



Developed with Kristin Hotter

Volume 5 | Gr. 5-8

Design & Engineering: Invention with a purpose



Time:

Introduction: 30 minutes

Activity 1: 45 minutes

Activity 2: 40 minutes

Activity 3: 45 minutes

Total Time: 160 minutes

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.

MS-ETS1-3

Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Objectives

Students will be able to...

- Explain how and why new inventions are created
- Create an independent sketch for a new invention
- Collaborate to develop a prototype of a new invention



Materials list

- *Girls Think of Everything: Stories of Ingenious Inventions by Women* by Catherine Thimmish (pages 4-7)
- *Girls Think of Everything* Worksheet (included)
- Slideshow Presentation Outline (included)
- Simple Building Materials Kit (**TB27626**)

Content

Facilitate a discussion with students as to why someone might invent something new. Use that conversation as a segue into reading an excerpt from *Girls Think of Everything: Stories of Ingenious Inventions by Women*, which provides additional context into certain inventions and the reasons why they were invented. Students will then choose a particular invention and create a slideshow presentation that details the invention, how it was thought of, and how it made life easier for people.

Once students have some additional knowledge about inventions, they will have the chance to invent something themselves. Ask them to imagine a world that doesn't include one of the chores they dislike the most. What if they could design something to eliminate that chore forever? Give students the opportunity to first work independently to sketch a solution to their problem. Then ask students to work with a small group to put their ideas together and create the ideal solution to their chore problem. Finally, have students work with their small group to create a prototype and advertisement for the newfangled invention.

STEAM Connections

Science — Students will compare and contrast their designs with other inventors. Those groups will put together the best elements of each design model to create “the perfect solution” to their chore problem.

Technology — Students will be assigned to learn more about an inventor that developed a product to make a household task easier. Students will research their inventor to determine what that individual invented, why it was invented, and how it was invented.

Engineering — Each group of students will use simple building materials to create a prototype of their invention.

Art — Students will work independently to sketch and design a possible invention that will make a particular household chore easier. They will then work with their small group to create an advertisement for their invention.

Math — Students will estimate the cost of their invention based on the pricing of materials they are interested in incorporating into their design. They’ll create an advertisement for their invention.



Introduction

1. Pose the following question to students: “What are some reasons why someone might invent a new product?” Ask students to think about the question independently for a moment, then have them talk with a neighbor about their thoughts. Finally, reconvene as a group and create a class list of responses.

Sample responses may include:

- To solve a problem
- By accident
- To make a process easier

2. Ask students, “What are some household inventions that have made your life easier?” Create a classroom list.
3. Now that students have some idea as to why people develop inventions and some inventions others have developed, get them to talk about what they would like to invent. Ask them if there is something that would make their life easier. Is there a chore that they have to do at home that they wish they could complete quicker? Is there something that would make their life around the house easier? Have students turn and talk with the same partner

about a task they have to complete around the house that they wish was easier to get done. Here are a few sample responses:

- Trying to get every crumb off the floor when sweeping
- Getting every leaf when raking the lawn
- Cleaning out the cat’s litter box
- Picking up small toys on the floor
- Washing the silverware
- Cleaning up after the dog in the backyard

Have students imagine if they could create something that would make their life easier, telling them that’s what inventors think about all the time.

4. Distribute copies of *Girls Think About Everything* and accompanying worksheet. Tell students they are going to read an excerpt from *Girls Think About Everything: Stories of Ingenious Inventions by Women*, a book that highlights female inventors who have invented things from the chocolate chip cookie to the windshield wiper. Let them know the excerpt is from the introduction. Give them time to read the excerpt with a partner and answer the questions on the worksheet. As they read, they should think about the qualities someone who invents something new must have.



Activity 1

For this portion of the lesson, students will (either independently or with a partner) create a slideshow presentation about a famous inventor and their invention.

1. Assign each student or group an invention from the list below.

Invention	Inventor
Vacuum cleaner	Hubert Booth
Dishwasher	Josephine Cochrane
Washing machine	Hendy Sidgier
Mop	Thomas Stewart
Dustpan	Lloyd Ray
Broom	Levi Dickinson
Toilet brush	William Schopp
Ironing board	Sarah Boone
Sliced bread	Otto Rohwedder
Air conditioning	Willis Carrier
Paper clips	Johan Vaaler
Rubber bands	Stephen Perry
Drip coffee machine	Melitta Bentz
Can opener	William Lyman
Rake	Edmund Brown

2. Students will create a presentation about the assigned inventor and invention. Hand out the slideshow presentation outline.
3. Use the Ruth Wakefield reading from *Girls Think of Everything* to create a sample outline as a group. Read the passage about the invention of chocolate chip cookies together. Answer each question together so students have a sample outline to refer back to as they conduct their own research.
4. Have students do an Internet search on their assigned inventor. Encourage them to use multiple websites to confirm accuracy of information and to ensure they have the complete picture of the inventor and invention.
5. Students then create a slideshow presentation based on their findings. Encourage them to share their presentation with the class, as they are now experts on the topic.

Activity 2

1. Create groups of 3-4 students. Each group of students will either be assigned a chore (you may use the list included in the introduction), or choose a chore they all want to make easier for themselves.
2. Each member of the group will first work independently by drawing a design for an invention that solves the chore problem. Remind students that their first idea likely will not be their best idea. This is a great time to refer back to some of the inventors mentioned in Activity 1. Revisit some of their stories to show that the best inventions take multiple drafts and are not usually right the first time.
3. Once students have had an opportunity to create a design independently, put them with their group. Each member will tell the others about the design they came up with.
4. Ask students to compare and contrast their designs with others in their groups. Are there any shared features between models?
5. Each group will put their designs together to create one design for the group. The design should incorporate elements from each student's independent design plan.



Activity 3

1. Using simple building materials, students will work together to create the prototype. As they create it, ask them to correlate each piece of prototype material with the actual material they would want to use if creating the invention in reality.
2. Once the prototype has been constructed, have students calculate the real cost of the product. They'll need to do some research to determine how much particular materials would cost. Once students have an idea of the real cost of their product, have them set a price for the product.
3. Ask students to create an advertisement for their new invention. It should include a logo, a way for consumers to see exactly how the product would be used, the cost of the item, and where consumers can purchase it.



Name: _____ Date: _____

Read the excerpt from the book and answer the following questions:

How has Dr. Apgar's invention made an impact? _____

What does the phrase "Necessity is the mother of invention" mean? _____

Why were women such important early inventors? _____

Name two examples of early inventions developed by women. _____

Why was Sybilla Masters unable to get a patent for her invention? _____

What problem did Mary Dixon Kies' invention attempt to solve? _____

What are two characteristics many inventors possess? What evidence in the text led you to choose those characteristics? _____

According to the text, what is the main reason for most inventions? _____

Name: _____ Date: _____

Slide 1

What is the invention?

Who invented it?

When was it invented?

Slide 2

Why and how was the invention invented?

Slide 3

The impact the invention has had on daily life.

Slide 4

Additional important information about the inventor or the invention.