	4. Revise and complete original artistic work.	1.5.2.4.2	2. Document energy elements of a <i>dance phrase</i> using drawings, <i>symbols</i> , or utilizing technology.
5	Arts	3. Music	2. Create	3. Create original artistic work.	3.5.2.3.1	1. Organize chosen musical phrases into a given form using a system of notation or recording technology.
5	Arts	4. Theater	2. Create	2. Generate and develop original artistic ideas.	4.5.2.2.2	2. Propose and create <i>designs</i> using multiple technical theater elements (using available technology) to support the story and <i>given circumstances</i> in a <i>work</i> .

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
5	Arts	4. Theater	2. Create	4. Revise and complete original artistic work.	4.5.2.4.3	3. Create and justify solutions to <i>design</i> and technical challenges (using available technology) that arise in rehearsal for a <i>work</i> .
5	Arts	4. Theater	3. Perform	6. Make artistic choices in order to convey meaning through performance.	4.5.3.6.2	2. Modify and justify the use of specific technical elements (using available technology) in a <i>work</i> .
5	Arts	5. Visual Arts	2. Create	3. Create original artistic work.	5.5.2.3.2	2. Explain the <i>ethical responsibility of appropriation</i> in art making.
5	Arts	5. Visual Arts	3. Present	6. Make artistic choices in order to convey meaning through presentation.	5.5.3.6.1	1. Identify and describe the choices an artist makes when assembling a presentation or a <i>portfolio</i> . <i>For example: Physical verses digital formats.</i>
5	Science	Earth and Space Science	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	5E.2.2.1.2	Use data to describe patterns in the daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. (P: 5, CC: 1, CI: ESS1). <i>Examples of patterns may include the number of daylight hours over the course of a year, selected stars that are visible only in particular months, and the length and direction of shadows over a year.</i>

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
5	Science	Life Science	3 Developing possible explanations of phenomena or designing solutions to engineering problems	3.1.1 Students will be able to develop, revise, and use models to represent their understanding of phenomena or systems as they develop questions, predictions and/or explanations and communicate ideas to others.	5L.3.1.1.3	Create an electronic visualization of the movement of matter among plants, animals, decomposers, and the environment. (P: 2, CC: 4, CI: LS2). <i>Emphasis is on the idea that matter that is not food is changed by plants into matter that is food. Examples of systems through which matter cycles may include organisms, ecosystems, and the Earth. Examples of an electronic visualization may include a computer program, simulation, or animation.</i>
5	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	5.3.3.2	Create and share work, using self-selected digital tools, and articulate how chosen tools meet the task, purpose, and audience, demonstrating understanding of digital footprint.
6	Arts	1. Dance	2. Create	4. Revise and complete original artistic work.	1.6.2.4.2	2. Document changes in a <i>dance study</i> by using words, <i>symbols</i> , or technology with consideration of privacy issues.
6	Arts	2. Media Arts	5. Connect	9. Integrate knowledge and personal experiences while responding to, creating, and presenting artistic work.	2.6.5.9.1	1. Compare and contrast how creating and presenting media artworks forms personal and <i>digital identity</i> . <i>For example: Using platforms of systematic communications, distribution and engagement with new media.</i>

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
6	Arts	3. Music	2. Create	3. Create original artistic work.	3.6.2.3.1	1. Develop a <i>composition</i> consisting of a melody using a system of notation or recording technology.
6	Arts	4. Theater	2. Create	2. Generate and develop original artistic ideas.	4.6.2.2.2	2. Propose and create a comprehensive <i>design</i> using all technical theater elements and available technology to support the story and <i>given circumstances</i> in a work.
6	Arts	4. Theater	2. Create	4. Revise and complete original artistic work.	4.6.2.4.3	3. Analyze and revise planned technical design choices (using available technology) during the rehearsal process for a devised or scripted work .
6	Science	Earth Space Science: Weather and Climate	1 Exploring phenomena or engineering problems	1.2.1 Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena.	6E.1.2.1.1	Collect data and use digital data analysis tools to identify patterns to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions. (P: 3, CC: 2, CI: ESS2) <i>Emphasis is on how weather at a fixed location changes in response to moving air masses and to interactions at frontal boundaries between air masses. Examples of weather data may include temperature, air pressure, precipitation, and wind. Examples of data analysis may include weather maps, diagrams, and visualizations or may be obtained through laboratory experiments (such as with condensation).</i>

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6	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	6.3.3.2	Create and share, individually or in a collaborative group, an informative multi-media work or digital communication, choosing tools to meet the task, purpose, and audience, demonstrating understanding of digital footprint.

