Georgia
Standards of Excellence

Computer Science

Standards

Fourth Grade

Georgia Department of Education

Richard Woods, Georgia's School Superintendent
"Educating Georgia's Future"

Georgia Standards of Excellence (GSE) for Computer Science (CS) were created in response to the growing ubiquity of computing devices and their impact on every aspect of society. If Georgia's students are to participate effectively in society, a shift in K-12 education must correspond. In Georgia, Computer Science is understood as the study of computers and algorithmic processes, including their principles, their hardware and software designs, their implementation, and their impact on society. The standards blend the core concepts of computer science (i.e., what students should know) and computer science practices (i.e., what students should do). These core concepts and practices should be taught in an integrated way to provide authentic learning experiences for students.

The GSE for Computer Science immerse students in the practices of Computer Science from Kindergarten through grade 12, effectively transitioning Computer Science from a high school elective to a comprehensive K-12 discipline for all students. Some skills or concepts are emphasized more in particular grade bands in conjunction with research on how students learn and other knowledge and skills taught at those levels. Any curriculum aligned to these GSE should revisit domains and concepts over time as students apply their learning by creating computational artifacts. Creating computational artifacts can be as simple as writing socially responsible electronic messages (e.g., email and social media posts) and as complex as designing an app for a drone or a self-driving vehicle.

The standards are organized in grade bands rather than grade levels to afford schools flexibility in presenting the content while maintaining a structured, developmental progression from one band to another. Teachers can scaffold instruction from simple familiarization in the K-2 grade band to deeper involvement in the 3-5 and more thorough treatment in the 6-8 grade band. In addition, the 6-8 grade band standards are designed to feed directly into the high school CS pathways which are, in turn, designed to meet the dynamic needs of industry and post-secondary study of computer science.

Georgia-owned and Georgia-grown, the GSE for Computer Science relate broadly to national and international frameworks. The grade bands follow the structure set forth by the K12 CS Framework; they develop a comprehensive conceptual framework that grows over the years. The K-8 GSE for Computer Science also correspond to the ISTE standards for students as organizational domains. These domains are intended to be cross-curricular. The ISTE domains (e.g. Empowered Learner) define a high-level perspective on the characteristics of a 21st century student. These characteristics are couched in a digital society but are not restricted to computer science content. Likewise, the GSE for Computer Science can be integrated into other content areas and support enduring characteristics for learning (e.g., collaborative, communicative, creative, and critical thinking). Ultimately, the GSE for Computer Science support and inspire Georgia's students as they grow and learn, empowering students to be successful, responsible, and engaged citizens.

The Standards are written in the following format:

CSS = Computer Science Standard
EL = Empowered Learner (Domain)
6-8 = Grade band 6 through 8
1 = is the standard number
1… = Element of the standard

Cluster 6-8
Empowered Learner
CSS.EL.6-8.1
Use technology resources to increase self-direction and self-regulation in learning, including for problem solving and collaboration (e.g., using the Internet to access online resources, edit documents collaboratively)

1. Understand the difference between editing a shared document and suggesting edits (e.g. track changes)
2. Use digital tools or platforms to organize, display, annotate, and/or share a curated collection
3. Complete an individual project (e.g., research or design) using technology resources

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Empowered Learner
CSS.EL.3-5.1
Identify the features of current technologies and use that knowledge to understand emerging technologies.

1. Describe how internal and external parts of computing devices function to form a system.
2. Model how computer hardware and software work together as a system to accomplish tasks.
3. Determine potential solutions to solve simple hardware and software problems using common troubleshooting strategies.
4. Develop and apply keyboarding skills, utilizing current technology.
5. Compare and contrast prior knowledge on current technologies with that of new or emerging technologies.
6. Develop, reflect on, and revise personal learning goals in collaboration with their peers.

(*Clarifying statement:* An example could include teaching about functional differences between a monitor and computer keyboard and how they work together in a computing system.)

Knowledge Constructor
CSS.KC.3-5.2
Curate (analyze and evaluate) a variety of resources and digital tools to construct knowledge and produce creative artifacts.

1. Curate (analyze and evaluate) information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.
2. Build knowledge by actively exploring real-world issues.
3. Explain why a real-world issue exists or was created and develop a possible solution.

(*Clarifying statement:* Examples could include using search engines and collecting real-world information using interviews. Students can use different information sources to make connections and draw conclusions. The use of citations and reference lists are taught in upper grades.)

Digital Citizen
CSS.DC.3-5.3
Identify the rights, responsibilities, and opportunities of living, learning, and working in an interconnected society and model behaviors that are safe, legal, and ethical.

1. Discuss real-world cybersecurity problems (e.g. viruses, phishing attacks, click bait, etc) and how personal information can be protected.
2. Understand, demonstrate, and encourage respect for intellectual property of print and digital media.
3. Create and manage digital identity through positive, safe, and ethical online interactions.

(*Clarifying statement:* Examples could include cyber-bullying and the risks and benefits of online-only friendships. Specific cybersecurity and networking skills are taught in later grades.)

Innovative Designer and Creator
CSS.IDC.3-5.4
Use a variety of technologies within a design process to identify and solve problems by creating new, useful, or imaginative solutions.

1. Explore and practice a deliberate design process for generating ideas, testing theories, creating innovative artifacts, or solving authentic problems.
2. Select, evaluate, and use appropriate digital tools to plan and manage a design process.
3. Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features.

(*Clarifying statement:* Examples could include designing solutions to community or classroom challenges. Design thinking begins with building empathy for those impacted by a problem and includes modeling and prototyping possible solutions.)

Computational Thinker
CSS.CT.3-5.5
Develop and employ strategies for understanding and solving problems in ways that use the power of technological methods to develop and test solutions.

