



Computer Science 8

Curriculum

Board Approved: 05/21/2026

Course Information

Middle School Semester-Elective

Course Description:

This course builds on prior computer science learning by engaging students in advanced problem solving, system design, and creative computing projects. Students examine how computing technologies influence communication, media, and decision making in modern society while evaluating issues such as misinformation, privacy, and cybersecurity. Through hands-on experiences, students design computational models, develop programs, and integrate hardware and software to create interactive systems. Students also explore creative computing by producing original digital media while applying ethical practices such as proper attribution and responsible technology use. Throughout the course, students plan, test, and refine solutions using collaborative feedback, project management strategies, and iterative design.

Transfer Goals:

- Evaluate how computing technologies—including artificial intelligence, cybersecurity systems, and digital networks—affect communication, decision-making, and society while applying responsible and ethical technology practices.
- Design and refine digital artifacts and computing solutions by applying computational thinking, analyzing user needs, and using collaborative feedback to improve the effectiveness of digital products.
- Develop, test, and debug programs that use algorithms, variables, loops, and conditionals to solve complex problems and control computing systems.
- Engineer solutions that integrate hardware and software by designing, testing, and improving systems that interact with the physical world.
- Create and share original digital media while managing project timelines, collaborating with others, and following ethical standards such as proper attribution and responsible use of digital content.

Vertical Articulation:

priority standards indicated in **bold*

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Computer Science 6:

Provides foundational exposure to computer science concepts including cybersecurity, digital design, and introductory programming. Students develop basic computational thinking skills while working in structured and scaffolded learning environments.

Computer Science 7:

Builds on these foundational skills by having students evaluate digital technologies, design solutions with defined constraints, and develop algorithms to solve problems. Students collaborate to create digital artifacts, apply programming concepts, and refine their solutions through testing and feedback.

Computer Science 8:

Extends these concepts by having students analyze and engineer more complex computing systems. Students integrate hardware and software, apply advanced programming structures, evaluate cybersecurity risks, and develop solutions to real-world problems through iterative testing, debugging, and collaboration.

Curriculum Standards: [Missouri K-12 Computer Science Standards](#)

Proficiency Scales: [Computer Science 8 Proficiency Scales](#)

Curriculum Resource(s): NA

priority standards indicated in **bold*

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Unit 1: Digital Citizenship & Media Literacy

Timeframe: 2 weeks

Unit Description: In this unit, students examine the technical and social functions of digital systems, focusing on how algorithms and data influence the delivery of information. Students learn to apply objective criteria to evaluate the reliability and origin of digital content, including media generated by artificial intelligence. The unit explores the underlying mechanics of recommendation engines and their impact on information access. Students will practice collecting and transforming raw data into visualizations to identify patterns. By the end of the unit, students will produce digital artifacts that demonstrate an understanding of algorithmic functions, data privacy, and the technical strategies used to verify digital information.

Enduring Understandings:

- Computing systems use algorithms to filter and prioritize information based on data patterns, which influences what users encounter in digital environments.
- Digital content, including that generated by AI, varies in reliability and origin; technical strategies are required to verify the authenticity of media.
- Online communication requires balancing the benefits of sharing information publicly with the need to protect personal privacy and security.
- Transforming data into visual formats provides a method for analyzing trends and communicating objective information.
- Understanding the methods used in digital communication, such as automated social engineering, is essential for maintaining data privacy.

Essential Questions:

- How do algorithmic functions and data patterns work together to organize information and shape the user experience within digital systems?
- What objective criteria and technical strategies are most effective for verifying the authenticity and origin of digital media in an era of AI-generated content?
- How can users evaluate the trade-offs between public information sharing and the technical requirements of personal data protection?
- How does the transformation of raw data into visual models improve our ability to identify trends and communicate information objectively?
- How do automated systems like social engineering impact data privacy, and what technical protocols are necessary to secure information against these methods?

Unit 1 Standards	
STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
6-8.IC.C.01	• I can explain how digital systems and algorithms prioritize information based on data patterns to shape a user's experience resulting in both positive and negative impacts on society.

priority standards indicated in **bold*

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<u>6-8.IC.C.02</u>	• I can use objective criteria to evaluate the reliability of digital media and distinguish between human-generated and AI-automated content.
6-8.IC.SLE.01	• I can evaluate the trade-offs between the benefits of public information sharing and the technical requirements for personal data protection.
6-8.DA.CVT.01	• I can collect raw data and transform it into visual models (such as charts or infographics) to identify and communicate trends objectively.
6-8.NI.C.01	• I can recognize common risks in digital communication such as cyberbullying, scams, or phishing. • I can describe strategies that help protect people and information online.

priority standards indicated in **bold*

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Unit 2: Computational 3D Design

Timeframe: 4 weeks

Unit Description: In this unit, students use advanced 3D modeling tools to design digital solutions to real-world design challenges. Students apply spatial reasoning and design thinking to plan, build, and refine three-dimensional models that meet defined design goals and constraints. Throughout the design process, students evaluate how digital tools support user interaction and functionality while improving the usability and effectiveness of their models. Students manage multi-step design projects, use collaborative feedback to revise their work, and develop digital prototypes that demonstrate problem-solving through computational design.