Grades 7-12 Integrated Computer Science Standards

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
7	Arts	1. Dance	2. Create	4. Revise and complete original artistic work.	1.7.2.4.2	2. Document dance compositions by using words, <i>symbols</i> , or technology with consideration of privacy issues.
7	Arts	2. Media Arts	5. Connect	9. Integrate knowledge and personal experiences while responding to, creating, and presenting artistic work.	2.7.5.9.1	1. Analyze how to <i>safely, ethically</i> and intentionally develop <i>digital identity</i> when creating and presenting media artworks, through <i>systematic communications</i> . <i>For example: Ethically</i> exploring anonymity in a <i>virtual world</i> such as gaming; <i>digital safety</i> ; <i>digital security</i> .
7	Arts	3. Music	2. Create	3. Create original artistic work.	3.7.2.3.1	1. Develop a <i>composition</i> consisting of a <i>melody</i> with <i>expressive elements</i> using a system of <i>notation</i> or recording technology.
7	Arts	4. Theater	2. Create	4. Revise and complete original artistic work.	4.7.2.4.3	3. Compare and contrast multiple planned <i>technical design elements</i> (using available technology) during the <i>rehearsal</i> process for a <i>devised</i> or <i>scripted work</i> .

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
7	Arts	4. Theater	3. Perform	6. Make artistic choices in order to convey meaning through performance.	4.7.3.6.2	2. Determine a variety of technical elements (using available technology) that can be applied to a <i>design</i> for a <i>work</i> .
7	Arts	5. Visual Arts	2. Create	3. Create original artistic work.	5.7.2.3.2	2. Describe <i>ethical responsibility</i> when sharing original <i>artwork</i> through the internet and communication formats.
7	Arts	5. Visual Arts	3. Present	6. Make artistic choices in order to convey meaning through presentation.	5.7.3.6.1	1. Compare and contrast the differences between engaging with <i>art</i> through technology and physically experiencing an <i>artwork</i> .
8	Arts	1. Dance	2. Create	4. Revise and complete original artistic work.	1.8.2.4.2	2. Compare and contrast recognized systems of dance documentation and notation , considering intellectual property rights.
8	Arts	3. Music	2. Create	3. Create original artistic work.	3.8.2.3.1	1. Develop a <i>composition</i> in a specific form that includes expressive elements using notation or recording technology.
8	Arts	4. Theater	2. Create	4. Revise and complete original artistic work.	4.8.2.4.3	3. Implement and refine a planned technical design (using available technology) during the rehearsal process for devised or scripted work .
8	Arts	4. Theater	3. Perform	6. Make artistic choices in order to convey meaning through performance.	4.8.3.6.2	2. Apply a variety of technical elements (using available technology) to create a <i>design</i> for a rehearsal or production.
8	Arts	5. Visual Arts	2. Create	3. Create original artistic work.	5.8.2.3.2	2. Apply ethics of <i>appropriation, fair use, creative commons, open sources, and copyright</i> to the creation of <i>artwork</i> .
High School (HS)	Arts	1. Dance	2. Create	4. Revise and complete original artistic work.	1.9.2.4.2	2. Document a dance using self-created or recognized systems of documentation with consideration of privacy and intellectual property rights.
HS	Arts	3. Music	2. Create	3. Create original artistic work.	3.9.2.3.1	1. Select multiple <i>musical ideas</i> , original or existing, to <i>create</i> drafts of music using notation or technology, where appropriate.

Grade	Academic Standard Area	Content Area	Strand	Anchor Standard	Code	Benchmark
HS	Arts	3. Music	2. Create	4. Revise and complete original artistic work.	3.9.2.4.1	1. <i>Revise or arrange a composition</i> to become a completed <i>musical work</i> using current technology (as available) to preserve the <i>composition</i> .
HS	Arts	3. Music	3. Perform	5. Develop and refine artistic techniques and work for performance.	3.9.3.5.1	1. Utilize multiple rehearsal strategies to <i>refine performance</i> , using technology where appropriate.
HS	Arts	4. Theater	2. Create	2. Generate and develop original artistic ideas.	4.9.2.2.1	1. Apply research (including available technology) to construct the <i>visual composition</i> for a <i>work</i> .
HS	Arts	4. Theater	2. Create	2. Generate and develop original artistic ideas.	4.9.2.2.2	2. Investigate the impact of technology on <i>design</i> choices in a <i>work</i> .
HS	Arts	4. Theater	2. Create	4. Revise and complete original artistic work.	4.9.2.4.3	3. Refine a technical design (including available technology) to support the story and emotional impact of a devised or scripted work .
HS	Arts	4. Theater	3. Perform	6. Make artistic choices in order to convey meaning through performance.	4.9.3.6.2	2. Research and apply technical elements (using available technology) to create a <i>design</i> for a production.
HS	Arts	5. Visual Arts	2. Create	3. Create original artistic work.	5.9.2.3.2	2. Balance freedom and <i>ethical responsibility</i> in the use of images, <i>materials</i> , tools, and equipment during <i>art</i> making.
7	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	7.3.3.2	Create and share, individually or in a collaborative group, an artistic or entertaining multi-media work or digital communication, choosing tools to meet the task, purpose, and audience, demonstrating understanding of digital footprint.

