

Illinois Computer Science Standards

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Illinois Computer Science Standards

Illinois Computer Science Standards were adopted with the enactment of [Public Act 101-0654](#), which required the Illinois State Board of Education to develop rigorous learning standards for computer science by December 1, 2021. These standards were developed by a stakeholder group of educators throughout Illinois and based on the Computer Science Teachers Association CS Standards.

Computer Science Practices

“The seven core practices of computer science describe the behaviors and ways of thinking that computationally literate students use to fully engage in today’s data-rich and interconnected world. The practices naturally integrate with one another and contain language that intentionally overlaps to illuminate the connections among them. They are displayed in an order that suggests a process for developing computational artifacts. This process is cyclical and can follow many paths; in the framework, it begins with recognizing diverse users and valuing others’ perspectives and ends with communicating the results to broad audiences.

“Unlike the core concepts, the practices are not delineated by grade bands. Rather, the practices use a narrative to describe how students should exhibit each practice with increasing sophistication from kindergarten to Grade 12. In addition to describing the progression, these narratives also provide some examples of the interrelatedness of the practice statements and the ways in which these statements build upon one another.”

- [K-12 Computer Science Framework](#)

Computer science practices 8 and 9 below were added to the original seven-core practices from the K-12 Computer Science Framework to meet the needs of emerging and future technologies.

Practice 1 – Fostering an inclusive computing culture.

Practice 2 – Collaborating around computing.

Practice 3 - Recognizing and defining computational problems.

Practice 4 - Developing and using abstractions.

Practice 5 - Creating computational artifacts.

Practice 6 - Testing and refining computational artifacts.

Practice 7 - Communicating about computing.

Practice 8 - Analyzing the effects of advancements in computing on one’s society, economy, and culture.

Practice 9 - Reflecting on and revising one’s computational thought processes and those of others.

Computer Science Standards

The following standards are a modified version of the K-12 Computer Science Framework and introduce standards for "emerging technologies" as a dynamic field that can contribute to many future technologies. Examples of emerging technologies currently include, but are not limited to, artificial intelligence, quantum computing, augmented reality, and applications of robotics. Teachers and students are given freedom to decide how to incorporate the future of computing into their classrooms. Within each grade band standards, this domain comprises a general progression of competencies that students should have across grade levels. These are duplicated and presented in each grade band.

All standards are coded for ease of use and reference.

The code is keyed as follows: “Grade Band. Content Domain. Number of Standard”

Grades K-2 Standards

Computing Systems

Devices

K-2.CS.1 Select and operate appropriate software to perform a variety of tasks and recognize that users have different needs and preferences for the technology they use.

Hardware and Software

K-2.CS.02 Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware).

Troubleshooting

K-2.CS.03 Describe basic hardware and software problems using accurate terminology.

Networks and the Internet

Cybersecurity

K-2.NI.04 Explain what passwords are and why we use them and use strong passwords to protect devices and information from unauthorized access.

Data and Analysis

Storage

K-2.DA.05 Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data.

Collection, Visualization, and Transformation

K-2.DA.06 Collect and present the same data in various visual formats.

Interference and Models

K-2.DA.07 Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions.

Algorithms and Programming

Algorithms

K-2.AP.08 Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks.

Variables

K-2.AP.09 Model the way programs store and manipulate data by using numbers or other symbols to represent information.

Control

K-2.AP.10 Develop programs with sequences and simple loops, to express ideas or address a problem.

Modularity

K-2.AP.11 Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions.

Program Development

K-2.AP.12 Develop plans that describe a program’s sequence of events, goals, and expected outcomes.

K-2.AP.13 Give attribution when using the ideas and creations of others while developing programs.

K-2.AP.14 Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops.

K-2.AP.15 Using correct terminology, describe steps taken and choices made during the iterative process of program development.

Impacts of Computing

Culture

K-2.IC.16 Compare how people live and work before and after the implementation or adoption of new computing technology.

Social Interactions

K-2.IC.17 Work respectfully and responsibly with others online.

Safety Law and Ethics

K-2.IC.18 Keep login information private and log off of devices appropriately.

Emerging and Future Technologies

K-2.ET.A Explain that the field of emerging technologies will be evolving and rapidly growing.

