



Curriculum & Instruction

SUMMIT PUBLIC SCHOOLS

Content Area: STEAM

Course: STEAM

Grade(s): Grade 4

Course Overview

This STEAM course empowers students to think critically, collaborate effectively, and apply scientific and engineering concepts through engaging, hands-on learning. In the first unit, students build a growth mindset and practice teamwork through collaborative challenges that emphasize persistence and problem solving. They explore computer science using SAM labs, where they design interactive systems like smart lights and traffic signals while learning inputs, outputs, behaviors and coding. The second unit focuses on sound, light, and heat energy, as students investigate how energy travels and interacts with different materials through experimentation and exploration. In the third unit, students explore Earth's surface processes such as weathering, erosion, and deposition, using models and simulations to understand natural forces and design solutions to prevent erosion. The course concludes with an engineering design challenge inspired by Caine's Arcade, where students apply the design process to create original, functional arcade games. Throughout the course, students engage in inquiry based learning, apply real world problem solving, and grow as innovative and collaborative thinkers.

New Jersey State Learning Standards

Summit Public Schools curriculum aligns with the [New Jersey Student Learning Standards](#).

Content Area Standards:

3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.

4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

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- 4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- 4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features
- 4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
- 4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes and climate change have on humans.

Interdisciplinary Standards:

MP.5 Use appropriate tools strategically. (4-ESS2-1)

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS1-2)

Career Readiness, Life Literacies and Key Skills Standards:

9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, [3.MD.B.3](#), 7.1.NM.IPERS.6).

9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).

9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

9.4.5.CT.4: Apply critical thinking and problem- solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).

Computer Science and Design Thinking Standards:

8.1.5.CS.2: Model how computer software and hardware work together as a system to accomplish tasks.

8.1.5.AP.2: Create programs that use clearly named variables to store and modify data.

8.1.5.AP.3: Create programs that include sequences, events, loops, and conditionals.

8.1.5.AP.6: Develop programs using an iterative process, implement the program design, and test the program to ensure it works as intended.

8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes.

8.1.5.IC.2: Identify possible ways to improve the accessibility and usability of computing technologies to address the diverse needs and wants of users.

8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.

8.2.12.NT.2: Redesign an existing product to improve form or function.

8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.

8.2.12.ED.2: Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback.

8.2.12.ED.3: Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.

Career Ready Practices

CRP 1. Act as a responsible and contributing citizen and employee.

CRP 2. Apply appropriate academic and technical skills.

CRP 3. Attend to personal health and financial well-being.

CRP 4. Communicate clearly and effectively and with reason.

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- CRP 5. Consider the environmental, social and economic impacts of decisions.
- CRP 6. Demonstrate creativity and innovation.
- CRP 7. Employ valid and reliable research strategies.
- CRP 8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP 9. Model integrity, ethical leadership and effective management.
- CRP 10. Plan education and career paths aligned to personal goals.
- CRP 11. Use technology to enhance productivity.
- CRP 12. Work productively in teams while using cultural global competence.

New Jersey Curriculum Mandates:

This curriculum integrates lessons that address the following interdisciplinary New Jersey Curriculum Mandates:

- [Diversity and Inclusion](#) (Grades K - 12)
- [Climate Change Education](#) (Grades K - 12)

Learning Objectives

- Students will be able to explain the concept of a growth mindset and describe how it supports collaboration and problem-solving during STEAM challenges.
- Students will be able to apply knowledge of inputs, outputs, and behaviors to create and analyze a functional system using SAM Labs tools.
- Students will be able to design, test, and evaluate a solution to a real-world problem by following the steps of the engineering design process.
- Students will describe how sound, light, and heat travel and interact with different materials, using scientific vocabulary such as reflection, refraction, pitch, and conduction.
- Students will construct models and conduct investigations (e.g., string telephones, light stations, soundproof boxes) to explore how energy behaves in various forms and conditions.
- Students will compare and evaluate the effectiveness of different materials in transmitting or blocking sound, reflecting or refracting light, and transferring heat, using data collected from hands-on experiments.
- Students will be able to analyze visual and video evidence to determine how weathering, erosion, and deposition change Earth's surface over time.
- Students will be able to design and construct a model that demonstrates a solution to minimize erosion using the engineering design process.
- Students will be able to evaluate the effectiveness of erosion-prevention strategies by testing designs, collecting data, and presenting findings.
- Students will be able to analyze how Caine used each step of the engineering design process to create his arcade and compare it to the students' own design experience.
- Students will be able to design and construct a functional arcade game prototype that incorporates group ideas, feedback, and iterative improvements.
- Students will be able to evaluate and justify improvements made to their arcade game based on teacher and peer feedback during the testing phase.

Units of Study

Unit 1: Introduction to Engineering Design Process and Coding/ Robotics (10 days)

- How does having a growth mindset help us learn from challenges and work better with others?
- In what ways do inputs, outputs, and behaviors work together to create smart systems in the

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- real world?
- How can we use the engineering design process to solve problems and improve our solutions over time?

Unit 2: Sound and Energy (15 days)

- How do sound, light, and heat travel, and what happens when they interact with different materials?
- In what ways can we observe and measure energy in the world around us?
- How can we use our understanding of energy to design, test, and improve real-world solutions (like soundproofing or communication tools)?

Unit 3: Earth Systems (15 days)

- How do natural forces like wind, water, and ice shape and change Earth's surface over time?
- What evidence can we use to understand how landforms are created and transformed?
- How can we design solutions to reduce the impact of erosion and protect our environment?

Unit 4: Collaboration through Engineering: Caine's Arcade (10- 15 days)

- How does the engineering design process help us solve real world problems creatively and effectively?
- What makes a game fun, fair, and engaging for players and how can we design one that meets those goals?
- Why is testing and improving an important part of the design process and how does feedback help us make better designs?

Instructional Resources and Materials

Instructional resources are the information sources teachers utilize to guide their teaching and assessing. Instructional materials are the texts students read or review. The instructional resources and materials may vary in order to meet the learning needs of students.

- **Technology:** SAM Labs, Chromebooks, 3D printer
- **Online Tools:** Mystery Science, Generation Genius
- **Building Materials:** Masking and duct tape, cups, craft sticks, pipe cleaners, paper plates, cardboard, cardboard tubes, string, cotton balls, make do tools
- **Experiment materials:** aluminum foil, mirrors, food coloring, skittles, soil, sand

Assessment Strategies

Assessment measures a student's mastery of a course standard and learning objective. Assessment can be used for both instructional purposes and for evaluative purposes. Teachers may choose one or more of the following ideas to assess learners. They may also modify these ideas to make the assessment more responsive to students' interests and needs.

Formative:

- Observation of teamwork and communication during group activities
- Science journals: entries including annotated diagrams, observations, and questions
- Peer feedback and self assessment on group collaboration

Summative:

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- Engineering Challenge Products in all units

Benchmark:

- Rubric based self reflection of the engineering design process in each unit challenge

Suggested Strategies for Modification & Differentiation

[Modifications Chart](#)