Become a Scientist

Overview: Students love to be the center of attention. Why not give them the chance to be a scientist in front of the entire class? Use this engaging activity to teach students the scientific method and energy!

Procedure:
1) Review the concepts of potential and kinetic energy. Here is a simple article you can share with your students.
2) Have students demonstrate potential and kinetic energy with a pencil. (Potential energy can be represented by holding the pencil in the air. Kinetic energy can be represented by dropping the pencil.)
3) Discuss with students that they will be the scientist behind this experiment. Explain to students what makes up the scientific method. (Question, hypothesis, materials, experiment, results, and conclusion)
4) Have students choose two similar objects to perform their own experiment that uses potential and kinetic energy. Start with students forming a question that can be tested in school using potential and kinetic energy with their objects. Have students create a hypothesis for their experiment.
5) Next ask students to make a list of materials they will need for their experiment. Then have students think through the procedures to complete this experiment. Make sure student write the steps to their experiment.
6) Allow each student to conduct their experiment and document their results.
7) Give students the opportunity to make a table or graph that represents their results and the results of other students' experiments. Then have students draw conclusions based on their results.
8) Review with students the potential and kinetic components in each experiment.

ASOLs Covered in this Activity:

SCIENCE

5S-FME 1: The student will investigate and understand characteristics and interactions of moving objects. Key concepts include
a) motion is described by an object's direction and speed;
b) changes in motion are related to force and mass;
c) friction is a force that opposes motion.
d) moving objects have kinetic energy.

8S-FME 1: The student will investigate and understand basic sources of energy, their origins, transformations, and uses. Key concepts include
a) potential and kinetic energy;
e) energy transformation

Extension Idea:
This activity gives students the opportunity to investigate and understand energy in motion through developing their own science experiments.

5S-SI 1: The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which

a) distinctions are made among observations, conclusions, inferences, and predictions;
b) objects or events are classified and arranged according to characteristics or properties;
e) predictions and inferences are made, and conclusions are drawn based on data from a variety of sources;
h) hypotheses are developed as cause and effect relationships;
i) data are collected, recorded, analyzed, and displayed using bar and basic line graphs;
k) data are communicated with simple graphs, pictures, written statements, and numbers;

5S-SI 2: The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
b) estimates are made and accurate measurements of length, mass, volume, and temperature are made in metric units using proper tools;
d) hypotheses are formed from testable questions;
g) data are collected, recorded, analyzed, and communicated using proper graphical representations and metric measurements;
h) predictions are made using patterns from data collected, and simple graphical data are generated;
i) inferences are made and conclusions are drawn;
j) models are constructed to clarify explanations, demonstrate relationships, and solve needs.

8S-SI 1: The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations which
a) observations are made involving fine discrimination between similar objects and organisms;
b) precise and approximate measurements are recorded;
e) a method is devised to test the validity of predictions and inferences;
f) one variable is manipulated over time, using many repeated trials;
g) data are collected, recorded, analyzed, and reported using metric measurements and tools;
h) data are analyzed and communicated through graphical representation;

8S-SI 2: The student will demonstrate an understanding of science by planning and conducting investigations in which
a) data are organized into tables showing repeated trials and means;
g) variables are controlled to test hypotheses, and trials are repeated;
h) data are organized, communicated through graphical representation, interpreted, and used to make prediction;
i) patterns are identified in data and are interpreted and evaluated.

8S-SI 3: The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
j) valid conclusions are made after analyzing data;
k) research methods are used to investigate practical problems and questions;

l) experimental results are presented in appropriate written form.

HSS-SI 1: The student will plan and conduct investigations in which
c) scales, diagrams, charts, graphs, tables, imagery, models, and profiles are constructed and interpreted;

HSS-SI 2: The student will demonstrate an understanding of the nature of science and scientific reasoning and logic. Key concepts include
a) science explains and predicts the interactions and dynamics of complex Earth's systems;
b) evidence is required to evaluate hypotheses and explanations;
c) observation and logic are essential for reaching a conclusion;
d) evidence is evaluated for scientific theories.

Extension Idea:
These standards can be addressed through the course of this activity's scientific process.

READING & WRITING

3E-RW 2a: The student will use newly acquired vocabulary drawn from reading and other content areas.
3E-CN 1g: The student will sequence at least two steps in a procedure or ideas/incidents in an event.
6E-CN 1c: The student will use content words and phrases from nonfiction text.
4E-RW 1c: The student will use newly acquired vocabulary drawn from reading and other content areas.
5E-RW 1f: The student will demonstrate understanding of content-specific words.
7E-CN 1e: The student will use content words and phrases from a nonfiction text.
8E-RW 1e: The student will acquire and use content words and phrases.
8E-WP 1a: The student will write to convey ideas and information including facts, details, and other information.
c: The student will plan by brainstorming and revise own writing by adding more information.
d: The student will use content specific vocabulary when writing about a topic.
8E-WP 5 b: The student will write to convey ideas and information clearly including facts, details, and other information.
c: The student will produce writing that is appropriate for the task, purpose, or audience.
HSE-RW 2c: The student will acquire and use content words and phrases.
HSE-WP 1b: The student will write to convey ideas and information using clear organization and including facts, details, and other information as well as graphics and multimedia as needed.
c: The student will write about an event or personal experience by introducing the event or experience, at least one character, and describing multiple events in sequence.
d: The student will produce writing that is appropriate to a particular task, purpose, and audience;
e: The student will develop writing by planning and revising own writing by adding more information.

