



Curriculum & Instruction

SUMMIT PUBLIC SCHOOLS

Content Area: STEAM

Course: STEAM

Grade(s): Grade 3

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 develop a growth mindset and explore computer science by using Micro:bit and block based coding to create interactive projects that integrate concepts like inputs, outputs, loops, and variables. The second unit focuses on forces and motion, where students investigate real world phenomena such as rollercoasters and pendulums to understand Newton's Laws and the relationship between energy and motion. Students use this knowledge to design and test a marble run, applying scientific vocabulary, data analysis, and experimentation. In the third unit, students explore weather and climate through data collection, modeling and coding activities, developing their understanding of the water cycle, atmospheric patterns, and the difference between weather and climate. The unit concludes with an engineering challenge to build a storm resistant structure. Finally, students use the engineering design process during a collaborative paper rollercoaster project, applying their understanding of forces, structure, and teamwork. Throughout the course, students engage in inquiry based learning, making evidence based decisions, and grow as collaborative problem solvers.

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.

3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

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3-PS2-3 Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season
3-ESS2-2 Obtain and combine information to describe climates in different regions of the world.
3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of climate change and/or a weather-related hazard.

Interdisciplinary Standards:

SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. (3-PS2-3)
MP.5 Use appropriate tools strategically. (1-PS4-4)
W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-PS2-1), (3-PS2-2)
3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in bar graphs. (3-ESS2-1)

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.
8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process.
8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and tradeoffs identified in the design process.

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.
- 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 difference between a fixed and growth mindset and describe how a growth mindset can enhance collaboration during group challenges.
- Students will apply coding concepts such as sequences, loops, inputs/outputs, and variables to create interactive Micro:bit projects.
- Students will evaluate the effectiveness of their design solutions during the zipline challenge by testing, identifying improvements, and presenting their final product using the steps of the engineering design process.
- Students will be able to analyze and explain how different forces affect the motion of objects through observation, experimentation, and discussion.
- Students will be able to design, build, and test a solution to a challenge by applying the steps of the engineering design process.
- Students will be able to develop and revise diagrams and scientific explanations to accurately represent the roles of potential and kinetic energy and Newton's Laws in real-world systems.
- Students will describe the components and processes of weather systems, including the water cycle, cloud formation, and climate zones using models, diagrams, and vocabulary.
- Students will collect and analyze weather data over time to identify patterns and make predictions about weather conditions and their potential impacts on people and the environment.
- Students will design, test, and revise a weather-resistant structure by applying the steps of the engineering design process and justify design decisions based on their knowledge of extreme weather phenomena.
- Students will be able to explain the engineering design by identifying the goal, required components, and key principles of motion and forces that influence rollercoaster performance.
- Students will apply the engineering design process by planning, constructing, and refining a paper rollercoaster using their annotated diagram and team based strategies.
- Students will evaluate their rollercoaster's performance and teamwork by testing their

design, analyzing test results, and reflecting on how collaboration and iteration contributed to their final outcome.

Units of Study

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

- How does having a growth mindset help us work better with others and overcome challenges?
- How do computers follow instructions and how can we use coding to solve real- world problems?
- What steps do engineers take to design and improve solutions and why is collaboration important in that process?

Unit 2: Motion and Stability (15 days)

- How do different forces affect the way that objects move?
- What can we learn about motion and energy by observing and experimenting with real-world systems?
- How can we use the engineering design process to solve problems and create systems that control or use motion effectively?

Unit 3: Earth Systems: Weather (15 days)

- How does weather affect people, places, and the environment around us?
- What patterns can we observe in weather and climate and how can we use them to make predictions?
- How can we use science, data, and engineering to create ways to stay safe during extreme weather events?

Unit 4: Collaboration through Engineering: Paper Rollercoasters (10 - 15 days)

- How can we use the engineering design process to turn our ideas into a working rollercoaster?
- What role do forces and motion play in how a rollercoaster moves and functions?
- How does effective collaboration help a team solve problems and improve their design?

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:** Micro:bits, Chromebooks
- **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
- **Experiment materials:** Ping pong balls, Newton's Cradle, magnets, paperclips, sandpaper, mason jars, hairspray, food coloring

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:

- 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](#)