

Eighth Grade: Computer Science

In Eighth Grade, students show mastery of understanding of the role of computing systems and data transmission over the Internet. Students contrast physical and digital safeguards implemented to protect electronic information from potential threats. Moreover, students assess the social and ethical implications of computing technologies from the perspective of both the creator and the consumer of computing technologies. The design and development of computing technologies are evaluated to account for the needs and wants of end users. Students continue to build upon previous knowledge and skills and create programs that contain multiple control structures. Their computational thinking skills are honed through the development of programs utilizing diverse data types, the development of computational models, and the use of pattern recognition and abstraction to make recommendations and predictions. As computer science skills and concepts can be applied to various careers, students will build upon their awareness of their skillsets and create education and training plans that foster continued pursuits of expanding their computer skills and knowledge to foster aspirations for post-secondary opportunities within computer science.

Algorithms and Programming (AP)

8.AP.1 The student will apply computational thinking to construct programs to accomplish a task as a means of creative expression or scientific exploration.

- a. Identify patterns and repeated steps in an algorithm, problem, or process.
- b. Decompose an algorithm, problem, or process into sub-components.
- c. Abstract relevant information to identify essential details.
- d. Use pseudocode, decision trees, or flowcharts to illustrate complex problems as algorithms.

8.AP.2 The student will plan and implement algorithms that include sequencing, loops, variables, user input, conditional control structures, functions, and various data types.

- a. Describe the concept of input and output of various data types for use in a computer program.
- b. Plan an algorithm using plain language, pseudocode, or diagrams.
- c. Write and test algorithms expressed using block-based or text-based programming languages.

8.AP.3 The student will use the iterative design process to create, test, and debug programs using a block-based or text-based programming language.

- a. Create and test programs that contain multiple control structures.
- b. Trace and predict outcomes of programs.
- c. Analyze the outcomes of programs to identify logic and syntax errors.
- d. Analyze and describe the results of a program to assess validity of outcomes.
- e. Revise and improve an algorithm to resolve errors or produce desired outcomes.

- 8.AP.4 The student will incorporate work from others into programs and projects.**
- a. Explain the role of Creative Commons licensing for the use and modification or “remixing” of information.
 - b. Utilize Creative Commons assets in a programming project.
 - c. Use and remix code from other projects within a programming project and provide proper attribution.

Computing Systems (CSY)

- 8.CSY.1 The student will recommend and design improvements to computing devices based on the needs of various users.**
- a. Analyze existing computing devices for advantages and limitations.
 - b. Recommend and design improvements to computing devices based on user interactions.
- 8.CSY.2 The student will apply computational thinking to troubleshoot and document hardware and software-related problems.**
- a. Apply systematic processes to resolve hardware, software, and connectivity-related problems.
 - b. Design an end-user document/guide to resolve hardware, software, and connectivity-related problems.

Cybersecurity (CYB)

- 8.CYB.1 The student will investigate and describe ways to protect sensitive data from malware and other attacks.**
- a. Identify impacts of hacking, ransomware, scams, phishing, fake vulnerability scans and the ethical and legal concerns.
 - b. Describe how cyber-attacks can affect a computing system.
 - c. Compare and contrast safe and unsafe computing practices.
 - d. Explore how industries and emerging technologies are addressing cyber solutions.
 - e. Model common prevention practices for cyber-attacks.
- 8.CYB.2 The student will investigate and explain how physical and digital security measures can protect electronic information for businesses, governments, and organizations.**
- a. Investigate and explain how physical and digital security measures are used to safeguard electronic information.
 - b. Research the advantages and limitations of different security measures in protecting users against security threats.

- c. Explore how emerging technologies may affect methods to safeguard personal and public data.

Data and Analysis (DA)

8.DA.1 The student will create computational models to simulate events or represent phenomena.

- a. Compare and contrast the use of computational models and simulations to analyze patterns and replicate phenomena.
- b. Design and create complex computational models that simulate dynamic systems (abstraction), incorporating multiple variables and interactions.
- c. Refine computational models based on generated outcomes.

8.DA.2 The student will evaluate computational models to analyze patterns and make recommendations or predictions.

- a. Define data biases within a dataset and the unintended consequences that may impact data reliability and final analysis.
- b. Analyze patterns and interpret data generated by computational models and simulations, identifying meaningful patterns and relationships.
- c. Utilize data visualization techniques to communicate and present findings derived from computational models and simulations.

Impacts of Computing (IC)

8.IC.1 The student will assess the social impacts and ethical considerations of computing technologies.

- a. Analyze the impact of sharing data through computing technologies.
- b. Critique the role the Internet plays in social life, the global economy, and culture.
- c. Evaluate online and print sources for credibility and reliability.
- d. Research and discuss factors that impact access and availability to computing technologies.
- e. Discuss ethical issues around cybersecurity and networks: censorship, privacy, safety, and access.

8.IC.2 The student will analyze and evaluate the ramifications of screen time in one's life.

- a. Analyze scenarios or case studies to assess the impact of screen time on one's physical and mental health.
- b. Justify the argument that excessive screen time and video games can have significant consequences for the physical, emotional, and cognitive development of children and adolescents.

8.IC.3 The student will identify opportunities for education, training, and preparation to enter into a chosen computer science career field.

- a. Identify an education and training plan for a chosen computer science career.
- b. Outline the use of computer science skills required in a chosen career.
- c. Develop short-and long-term goals for a chosen career.
- d. Research emerging trends in a chosen career path.

Networks and the Internet (NI)

8.NI.1 The student will model and describe the role of computing devices in transmitting data in and on computing networks and the Internet.

- a. Identify the roles of computing devices: routers, switches, servers, and clients communicating over a network.
- b. Design a network topology of computing devices.
- c. Demonstrate how data is transmitted over networks and the Internet.
- d. Analyze factors that strengthen or weaken network connectivity.