The power of invention: From problem to discovery to design

Overview

This series of lessons was designed to meet the needs of gifted children for extension beyond the standard curriculum with the greatest ease of use for the educator. The lessons may be given to the students for individual self-guided work, or they may be taught in a classroom or a home-school setting. This particular lesson plan is primarily effective in a classroom setting. Assessment strategies and rubrics are included. The lessons were developed by Lisa Van Gemert, M.Ed.T., the Mensa Foundation's Gifted Children Specialist.

Introduction

Guiding Questions

- What are some important inventions?
- What leads people to invent?
- How are our lives impacted by inventions?
- How do inventions change over time?

Learning Objectives

After completing the lessons in this unit, students will be able to:

- Describe the development of inventions.
- Compare and contrast the value of different inventions.
- Evaluate the usefulness and appeal of various inventions.
- Design an invention.
- Devise a solution to a problem using an invention.
- Identify connections among inventions.
- Search and extract data from a worldwide database of inventions.

Rubrics for tasks with an asterisk (*) are found at the end of the lesson plan.

Preparation

- Print out all sheets that need to be completed on paper.
- Make sure you have reliable Internet access.

Lesson 1: The Power of Invention

Invention is part of our everyday vocabulary. We have sayings like, "It's the best thing since sliced bread," and "Don't re-invent the wheel" that reflect our strong connection to inventions of all kinds. It would be very difficult to live even a single minute without the benefit of some invention. Virtually everything we use had to be invented. For instance, if you are in a room right now, think of the thousands of inventions that surround you – from the windows to the floors to the furniture to the device that heats or cools the room.

Some inventions are famous and legendary, while others are obscure and practically forgotten. Many inventions stand on the shoulders of inventions that came before them. Behind every invention is a person who saw a problem or an opportunity and invented a solution or a new device.

Sometimes a terrific invention is a matter of sheer luck and discovery. For example, Red Delicious apples are one of the most common varieties of apples available. It was discovered by an Iowan farmer named Jesse Hiatt who saw a small seedling growing on his farm. He thought it was a nuisance plant and chopped it down. The tree kept growing back, however, and finally he allowed it to grow to maturity. It produced red apples. Eighteen years went by and he took the apple he called "Hawkeye" to a fruit show where he sold the rights to market the apple that was renamed Red Delicious.

- Go to the Inventor's Hall of Fame website at bit.ly/inventfame.

Select "search by decade" and select "1900." Scroll through the inventions from this decade that made it into the Hall of Fame.

Choose the five that you feel are most important and list them here:

1. _____
2. _____
3. _____
4. _____
5. _____

Circle the number(s) of the invention(s) listed that you have used.

Place a star next to the one you would least like to live without.

Select "search by decade" again and select any decade you wish.

Which invention do you wish most that you would have invented yourself?

_____

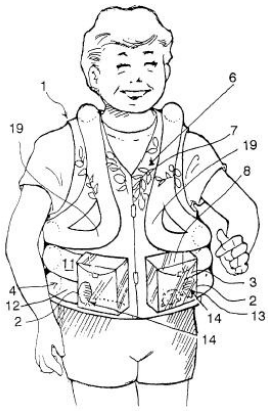
* Describe what life would be like without that invention using the three-frame comic strip below. Use the first two frames to show life with the invention and the last frame to show life without the invention.

Lesson 2: Evaluating inventions

Some inventions are just silly. Lefty Gomez once said, "I've got a new invention. It's a revolving bowl for tired goldfish."

- Go to google.com/patents/US5901666 to see a silly invention.

- Rate the invention on a scale of 1–10 (10 being highest), using the following criteria:



Usefulness to general public	1 2 3 4 5 6 7 8 9 10 (circle)
Comfort of user	1 2 3 4 5 6 7 8 9 10 (circle)
Versatility	1 2 3 4 5 6 7 8 9 10 (circle)
Ease of use	1 2 3 4 5 6 7 8 9 10 (circle)
Creativity	1 2 3 4 5 6 7 8 9 10 (circle)

Would you want one? Yes No (circle)

The invention above was meant to let a person carry his/her hamster around. Think of another pet that could be carried in a specially designed habitat that could be worn and design the habitat. Label and describe at least five specific features of your invention.

