



PISCATAWAY TOWNSHIP SCHOOLS

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LEAP STEAM

Content Area: LEAP
Grade Span: Grade 3
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COURSE OVERVIEW

Description

Grade 3 STEAM students will explore an introduction to Chemistry, which is the study of matter and energy and the interaction between them. Chemistry is everywhere in the world around us; in our bodies, in our food, cleaners, medicines, etc. Grade 3 STEAM students will explore the concept of robots and robotics, learn to program a robot to carry out simple tasks (Botley) and explore electrical circuits (Snap Circuits) including building a rover in different modes which can be programmed to carry out various tasks. Grade 3 STEAM students will conduct or view the conduction of experiments, keep a LEAP Journal, and choose from an array of rigorous and challenging follow up activities that support presented topics.

Goals

To guide students to the understanding that scientists must be open minded and willing to incorporate new knowledge. To encourage students to conduct independent research and keep notes, just as actual scientists do. To provide challenging tasks that are more rigorous and challenging than the general classroom tasks, and to foster intellectual curiosity.

Scope and Sequence

Unit	Topic	Length
1	Chemistry	Full Marking Period
2	Robotics	½ Marking Period
3	Circuits	½ Marking Period

Resources

Suggested Resources:

Snap Circuits, Snap Circuit Rovers, various robots
 GenerationGenius, ReadWorks, RazKids/Reading A-Z, TrueFlix, Epic!, CrashCourse Video Series on YouTube, Bill Nye the Science Guy, LEAP Journal

UNIT 1: Chemistry

Summary and Rationale

Grade 3 STEAM LEAP students will be challenged, through viewing demonstrations, engaging in experiments when able, viewing videos that demonstrate experiments and explore concepts, through independent readings and research (including DIY at home activities/remote learning) to explore science/chemistry concepts. Chemistry is the study of matter, its properties, how and why substances combine or separate to form other substances, and how substances interact with energy. Chemistry is one of the physical sciences that help us to describe and explain our world. Chemistry helps us understand the world around us. Chemistry can help us make informed decisions. Chemistry relates to us every day – it is the heart of cooking. Because it is a science, learning chemistry helps us learn to be objective and how to reason to solve problems.

Concepts and activities selected meet the desire to provide rigor and challenge to the LEAP program, as most of these are 5th grade level; 2 years above grade level for these students.

Recommended Pacing

Grade 3 LEAP STEAM students will complete 2 lessons per week of approximately 50-60 minutes.

State Standards

- 5-PS1-1: Develop a model to describe that matter is made of particles too small to be seen.
- 5-PS1-3: Make observations and measurements to identify materials based on their properties.
- 5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in a new substance.

Instructional Focus

Unit Enduring Understandings

- Science is the process of learning about the natural world through observation and experimentation.
- The more evidence we have about a theory the more confident we are about it.
- You must be willing to change your mind based on new evidence.
- Many things around us appear to be science but are not.
- All matter is made of particles that are too small to be seen.
- Changes in matter can be physical or chemical.

Unit Essential Questions

- What is science?
- What is matter?
- How can I explore/demonstrate/test my hypothesis?
- How can I explain/incorporate new evidence?

Objectives

Students will know:

- Many things around us appear to be science but are not.
- Scientists must be open to new experiences/evidence.
- Matter is everywhere, can change state, and can be observed and manipulated.
- Some changes are chemical while others are physical.

Students will be able to:

- Describe what a scientist does
- Explain the 3 states of matter
- Explain chemical changes
- Explain physical changes

Resources

Various websites, videos, books, computers, etc.

UNIT 2: Robotics

Summary and Rationale

Grade 3 LEAP STEAM students will gain a basic understanding of what Robotics is as they research what “Robotics” is and explore working with basic robots. Students will become programmers as they explore what an algorithms is and write a simple program for Botley to execute. They will also explore how Robots are used in the real world in the medical and manufacturing fields. The standards addressed are above grade level, making this unit ideal for an enrichment program. The goals of this unit directly relate to multiple areas of the Standards, not only in Science but in Literacy, Math, Engineering, and Technology but Art as well. This unit will be conducted over a half Marking Period, with the students meeting/working twice per week. The engaging lessons and element of student choice as well as introduction of more advanced tasks and projects working with robots incorporated in the unit will foster student interested in this topic. Lessons are full of questions that will keep students thinking, and hands on activities that will expand their inquiry. The various types of lessons will meet the different learning styles of the group. Lessons use technology and include visual or hands on materials to meet the needs of diverse learners. Lessons incorporate simple robots and Botley, websites, books, and videos.

