



Curriculum & Instruction

SUMMIT PUBLIC SCHOOLS

Content Area: STEAM

Course: STEAM

Grade(s): Grade 2

Course Overview

This STEAM course invites students to think like engineers, scientists, and coders through a series of hands on, inquiry based learning experiences. In the first unit, students build a foundation in computer science by programming Ozobots with line-based coding, while learning key concepts such as sequences, loops, and debugging. They develop a growth mindset and strengthen their collaboration and problem solving skills, culminating in an engineering design challenge that applies the full design process. The second unit dives into the properties and behaviors of matter, where students observe physical changes, create labeled scientific models, and use evidence to explain states of matter through experiments and peer discussion. In the third unit, students investigate plant growth through data collection, experimentation, and modeling, using scientific reasoning to understand what plants need to thrive. They apply their learning in a real world context by designing and building mini greenhouses using the engineering design process. The final unit challenges students to combine engineering, geometry, and simple machines using Strawbees, where they build 3D structures and work in teams to create a city navigated by coded Ozobots. Throughout the course, students apply critical thinking, creativity, and collaboration to explore STEAM concepts and solve real world problems.

New Jersey State Learning Standards

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

Content Area Standards:

K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

2-PS1-3 Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

2-PS1-4 Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

2-LS2-1 Plan and conduct an investigation to determine if plants need sunlight and water to grow.

2-LS2-2 Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats.

Interdisciplinary Standards:

MP.5 Use appropriate tools strategically. (1-PS4-4)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1), (K-2-ETS1-3)

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

Career Readiness, Life Literacies and Key Skills Standards:

9.4.2.CI.1: Demonstrate openness to new ideas and perspectives

9.4.2.CI.2: Demonstrate originality and inventiveness in work

9.4.2.CT.1: Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem

9.4.2.CT.2: Identify possible approaches and resources to execute a plan

9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive).

9.4.2.TL.3: Enter information into a spreadsheet and sort the information.

9.4.2.TL.7: Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts.

9.4.2.IML.2: Represent data in a visual format to tell a story about the data

9.4.2.IML.3: Use a variety of sources including multimedia sources to find information about topics such as climate change, with guidance and support from adults

Computer Science and Design Thinking Standards:

8.1.2.AP.4: Break down a task into a sequence of steps.

8.1.2.AP.1: Model daily processes by creating and following algorithms to complete tasks.

8.1.2.AP.3: Create programs with sequences and simple loops to accomplish tasks

8.1.2.AP.5: Describe a program's sequence of events, goals, and expected outcomes.

8.1.2.AP.6: Debug errors in an algorithm or program that includes sequences and simple loops.

8.2.2.ITH.1: Identify products that are designed to meet human wants or needs.

8.2.2.ED.2: Collaborate to solve a simple problem, or to illustrate how to build a product using the design process.

8.2.2.ED.3: Select and use appropriate tools and materials to build a product using the design process.

8.2.2.ED.4: Identify constraints and their role in the engineering design process.

8.2.2.NT.2: Brainstorm how to build a product, improve a designed product, fix a product that has

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stopped working, or solve a simple problem.

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 explain the concept of a growth mindset and identify qualities of effective collaboration by using examples from stories, videos, and class discussions.
- Students will create and modify block-based programs using Ozobot Blockly to demonstrate sequences, loops, and debugging concepts.
- Students will analyze problems and evaluate their group's solutions by applying the engineering design process to design, test, and improve their projects collaboratively.
- Students will evaluate and articulate observations and wonderings about properties of solids, liquids, and gases through written and visual explanations in journals, using descriptive language and evidence to support scientific reasoning.
- Students will engage in scientific discourse by explaining models and investigations, asking clarifying questions, and collaboratively refining ideas with peers to deepen understanding of states of matter, demonstrating communication and critical thinking skills.
- Students will design an insulated structure to prevent an ice cube from melting, test its effectiveness through repeated trials, and defend their design choices using data and evidence collected during the investigation.
- Students will analyze patterns in plant growth by collecting, measuring, and interpreting data from multiple investigations to determine how different variables affect plant development.
- Students will construct and revise scientific models, including labeled diagrams and bar graphs, to explain and communicate their understanding of plant needs, seed dispersal, and water transport systems.
- Students will apply and evaluate the Engineering Design Process by designing, building, testing, and improving a greenhouse that meets specific criteria and supports healthy plant growth, using evidence and peer feedback to guide redesigns.
- Students will be able to describe the function of Strawbees components and explain how they can be used to build various structures and simple machines.

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- Students will be able to construct 3D shapes, mechanical arms, and buildings using Strawbees by following the engineering design process.
- Students will be able to analyze and revise their designs based on testing, peer feedback, and performance criteria to improve functionality and stability.

Units of Study

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

- How can having a growth mindset help us overcome challenges and collaborate better with others?
- What steps do programmers take to create, test, and improve a sequence of instructions for a robot?
- How does following the engineering design process help us solve real-world problems effectively?

Unit 2: Structure and Properties of Matter (15 days)

- How can we use models to explain and understand scientific phenomena that we cannot directly touch or see?
- How can we design fair tests and use data to find out which materials are strongest or change the fastest?
- Why is it important to ask questions, share ideas, and work with others when scientists study the natural world?

Unit 3: Ecosystems: Plants (15 days)

- How can we use what we learn from nature to solve problems and design solutions to help plants grow?
- What do plants need to survive and grow, and how can we use observations and data to figure that out?
- How do the structures and parts of a plant help it live, grow, and reproduce in different environments?

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

- How can we use simple materials like straws and connectors to design and build structures that solve real world problems?
- What steps do engineers take to turn their ideas into functional creations and why is it important to test and improve our designs?
- How do shapes, machines, and coding work together to help us build and navigate a working city?

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:** Ozobots, Chromebooks
- **Online Tools:** Mystery Science, Generation Genius

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- **Building Materials:** Masking and duct tape, cups, craft sticks, pipe cleaners, paper plates, cardboard, cardboard tubes, string, cotton balls, Strawbees
- **Experiment materials:** Magnifying glasses, washers, various liquids, cornstarch, baking soda, salt, sugar, sand vinegar, lima bean seeds, plants, ziploc bags, lettuce, food coloring
- **Texts:** *Izzy Peck Architect*

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](#)