HSE-WP 5b: The student will develop and strengthen writing as needed by planning, revising, editing, and rewriting.

Extension Idea:

Upon completion of this experiment, students will write a fictional text that incorporates the non-fiction content. Instruct students to choose an object in the room, and have students think about what would happen if the object had continuous kinetic energy. Create your own story to share as a model with the class. Have students brainstorm, draft, edit, and write a final copy of their story. Address the need for the story to be appropriate for a particular task, purpose, and audience. Encourage students to use content words such as kinetic and potential energy.

MATH

3M-PSPFA 1b: The student will use picture or bar graphs to answer questions.
c: The student will insert data into a pre-constructed bar graph template.
d: The student will interpret data from a variety of graphs to answer questions.
5M-PSPFA 1a: The student will compare two sets of data within a single data display such as a picture graph, line plot, or bar graph.
b: The student will represent and interpret data on a picture, line plot, or bar graph given a model and a graph to complete.
6M-PSPFA 1a: The student will display data on a graph or table that shows variability in the data.
b: The student will summarize data distributions on a graph or table.
c: The student will answer a question related to the collected data from an experiment, given a model of data, or from data collected by the student.
8M-PSPFA 1b: The student will describe how a graph represents a relationship between two quantities.
HSM-FS 2a: The student will indicate general trends on a graph or chart.
HSM-FS 3a: The student will, given data, construct a simple graph and answer questions about the data.

Extension Idea:

Students will use data to create a graph or table that displays their results. Ask students to interpret the data and confirm or edit their original hypothesis.

3M-NCE 1a: The student will identify and write numerals 0 to 30.
b: The student will identify the place value of tens on a number line between the numbers 0 to 30.
3M-NCE 2a: The student will solve addition and subtraction problems when result is unknown with number 0-30.
3M-NSCE 4a: The student will add to solve single-step story problems from 0-30;
b: The student will identify place value to tens.
4M-NSCE 1a: The student will compare numbers to each other based on place value groups by composing and decomposing to 50;
b: The student will compare whole numbers (<,>,=);
c: The student will interpret data from a variety of graphs to answer questions.
4M-NSCE 4a: The student will solve single-step word problems using addition or subtraction.

4M-PSPFA 1: The student will use repeating patterns to make predictions.
6M-PSPFA 1a: The student will match an equation to a real-word problem in which variables are used to represent numbers.
7M-PSPFA 1a: The student will describe the probability of events occurring as possible or impossible.

Extension Idea:

When interpreting data, students can use math skills such as: identifying numerals, comparing and contrasting whole numbers, adding and subtracting single-step problems, and identifying place value. Data can also be interpreted by identifying patterns, matching equations, and identifying if certain events are possible or impossible.

3M-MG 2a: The student will order by length using non-standard units.
b: The student will identify standard units of measure for mass and volume;
c: The student will measure length of objects using standard tools, such as rulers, yardsticks, and meter sticks.
4M-MG 1a: The student will identify smaller units that divide a larger unit within a measurement system.
5M-MG1a: The student will use customary units of measure weight and length of objects.
HSM-EI 3b: The student will interpret rate of change (e.g., higher/lower, faster/slower).

Extension Idea:

Use this activity to practice measurement skills with your students. Have students measure the objects used in their experiment. If students choose to drop objects in their experiment, instruct them to measure the length and/or rate of change in their drop.

History

HS-H17: The student will identify and compare changes in the community life over time in terms of buildings, jobs, transportation, and population.
HS-H 36a: The student will demonstrate knowledge of scientific, political, economic, and religious changes during the sixteenth, seventeenth, and eighteenth centuries by describing the Scientific Revolution and its effects.

Extension Idea:

Have students relate the scientific method they used in class to the scientific revolution and scientists today.

Materials Needed:

-scientific method template
- a prepared table or graph paper

Instructional Setting:

A room with typical school supplies will work great.

Community Connections and/or Peer Interaction:

Students can present their experiment to peers. You could also have a local scientist come and discuss how he/she uses the scientific method every day.

Functional Activity/Routine:
This activity encourages functional skills such as turn-taking, following instructions, research skills, and cleaning up afterward.

Strategies to Collect Evidence:
For collection of evidence, be sure that each student records a hypothesis, data, and conclusion individually.

Specific Options for Differentiating this Activity:
-For students with poor fine motor skills allow them choices of objects in which they can hold and/or assist in dropping.
-Allow students to use their preferred "pencil" when writing. This may include writing utensil, keyboard, alternative pencil, or dictating to a scribe.
-Prepare, as necessary, for each student to make choices and communicate with their preferred method. This may include using augmentative communication.