Recommended Pacing

Grade 3 LEAP STEAM students will complete 2 lessons per week of approximately 50-60 minutes.

State Standards

2020 New Jersey Student Learning Standards – Computer Science and Design Thinking 8.1

- 8.1.5.AP.1: Compare and refine multiple algorithms for the same task and determine which is the most appropriate.
- 8.1.5.AP.3: Create programs that include sequences, events, loops, and conditionals.
- 8.1.5.AP.4: Break down problems into smaller, manageable sub-problems to facilitate program development.
- 8.1.5.AP.5: Modify, remix, or incorporate pieces of existing programs into one’s own work to add additional features or create a new program.

Instructional Focus

Unit Enduring Understandings

- Individuals develop and follow directions as part of daily life.
- An algorithm is a sequence of steps designed to accomplish a specific task.
- Algorithms can be translated to a code, which provides the instructions for a computing device (Botley.)
- A variety of control structures are used to change the flow of program execution (e.g., sequences, events, loops, conditionals).
- Individuals develop programs using an iterative process involving design, implementation, testing, and review.

Unit Essential Questions

- What is a robot?
- How and why do humans use robots?
- What is an algorithm?
- What is a program?
- How can we create a program for our robot (Botley) to execute?

Objectives

Students will know:

- An algorithm is a sequence of steps designed to accomplish a specific task.

- Using a “code” we can program a computer (Botley) to perform tasks.
- How to include program execution such as loops, repeat, change direction, etc. when programming Botley.

Students will be able to:

- Imagine/design/write a code to program Botley to complete multiple steps, including changing direction, loop, turn around, avoid an obstacle, follow a line.

Resources

Various robots, Botley, websites, videos, books, computers, etc.

UNIT 3: Circuits

Summary and Rationale

Grade 3 LEAP STEAM students will build upon and extend their knowledge of snap circuits as they explore how to make things work. Students will become engineers as they determine the steps necessary to program a vehicle, turn on various options such as lights and sirens, and use a snap circuit rover to conduct an experiment. They will also explore programming their vehicle using a remote control, and navigate an obstacle course. The components explored in this unit build upon what was learned in grade 2, and are advanced for a typical grade 3 student, (see by the end of grade 5 standards below) making them ideal for an enrichment program. The goals of this unit directly relate to multiple areas of the Standards, not only in Science but in Literacy, Math, Engineering, and Technology as well. This unit will be conducted over a half Marking Period, with the students meeting/working twice per week. The engaging lessons and element of student choice as well as introduction of more advanced tasks and projects working with snap circuits incorporated in the unit will foster student interest in this topic. Lessons are full of questions that will keep students thinking, and hands on activities that will expand their inquiry. The various types of lessons will meet the different learning styles of the group. Lessons use technology and include visual or hands on materials to meet the needs of diverse learners. Lessons incorporate Snap Circuits and Snap Circuit Rovers, websites, books, and videos.

Recommended Pacing

Grade 3 LEAP STEAM students will complete 2 lessons per week of approximately 50-60 minutes.

State Standards

2020 New Jersey Student Learning Standards – Computer Science and Design Thinking

- 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.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
- 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.
- 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.
- 8.2.8.ED.1: Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
- 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.
- 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product

Instructional Focus

Unit Enduring Understandings

- Engineers follow the Engineering Design Process.
- Constraints play a role in product design.
- Designs/products perform a function.
- When a device stops working, we can troubleshoot to try out ways to fix the problem.
- Electrical circuits play a role in designing devices

Unit Essential Questions

- (Review/present for new LEAP students) What is a circuit? How do electrical circuits work?
- How can a device be built to conduct a task?
- How can I use and program a remote control to have a device perform different/multiple tasks?

Objectives

Students will know:

- Engineers use the Engineering Design Process to design products.
- Constraints have impact and must be considered when designing devices.
- How to follow more advanced directions to assemble real circuits to create devices
- Snap Circuits can be used to build a machine/robot/device which can complete a task
- When a device stops working, we can brainstorm and troubleshoot to find a way to fix it

Students will be able to:

- Work with *Snap Circuits* Electronic Discovery Kits (including the Rover) appropriately, which includes following written and illustrated step by step directions to assemble real circuit components to create working electronic circuits and devices.
- Conduct an experiment using Snap Circuits
- Explain what their device is designed to do
- Explain what Constraints are, and Brainstorm ways to work within constraints
- Demonstrate using a remote control with their devices to have their device follow multiple steps
- Attempt to solve the problem when a device stops working
- Design and obstacle course for their Snap Circuit Rover to navigate

Resources

Various websites, Snap Circuits and Snap Circuit Rovers, videos, books, computers, etc.