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8	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	8.3.3.2	Create and share, individually or in a collaborative group, a persuasive multi-media work or digital communication, choosing tools to meet the task, purpose, and audience, demonstrating understanding of digital footprint.
9	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	9.3.3.2	Create and share, individually or in a collaborative group, a piece of digital work or digital communication, for a specific purpose and audience, demonstrating understanding of digital footprint while respecting intellectual property.
10	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	10.3.3.2	Create and share, individually or in a collaborative group, and present a piece of digital work or digital communication, which may include ethical remixing or transformation of work, for a specific purpose; publish work, considering audience, demonstrating understanding of digital footprint.

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11th - 12th	English Language Arts	English Language Arts	Listening, Speaking, Viewing, and Exchanging Ideas	LSVEI 3 Media Literacy in Exchanging Ideas: Thoughtfully and safely access, analyze, and create written, oral, and digital content, applicable to task, purpose, audience, and discipline.	11.3.3.2	Create and present a piece of digital work or digital communication, which may include ethical remixing or transformation of work, for a specific, current, relevant purpose; publish work, considering audience, demonstrating understanding of digital footprint.
7	Science	Life Science: Ecosystems: Interactions, Energy, and Dynamics	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.1.1 Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables.	7L.2.1.1.1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (P: 4, CC: 2, CI: LS2) <i>Emphasis is on cause and effect relationships between resources and growth of individual organisms and the number or organisms in ecosystems during periods of abundant and scarce resources. Examples may include populations of MN deer, moose, wolf, scavengers or aquatic populations in Lake Superior or algal blooms in lakes and ponds. Examples of evidence may include the use of flow charts to organize and sequence the algorithm, and to show relationships.</i>
7	Science	Life Science Evolution: Unity and Diversity	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.1.1 Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables.	7L.2.1.1.3	Analyze visual data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. (P: 4, CC: 1, CI: LS4) <i>Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing their macroscopic appearances on diagrams or pictures.</i>

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7	Science	Life Science Evolution: Unity and Diversity	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	7L.2.2.1.1	Use an algorithm to explain how natural selection may lead to increases and decreases of specific traits in populations. (P: 5, CC: 2, CI: LS4) <i>Emphasis is on using proportional reasoning to develop mathematical models, probability statements, or simulations to support explanations of trends in changes to populations over time.</i>
8	Science	Physical Science:: Energy	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	8P.2.2.1.2	Create a computer program to illustrate the transfer of energy within a system where energy changes form. (P: 5, CC: 7, CI: PS3) <i>Emphasis of the programming skills is the use of sequences, events and conditionals. Examples of a system may include a roller coaster, a pendulum, an electric water heater, and a solar electric collector.</i>

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8	Science	Physical Science: Waves and their Applications	4 Communicating reasons, arguments and ideas to others	4.2.1 Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats.	8P.4.2.1.2	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. (P: 8, CC: 6, CI: PS4) <i>Emphasis of the practice is on using information to support and clarify claims. Emphasis of the core idea is on understanding that waves (encoded both analog and digitally) can be used for communication purposes. Examples of encoding and transmitting information may include using fiber optic cable to transmit light pulses, radio wave pulses in Wi-Fi devices, and conversion of stored binary patterns to make sound or text on a computer screen.</i>
9-12 Chemistry	Science	Chemistry: Structure and Properties of Matter	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	9C.2.2.1.1	Develop a data simulation, based on observations and experimental data of how the pressure, volume, temperature, and mass of a gas are related to each other, to predict the effect on a system of changing one of those variables. (P: 5, CC: 2, CI: PS1) <i>Emphasis is on applying the kinetic molecular theory of gases to develop gas laws. Example systems may include balloons, tires, or syringes.</i>