Enduring Understandings:

- Digital modeling tools allow designers to create, evaluate, and refine three-dimensional representations of ideas and solutions.
- Effective 3D design requires spatial reasoning, planning, and attention to how a model will function and be used.
- Designing digital prototypes involves working within design goals and constraints while refining solutions through testing and revision.
- Feedback and evaluation are important parts of the design process and help improve the usability and effectiveness of digital models.
- Managing complex tasks, timelines, and responsibilities helps ensure that multi-step design projects are completed successfully.

Essential Questions:

- How do digital design tools support the creation and improvement of three-dimensional models?
- How does spatial reasoning help designers create functional and effective 3D models?
- How do design goals and constraints influence the decisions designers make during the modeling process?
- How can feedback and evaluation improve the effectiveness of a digital design?
- How does managing tasks and timelines help teams successfully complete complex design projects?

Unit 2 Standards	
STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
<u>6-8.CS.D.01</u>	• I can evaluate how digital design tools support the creation and modification of three-dimensional models. • I can explain how design features and user interaction affect the usability and effectiveness of a digital model.
6-8.AP.PD.02	• I can use feedback from others to revise and improve a digital design. • I can evaluate my design and make changes to better meet project goals.

priority standards indicated in **bold*

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6-8.AP.PD.05

- I can manage tasks, timelines, and responsibilities when completing a multi-step design project.

priority standards indicated in **bold*

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Unit 3: Cybersecurity and Encryption

Timeframe: 2 weeks

Unit Description: In this unit, students investigate how cybersecurity threats such as phishing, social engineering, and data interception exploit vulnerabilities in digital systems and human behavior. Students analyze how cryptographic methods and algorithms can be used to protect information and secure digital communication. Through hands-on activities, students design and test simple encryption methods while examining the tradeoffs between global connectivity, security, and personal privacy. Students evaluate strategies that individuals and organizations use to defend systems and protect sensitive data in an increasingly interconnected world.

Enduring Understandings:

- Cybersecurity threats often exploit both technological vulnerabilities and human behavior to gain unauthorized access to information.
- Cryptographic methods and algorithms can be used to protect information and secure communication across digital networks.
- Protecting digital information requires understanding how data can be encoded, transmitted, and decoded securely.
- Cybersecurity practices require balancing the benefits of connectivity with the need to protect privacy, systems, and sensitive data.
- Understanding cybersecurity principles helps individuals make responsible decisions when using and protecting digital technologies.

Essential Questions:

- How do cybersecurity threats such as phishing and social engineering exploit weaknesses in digital systems and human behavior?
- How can encryption and cryptographic methods be used to protect information during digital communication?
- How do algorithms help encode and decode information to keep data secure?
- What strategies can individuals and organizations use to protect digital systems and sensitive information?
- What tradeoffs exist between global connectivity, security, and personal privacy in modern digital systems?

Unit 3 Standards

STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
<u>6-8.NI.C.02</u>	• I can explain how cryptographic methods such as encoding and encryption protect digital information. • I can describe how data can be secured when it is transmitted across digital networks.
6-8.AP.A.01	• I can analyze simple algorithms used in encryption or encoding systems. • I can explain how algorithms can be used to secure or compromise digital information.

priority standards indicated in **bold*

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Unit 4: Physical Computing & Robotics

Timeframe: 4 weeks

Unit Description: In this unit, students design and program systems that integrate hardware and software to solve real-world challenges while exploring the foundations of Artificial Intelligence and Data Science. Students apply computational thinking to program robots that interact with their environment using sensors and actuators. Beyond basic programming, students will collect, visualize, and analyze sensor data to identify trends and create predictive models that allow machines to respond dynamically to changing conditions. Students will also investigate how AI systems "learn" from data, evaluating the impact of data quality and bias on automated decision-making. Throughout the engineering design process, students test, debug, and refine their systems, collaborating to improve the reliability and intelligence of their solutions

Enduring Understandings:

- Computing systems combine hardware and software to collect data, perform tasks, and interact with the physical world.
- AI systems rely on large datasets to create models that make predictions or decisions without being explicitly programmed for every scenario.
- Visualizing and transforming data into charts or graphs helps humans and machines identify patterns that are not obvious in raw numbers.
- Control structures such as loops and conditionals allow machines to process input and respond dynamically to changing conditions.
- The reliability of an AI or robotic system depends on the quality and variety of the data used to train or inform it.
- The engineering design process requires iterative and collaborative testing and debugging to refine systems and improve performance.