1. Compare and refine multiple algorithms for the same task and determine which is the most appropriate.
2. Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process.
3. Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended.
4. Create programs that include sequences, events, loops, conditionals, and variables.

(*Clarifying statement:* Students can work in a Blockly coding environment, such as Scratch, with well-defined problems.)

Creative Communicator
CSS.CC.3-5.6
Select and use the most appropriate platform, tool, style, format and digital media to clearly and creatively express thoughts, messages, goals, or positions.

1. Create original works or responsibly repurpose or remix digital resources into new creations.
2. Communicate complex ideas clearly and effectively by creating or using a variety of digital objects.
3. Publish or present content that customizes the message and medium for their intended audiences.

(*Clarifying statements:* An example may include creating a digital portfolio for students' artwork.)

Global Collaborator
CSS.GC.3-5.7
Use digital tools to expand personal viewpoints and enrich learning by collaborating effectively both locally and globally.

1. Explore local and global issues using digital tools to connect with learners from a variety of backgrounds and cultures
3. Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development.

(*Clarifying statement:* Examples of global interactions could include making suggestions for improvement of Scratch or Khan Academy coding projects from students around the world.)

Reflective Researcher
CSS.RR.3-5.8
Gather, evaluate, and organize quality information from multiple sources.

2. Evaluate the accuracy, perspective, credibility and relevance of information, media, data, or other resources.

Digital Awareness
CSS.DA.3-5.9
Understand the relationship between technology, lifelong learning, and the appropriate use of information.

1. Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices.
2. Identify and propose ways to improve usability of technology for diverse users

(*Clarifying statement:* Examples of computing technologies may include the Internet, digital media, or robotics.)

Glossary of Computer Science Terms

These terms are used throughout the standards. They are content-specific vocabulary for Computer Science.

Term	**Definition**	**Example**
Abstraction	The process of taking away or removing characteristics from something in order to make it less complex. The product should be a new representation of essential characteristics. The new representation hides details that are irrelevant to the problem at hand.	To represent a person, an abstraction may include two arms, two legs, a head, and a torso but no hair or toes. This representation gives enough information to show a person without being too complex.
Algorithm	Detailed, step-by-step instructions for solving a problem or completing a task.	The set of steps used to solve a long division problem is an example of an algorithm.
Analog	A defining characteristic of data; analog data are stored in a continuous transmission of a signal. It is often contrasted with digital, which is how computers store and process data as a set of individual symbols.	A compact disc is digital; a vinyl record is analog.
Artifact (computational)	Anything created by a human using a computer.	A word processing document, an app, and a webpage are all computational artifacts.
Binary	A number system using only on the numerals 0 and 1.	The binary number 01011 converts to 11 in decimal numbers.
Biometric	The measurement and analysis of unique physical or behavioral characteristics (such as fingerprint or voice patterns) especially as a means of verifying personal identity.	Fingerprint scanners utilize a biometric evaluation to grant access.

Block-based programming language	A visual representation of common sets of instructions for coding that can be organized to create computer programs; block-based programing is often used to teach coding to younger or novice learners.	A popular block-based coding language is Blockly.
Coding	Creating a computer program.	Writing directions for a computer using a computer language such as Java, Python, or Blockly.
Computational Thinking	A problem-solving process used to formulate problems in a way that a computer and other tools could be used to help solve.	

Conditional	A programming statement, often starting with "if", in which one half expresses something that depends on the other half.	If student's grade is greater than or equal to 60
		Print "passed"
		else
		Print "failed"
		endif

Curate	Collect, organize, and present information typically using professional or expert knowledge.	Selecting a set of pictures to share or add to a photo album.
Debug	The process of finding and removing errors from computer programs.	Correcting errors.
Decomposition	Specific to computer science, decomposition means breaking a complex problem or system into parts that are easier understand.	To create an app that calculates an ideal heart rate, the program would break down the process to input of information from a patient, calculation of that information, and output of the ideal heart rate.
Design Process	A formal approach used by architects, engineers, and scientists for breaking down a large project into manageable chunks.	

Drone	A remote-controlled pilotless aircraft or missile.	A photographer can use a drone to take aerial pictures.
Event	An action or occurrence recognized by software, often originating from the external environment, that may be handled by the software.	Accepting input from a user is an event that may be followed up by some processing activity.
Hexadecimal (Hex)	Relating to or using a system of numerical notation that has 16 digits rather than 10 as its base.	The number 15 in our common base ten decimal system is represented with the letter 'F' in hexadecimal.
Ideate	The process of generating ideas and solutions.	Sketching, prototyping, or brainstorming can be processes for ideation.
Loop	A sequence of instructions that is continually repeated until a certain condition is reached.	An action that is performed again and again by a computer program.
Model	Constructing a representation of some part of a problem or system.	A budget is a model for how money is spent and earned.
Ordinal	Relating to an ordinal number; representing a position in a series.	1st, 2nd, 3rd, 4th, ...
Phishing	The fraudulent practice of sending emails purporting to be from reputable sources in order to entice individuals to reveal personal information, such as passwords and credit card numbers.	A phishing email is a fake message from a place like the Internal Revenue Service requesting a social security number.
Prototype	A model of something from which other forms are developed or copied.	At an auto show, a "concept car" is a prototype of a car that may go into mass production.
Remix	To change a set of code by adding or rearranging smaller code segments to create a different outcome.	A computer program that uses segments of other programs to solve a problem.

Scratch	A block-based programming platform commonly used for novice programmers.	
Sequence	An ordered, step-by-step process of an action or event proceeding in a pattern.	5, 10, 15, 20 is a sequence that relies on a pattern of +5.
Unplugged	Activities used for teaching computational thinking or computer science without a computing device.	Using playing cards to teach sorting is an unplugged activity to teach how computers sort data.