K-2.ET.B Compare existing and emerging technologies, ideas, and concepts.

K-2.ET.C Describe how emerging technologies are influencing current events at a local and global scale.

K-2.ET.D Predict the positive and negative societal, cultural, and economic impacts that emerging and future technologies may generate.

K-2.ET.E Create new or original work by applying emerging technologies.

Grades 3-5 Standards

Computing Systems

Devices

3-5.CS.01 Describe how internal and external parts of computing devices function to form a system.

Hardware and Software

3-5.CS.02 Model how computer hardware and software work together as a system to accomplish tasks. Discuss task specific embedded systems.

Troubleshooting

3-5.CS.03 Determine potential solutions to solve simple hardware and software problems using common troubleshooting strategies.

Networks and the Internet

Network Communication and Organization

3-5.NI.04 Model how information is broken down into smaller pieces, transmitted as packets through multiple devices over networks and the internet, and reassembled at the destination.

Cybersecurity

3-5.NI.05 Discuss real-world cybersecurity problems and how personal information can be protected.

Data and Analysis

Collection, Visualization, and Transformation

3-5.DA.06 Organize and present collected data visually to highlight relationships and support a claim.

Interference and Models

3-5.DA.07 Use data to highlight or propose cause-and-effect relationships, predict outcomes, or communicate an idea.

Algorithms and Programming

Algorithms

3-5.AP.08 Compare and refine multiple algorithms for the same task and determine which is the most appropriate.

Variables

3-5.AP.09 Create programs that use variables to store and modify data.

Control

3-5.AP.10 Create programs that include sequences, events, loops, and conditionals.

Modularity

3-5.AP.11 Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process.

3-5.AP.12 Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features.

Program Development

3-5.AP.13 Use an iterative process to plan the development of a program by including others' perspectives and considering user preferences.

3-5.AP.14 Observe intellectual property rights and give appropriate attribution when creating or remixing programs.

3-5.AP.15 Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended.

3-5.AP.16 Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development.

3-5.AP.17 Describe choices made during program development using code comments, presentations, and demonstrations.

Impacts of Computing

Culture

3-5.IC.18 Discuss computing technologies that have changed the world and express how those technologies influence, and are influenced by, cultural practices.

3-5.IC.19 Brainstorm ways to improve the accessibility and usability of technology products for the diverse needs and wants of users.

Social Interactions

3-5.IC.20 Seek diverse perspectives for the purpose of improving computational artifacts.

Safety Law and Ethics

3-5.IC.21 Use public domain or Creative Commons media and refrain from copying or using material created by others without permission.

Emerging and Future Technologies

3-5.ET.A Explain that the field of emerging technologies will be evolving and rapidly growing.

3-5.ET.B Compare existing and emerging technologies, ideas, and concepts.

3-5.ET.C Describe how emerging technologies are influencing current events at a local and global scale.

3-5.ET.D Predict the positive and negative societal, cultural, and economic impacts that emerging and future technologies may generate.

3-5.ET.E Create new or original work by applying emerging technologies.

Grades 6-8 Standards

Computing Systems

Devices

6-8.CS.01 Recommend improvements to the design of computing devices, based on an analysis of how users interact with the devices.

Hardware and Software

6-8.CS.02 Design projects that combine hardware and software components to collect and exchange data.

Troubleshooting

6-8.CS.03 Systematically identify and fix problems with computing devices and their components.

Networks and the Internet

Network Communication and Organization

6-8.NI.04 Model the role of protocols in transmitting data across networks and the internet.

Cybersecurity

6-8.NI.05 Explain how physical and digital security measures protect electronic information.

6-8.NI.06 Apply multiple methods of encryption to model the secure transmission of information.

Data and Analysis

Storage

6-8.DA.07 Represent data using multiple encoding schemes.

Collection Visualization and Transformation

6-8.DA.08 Collect data using computational tools and transform the data to make it more useful and reliable.

Interference and Models

6-8.DA.09 Refine computational models based on the data they have generated.

6-8.DA.10 Evaluate the misuse of data and impact of distorted outcomes.

Algorithms and Programming

Algorithms

6-8.AP.11 Use flowcharts or pseudocode to address complex problems as algorithms.

