

CREATING SNAKE-REPELLING HATS

LESSON OVERVIEW

In the book *Rosie Revere, Engineer* by Andrea Beaty, Rosie builds a hat to keep snakes off of her uncle's head using unusual objects. In this lesson participants use the engineering design process to build their own snake-repelling hats. They watch videos with experts as they learn about snakes, what snakes fear most, how to go through the engineering design process, and get inspired by others' creations.



STANDARDS

NGSS K-2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
NGSS 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.
NGSS 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.
NGSS 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.
CCSS – ELA RI.2.1	Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
CCSS - ELA W.2.8	Recall information from experiences or gather information from provided sources to answer a question.
CCSS - ELA RI.5.1	Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
CCSS - ELA RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
CCSS - ELA RI.5.9	Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.
CCSS - ELA W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.

OBJECTIVES

- Students will discuss how Rosie Revere used the engineering design process to plan, design, and test her inventions.
- Students will identify ways to repel snakes with provided resources, such as a video and websites.
- Students will design a snake-repelling hat using the engineering design process.
- Students will discuss their designs with the class and explain how their hats will repel snakes.

MATERIALS

- Engineering Design Process handout
- Newspaper
- Masking tape
- Cinnamon oil
- Colorful scraps of paper (i.e. marigold-colored tissue paper or brown paper for cinnamon sticks).
- Glue
- Other miscellaneous materials (i.e. sequins, pipe cleaners, pom poms)
- Camera to take pics and send them to us
- Computers/mobile devices for the engineering game

PROCEDURES

1. Read the book *Rosie Revere, Engineer* by Andrea Beaty and then ask the following questions and have discussions.
 - What is an engineer?
 - Can you name different types of engineers?
 - What were some of the things Rosie invented, and why do you think she wanted to invent them?
 - What is something useful you would like to invent?
2. Play the online engineering game based on the book *Rosie Revere, Engineer* by Andrea Beaty.
 - <http://smartspaceniu.com/i-%E2%99%A5-engineering/>
3. Watch a video with a herpetologist (person who studies snakes) and learn what might repel them.
 - <http://smartspaceniu.com/i-%E2%99%A5-engineering/>
 - What did you learn about snakes?
 - What do you think would repel snakes?
4. Watch a video with a mechanical engineer that recreates Rosie's invention using the engineering design process.
 - <http://smartspaceniu.com/i-%E2%99%A5-engineering/>
5. Get inspired by the inventions of others.
 - <http://smartspaceniu.com/i-%E2%99%A5-engineering/>
 - What kind of things might your hat do to repel snakes?
6. For students in grades 3-5, have them conduct additional research online to find out what might repel snakes.
7. Have the participants brainstorm ideas for their hats.
8. Have the participants build their prototypes for their snake-repelling hats.
9. Have the participants present their solutions to the group and explain how their design helps repel snakes. Older students can cite information that helped them arrive at this solution.



RUBRIC

	Target (3)	Meets (2)	Partially Meets (1)	Does Not Meet (0)
SNAKE-REPELLING HAT DESIGN	Does a great job showing an understanding of design for a purpose.	Does an okay job with showing an understanding of designing for a purpose.	Tries but has great difficulty showing an understanding of the design process.	Does not show an understanding of design.
USE OF MATERIALS	Inventively chooses materials that are interesting and support the project's purpose.	Appropriately chooses materials to support the project's purpose.	Chooses materials but some work against the purpose of the project.	Does not choose appropriate materials.
COLLABORATION	Works well with others and discusses ideas in a fair, respectful, encouraging way and is considerate of the feelings of others.	Works okay with others and discusses ideas in a fair, respectful way, but may not have been encouraging. Considers the feelings of others.	Works with others, but did not contribute a fair share of work OR was discouraging and did not consider the feelings of everyone.	Did not work well with others and/or discusses ideas in an unfair, disrespectful way.
PROTOTYPE	The prototype works well to accomplish the assigned task.	The prototype works okay to accomplish the assigned task.	The prototype works to partially accomplish the assigned task.	The prototype does not accomplish the assigned task.
REQUIREMENTS	Meets all of the requirements for the project.	Meets most of the requirements for the project.	Meets some of the requirements for the project.	Does not meet the requirements for the project.
DEMONSTRATION OF KNOWLEDGE OF CONTENT IN DISCUSSIONS AND ACTIVITIES	Does a great job showing an understanding of the content covered in class.	Does an okay job with showing an understanding of the content covered in class.	Tries but has a difficult time showing an understanding of the content covered in class.	Does not show an understanding of the content covered in class.
Total				/18

ENGINEERING DESIGN PROCESS



IDENTIFY THE PROBLEM

What is the problem, and why is it important?

RESEARCH AND BRAINSTORM

Research: What has been done to solve this problem? Who is affected by this problem? What current solutions are available?

Brainstorm: What sort of things can be used to solve this problem? How can current solutions be improved? What materials will you need? Create concept designs.

BUILD

Decide upon your best design, gather your materials, and build your prototype.

TEST

Test your prototype to determine its challenges, problems, and level of effectiveness.

IMPROVE

If the prototype does not work, repeat the process by identifying problems with the prototype design, conducting more research and brainstorming possible improvements, modifying or rebuilding the prototype, and performing additional testing until a solid solution is found.

PRESENT SOLUTIONS

Once an effective solution is discovered, present your work to others. Possible forms of presentation include a project board or multimedia presentation at a meeting or conference, documentation made accessible to those who can benefit from the work, and electronic communication of the solution via email, social media, blogs, websites, digital signs, videos, etc.