Essential Questions:

- How do AI models use data to "learn" and make decisions differently than traditional programs?
- How can we transform raw sensor data into visualizations to identify trends or errors in a system?
- How can hardware and software be combined to create systems that interact with the physical world?
- How do loops and conditionals allow robots or devices to respond to inputs and environmental changes?
- What happens to an automated system if the data it collects is biased or incomplete?
- How does collaboration improve the design and development of complex computing systems?

Unit 4 Standards

STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
<u>6-8.CS.HS.01</u>	• I can design systems that combine hardware and software to collect data or complete tasks.

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6-8.DA.CVT.01	• I can collect data using sensors and transform it into visualizations (like graphs) to identify trends in my robot's environment.
6-8.DA.IM.01	• I can use data I have collected to create a model or simulation that predicts how a system will behave.
6-8.AP.C.01	• I can use loops and conditionals to program devices to respond to inputs or environmental changes.
6-8.AP.PD.04	• I can test and debug programs that control physical systems to identify and fix errors.
6-8.IC.SI.01	• I can collaborate with others during the design process to share ideas and refine solutions.

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Unit 5: Programming Systems

Timeframe: 4 weeks

Unit Description: In this unit, students deepen their programming skills by designing and testing programs that solve complex problems. Students apply computational thinking to develop algorithms, use variables, and implement control structures such as loops and conditionals to create efficient and interactive programs. Through iterative testing and debugging, students analyze how programs behave and refine their solutions to improve reliability and performance. Students also practice decomposing complex problems into manageable steps while collaborating with others to develop and improve their programs.

Enduring Understandings:

- Programs use algorithms to organize instructions that allow computers to perform tasks and solve problems.
- Control structures such as loops and conditionals allow programs to make decisions and respond to changing inputs.
- Variables allow programs to store, update, and manipulate information during program execution.
- Debugging and testing are essential parts of the programming process and help improve the reliability of a program.
- Breaking complex problems into smaller steps helps programmers design, build, and refine effective solutions.

Essential Questions:

- How do algorithms help organize the steps needed to solve complex problems with code?
- How do loops and conditionals allow programs to respond to different inputs or situations?
- How do variables help programs store and manipulate information during execution?
- How does testing and debugging help programmers improve how a program works?
- How does breaking a large problem into smaller steps help programmers design better solutions?

Unit 5 Standards	
STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
<u>6-8.AP.A.01</u>	• I can design algorithms that organize the steps needed to solve a problem.
6-8.AP.C.01	• I can use loops and conditionals so a program can respond to different inputs or conditions.
6-8.AP.V.01	• I can create variables to store information in a program. • I can use variables to update or manipulate information while a program runs.
6-8.AP.PD.04	• I can test programs to determine whether they work correctly. • I can debug programs to identify and fix errors.

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Unit 6: Creative Computing

Timeframe: 6 weeks

Unit Description: In this unit, students design and produce original digital media projects such as stop-motion animations, sound designs, and visual graphics. Students explore how creative computing tools allow people to communicate ideas, tell stories, and influence audiences through digital media. Throughout the design process, students apply ethical practices by providing proper attribution for media they incorporate into their work. Students use collaborative feedback, user input, and project management strategies to plan, create, and refine digital artifacts that effectively communicate ideas to an intended audience.

Enduring Understandings:

- Digital media tools allow creators to communicate ideas, stories, and information through creative computing technologies.
- Producing digital media requires planning, iteration, and revision to improve the effectiveness of a final product.
- Responsible creators follow ethical guidelines by providing proper attribution when using media created by others.
- Collaboration and feedback help improve digital artifacts and ensure they meet the needs of an intended audience.
- Managing tasks and timelines helps creators successfully complete complex digital media projects.

Essential Questions:

- How do creative computing tools allow people to communicate ideas and stories through digital media?
- What ethical responsibilities do creators have when using images, audio, or other media created by others?
- How can feedback from others help improve the quality and effectiveness of a digital media project?
- How can collaboration and user input help creators design media that better meets audience needs?
- How does managing tasks and timelines help creators successfully complete complex media projects?

Unit 6 Standards

STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
6-8.AP.PD.02	• I can use feedback from peers and users to revise and improve a digital media project.
6-8.AP.PD.03	• I can give proper credit when using images, audio, code, or other media that I did not create.
6-8.IC.C.01	• I can explain how digital media technologies influence how people communicate ideas and information.

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