Variables

6-8.AP.12 Perform operations on student-created variables that possess descriptive names and represent different data types.

Control

6-8.AP.13 Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.

Modularity

6-8.AP.14 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.

6-8.AP.15 Create procedures with parameters to organize code and make it easier to reuse.

Program Development

6-8.AP.16 Seek and incorporate feedback from team members and users to refine a solution that meets user needs.

6-8.AP.17 Incorporate existing code, media, and libraries into original programs and give attribution.

6-8.AP.18 Systematically test and refine programs using a range of test cases.

6-8.AP.19 Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts.

6-8.AP.20 Document programs to make them easier to follow, test, and debug.

Impacts of Computing

Culture

6-8.IC.21 Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options.

6-8.IC.22 Discuss issues of bias and accessibility in the design of existing technologies.

Social Interactions

6-8.IC.23 Collaborate with many contributors through strategies such as crowdsourcing or surveys when creating a computational artifact.

Safety Law and Ethics

6-8.IC.24 Describe tradeoffs between allowing information to be public and keeping information private and secure.

Emerging and Future Technologies

6-8.ET.A Explain that the field of emerging technologies will be evolving and rapidly growing.

6-8.ET.B Compare existing and emerging technologies, ideas, and concepts.

6-8.ET.C Describe how emerging technologies are influencing current events at a local and global scale.

6-8.ET.D Predict the positive and negative societal, cultural, and economic impacts that emerging and future technologies may generate.

6-8.ET.E Create new or original work by applying emerging technologies.

Grades 9-10 Standards

Computing Systems

Devices

9-10.CS.01 Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects.

Hardware and Software

9-10.CS.02 Compare levels of abstraction and interactions between application software, system software, and hardware layers.

Troubleshooting

9-10.CS.03 Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.

Networks and the Internet

Network Communication and Organization

9-10.NI.04 Evaluate the scalability and reliability of networks by describing the relationship between routers, switches, servers, topology, and addressing.

9-10.NI.05 Give examples to illustrate how sensitive data can be affected by malware and other attacks.

9-10.NI.06 Compare various security measures, considering tradeoffs between the usability and security of a computing system.

Cybersecurity

9-10.NI.07 Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts.

9-10.NI.08 Explain tradeoffs when selecting and implementing cybersecurity recommendations.

Data and Analysis

Storage

9-10.DA.09 Translate between different bit representations of real-world phenomena, such as characters, numbers, and images.

9-10.DA.10 Evaluate the tradeoffs in how data elements are organized and stored.

Collection, Visualization, and Transformation

9-10.DA.11 Create interactive data visualizations using software tools to help others better understand real-world phenomena.

Interference and Models

9-10.DA.12 Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.

Algorithms and Programming

Algorithms

9-10.AP.13 Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.

Variables

9-10.AP.14 Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables.

Control

9-10.AP.15 Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance, and explain the benefits and drawbacks of choices made.

9-10.AP.16 Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue by using events to initiate instructions.

9-10.AP.17 Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, or objects.

Modularity

9-10.AP.18 Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.

9-10.AP.19 Systematically design and develop programs for broad audiences by incorporating feedback from users.

Program Development

9-10.AP.20 Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries.

9-10.AP.21 Evaluate and refine computational artifacts to make them more usable and accessible.

9-10.AP.22 Design and develop computational artifacts working in team roles using collaborative tools.

9-10.AP.23 Document design decisions using text, graphics, presentations, or demonstrations in the development of complex programs.

9-10.AP.24 Describe the characteristics and evaluate the impact of human computer interaction.

Impacts of Computing

Culture

9-10.IC.25 Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.

Evaluate the ways digital social interactions impact personal, ethical, social, economic, and cultural practices.

9-10.IC.26 Test and refine computational artifacts to reduce bias and equity deficits.

9-10.IC.27 Demonstrate ways a given algorithm applies to problems across disciplines.

Social Interactions

9-10.IC.28 Use tools and methods for collaboration on a project to increase connectivity of people in different cultures and career fields.

Safety Law and Ethics

9-10.IC.29 Explain the beneficial and harmful effects that intellectual property laws can have on innovation.

9-10.IC.30 Explain the privacy concerns related to the collection and generation of data through automated processes that may not be evident to users.