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9-12 Earth and Space Science (ESS)	Science	ESS: Earth's Place in the Universe	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	9E.2.2.1.1	Use mathematical and computational representations to predict the motion of natural and human-made objects that are in orbit in the solar system. (P: 5, CC: 3, CI: ESS1, ETS2) <i>Emphasis is on Kepler's laws of planetary motion and Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons.</i>
9-12 Earth and Space Science	Science	ESS: Earth's Systems and Processes	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	9E.2.2.1.2	Develop a computational model, based on observational data, experimental evidence, and chemical theory, to describe the cycling of carbon among Earth's systems. (P: 2, CC: 5, CI: ESS2) <i>Emphasis is on quantitative modeling of carbon as it cycles through the ocean, air, rock (particularly limestone), soil, and organisms. Emphasis is also on using empirical evidence and scientific reasoning to inform the algorithmic thinking about the conservation and cycling of matter.</i>

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9-12 Life Science	Science	Life Science: Ecosystems: Interactions, Energy, and Dynamics	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships, compare mathematical expressions to the real world, and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	9L.2.2.1.1	Use a computational model to support or revise an evidence-based explanation for factors that have ecological and economic impacts on different sized ecosystems, including factors caused by the practices of various human groups. (P: 5, CC: 3, CI: LS2) <i>Examples of ecological impacts might include changes in the carrying capacity, species numbers and/or types of organisms present in an environment. Examples of human practices that can have positive or negative impacts, such as stream restoration versus deforestation as an ecological example. Examples of computational models may include online simulations of population dynamics, population ecology, or population growth.</i>
9-12 Life Science	Science	Life Science: Ecosystems: Interactions, Energy, and Dynamics	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships, compare mathematical expressions to the real world, and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	9L.2.2.1.2	Use a computational model to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. (P: 5, CC: 5, CI: LS2) <i>Examples of claims about matter cycles may include how carbon, nitrogen, or water cycles through the environment, and/or how disruptions to those systems affect matter cycling. Examples of energy flow may include the transfer of the sun's energy into and among organisms, and/or connections between fossil fuel burning and the carbon cycle. Examples of computational models may include online simulations and animated representations.</i>

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9-12 Physics	Science	Physical: Energy	2 Looking at data and empirical evidence to understand phenomena or solve problems	2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.	9P.2.2.1.3	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in or out of the system are known. (P: 5, CC: 4, CI: PS3). <i>Emphasis is on explaining the meaning of mathematical expressions used in the model for systems of two or three components. Forms of energy may include thermal energy, kinetic energy, and elastic potential energy. Computational models may include the creation or use of a simulation or the analysis of a data set.</i>
9-12 Physics	Science	Physics: Energy	3 Developing possible explanations of phenomena or designing solutions to engineering problems	3.1.1 Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others.	9P.3.1.1.1	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects). (P: 2, CC: 5, CI: PS3) <i>Examples of phenomena at the macroscopic scale may include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above Earth, and the energy stored between two electrically-charged plates. Examples of models may include diagrams, drawings, descriptions, and computer simulations.</i>
9-12 Physics	Science	Physics: Motion and Stability: Forces and Interactions	3 Developing possible explanations of phenomena or designing solutions to engineering problems	3.2.2 Students will be able to use their understanding of scientific principles and the engineering design process to design solutions that meet established criteria and constraints.	9P.3.2.2.1	Develop a computer simulation to demonstrate the impact of a proposed solution that minimizes the force on a macroscopic object during a collision. (P: 6, CC: 2, CI: PS2, ETS1) <i>Emphasis is on applying science and engineering principles and analyzing the energy conversions. Examples of a device may include a helmet, a parachute, an airbag, and packaging for safe shipping.</i>

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9-12 Physics	Science	Physics: Waves and their Applications	1 Exploring phenomena or engineering problems	1.1.1 Students will be able to ask questions about aspects of the phenomena they observe, the conclusions they draw from their models or scientific investigations, each other's ideas, and the information they read.	9P.1.1.1.1	Evaluate questions about the advantages and disadvantages of using digital transmission and storage of information. (P: 1, CC: 7, CI: PS4, ETS1) <i>Emphasis is on the tradeoffs involved in the transmission and storage of data elements. Examples of advantages may include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Examples of disadvantages may include issues of easy deletion, security, and theft.</i>