9-10.IC.31 Evaluate the social and economic implications of privacy in the context of safety, law, or ethics.

Emerging and Future Technologies

9-10.ET.A Explain that the field of emerging technologies will be evolving and rapidly growing.

9-10.ET.B Compare existing and emerging technologies, ideas, and concepts.

9-10.ET.C Describe how emerging technologies are influencing current events at a local and global scale.

9-10.ET.D Predict the positive and negative societal, cultural, and economic impacts that emerging and future technologies may generate.

9-10.ET.E Create new or original work by applying emerging technologies.

Grades 11-12 Standards

Computing Systems

Devices

11-12.CS.01 Compare the characteristics and uses of traditional and emerging computing devices and systems.

Hardware and Software

11-12.CS.02 Categorize the roles of operating system software.

Troubleshooting

11-12.CS.03 Illustrate ways computing systems implement logic, input, and output through hardware components.

Networks and the Internet

Network Communication and Organization

11-12.NI.04 Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology).

Cybersecurity

11-12.NI.05 Compare ways software developers protect devices and information from unauthorized access.

Data and Analysis

Collection, Visualization, and, Transformation

11-12.DA.06 Use data analysis tools and techniques to identify patterns in data representing complex systems.

11-12.DA.07 Select data collection tools and techniques to generate data sets that support a claim or communicate information.

11-12.DA.08 Analyze the ways in which automated data collection is utilized in society.

Interference and Models

11-12.DA.09 Evaluate the ability of models and simulations to test and support the refinement of hypotheses.

Algorithms and Programming

Algorithms

11-12.AP.10 Describe how artificial intelligence drives many software and physical systems.

11-12.AP.11 Implement an artificial intelligence algorithm to play a game against a human opponent or solve a problem.

11-12.AP.12 Use and adapt classic algorithms to solve computational problems.

11-12.AP.13 Evaluate algorithms in terms of their efficiency, correctness, and clarity.

Variables

11-12.AP.14 Compare and contrast fundamental data structures and their uses.

Control

11-12.AP.15 Illustrate the flow of execution of a recursive algorithm.

Modularity

11-12.AP.16 Construct solutions to problems using student-created components, such as procedures, modules, or objects.

11-12.AP.17 Analyze a large-scale computational problem and identify generalizable patterns that can be applied to a solution.

11-12.AP.18 Demonstrate code reuse by creating programming solutions using libraries and application programming interfaces.

Program Development

11-12.AP.19 Plan and develop programs for broad audiences using a software life cycle process.

11-12.AP.20 Demonstrate conversion of source code into machine code using compilers or interpreters.

11-12.AP.21 Explain security issues that might lead to compromised computer programs.

11-12.AP.22 Develop programs for multiple computing platforms.

11-12.AP.23 Use version control systems, integrated development environments, and collaborative tools and practices (code documentation) in a group software project.

11-12.AP.24 Develop and use a series of test cases to verify that a program performs according to its design specifications.

11-12.AP.25 Discuss social, economic, and ethical consequences of malfunctioning software and software updates.

11-12.AP.26 Modify an existing program to add additional functionality and discuss intended and unintended implications (e.g., breaking other functionality).

11-12.AP.27 Evaluate key qualities of a program through a process such as a code review.

11-12.AP.28 Compare multiple programming languages and discuss how their features make them suitable for solving different types of problems.

Impacts of Computing

Culture

11-12.IC.29 Evaluate computational artifacts to maximize their beneficial effects and minimize harmful effects on society.

11-12.IC.30 Evaluate the impact of equity, access, and influence on the distribution of computing resources in a global society.

11-12.IC.31 Predict how computational innovations that have revolutionized aspects of our culture might evolve.

Safety Law and Ethics

11-12.IC.32 Debate laws and regulations that impact the development and use of software.

Emerging and Future Technologies

11-12.ET.A Explain that the field of emerging technologies will be evolving and rapidly growing.

11-12.ET.B Compare existing and emerging technologies, ideas, and concepts.

11-12.ET.C Describe how emerging technologies are influencing current events at a local and global scale.

11-12.ET.D Predict the positive and negative societal, cultural, and economic impacts that emerging and future technologies may generate.

11-12.ET.E Create new or original work by applying emerging technologies.