Animal: _____

Name of invention: _____

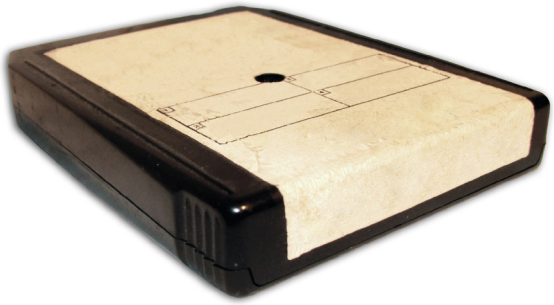
Description and illustration
(be sure to label at least five features):

- Rate your invention on a scale of 1–10, using the following criteria:

Usefulness to general public	1 2 3 4 5 6 7 8 9 10 (circle)
Comfort of user	1 2 3 4 5 6 7 8 9 10 (circle)
Versatility	1 2 3 4 5 6 7 8 9 10 (circle)
Ease of use	1 2 3 4 5 6 7 8 9 10 (circle)
Creativity	1 2 3 4 5 6 7 8 9 10 (circle)

Would you want one? Yes No (circle)

Some inventions outlive their usefulness. Ray Kurzweil, an inventor himself, said, "An invention has to make sense in the world in which it is finished, not the world in which it is started."



- Go to bit.ly/obsoleteinvention and read about one obsolete invention.

- What else did the inventor of the 8-track tape invent that did not become obsolete?

_____

- Think of three other inventions that have not stood the test of time. What toys did you play with when you were younger that are not available anymore? What electronics equipment can you think of that was popular and now are not?

1. _____ **2.** _____ **3.** _____

- Predict an item that is popular now that you think may become obsolete in 10 years. Explain your reasoning.

_____

_____

A common saying is that necessity is the mother of invention. Author Agatha Christie disagrees. She says, "I don't think necessity is the mother of invention. Invention, in my opinion, arises directly from idleness, possibly also from laziness — to save oneself trouble."

* Think of something you hate to do (a chore, a task, anything you do on a regular basis). Imagine that someone could invent something that would make that task easier or go away altogether.

What task would you pick?

_____

What should the invention could be called?

_____

Draw a picture of it in the space at right.

Lesson 3: Inventors

Not all inventions are designed by a single inventor. Often, a community of people work together to create a device or process. To learn how one inventor invented a business around this idea, watch the video at youtube.com/watch?v=GqYeWg7igkU.

quirky

Next, go to quirky.com/participate and scroll through some products that are being considered. Select a product that you think has strong potential and read the details about that product.

Product _____

What is its purpose? _____

Why do you think this idea has merit? _____

_____

What two things would you suggest to improve the product?

1. _____
2. _____

Some people invent because they have a concern about a social or environmental issue. This is why Daniel Gross started WorldHaus (*haus* is the German word for house, and it sounds the same as it does in English).

- Go to worldhaus.com and read about his invention.
- After you have read that, watch this video: vimeo.com/26873341

Using information from the website and the video, answer the following questions:

What problem is he trying to solve?

_____

What is his solution? _____

_____

How is this product superior to what is already available? _____

_____

WorldHaus is developing homes for people in India. If you were to design something that would benefit people in need, what do you think you would design?

_____

_____

_____

_____

_____

What problem would you solve with your invention?

_____

_____

Lesson 4: Exploring inventions

You never know what people are going to find interesting or fascinating. It may surprise you to know that there is a virtual toaster museum online!

- Go to toastermuseum.com and read about toasters!

See if you can find the toaster style that most matches your toaster at home. Did you find it?

Now, go to worldwide.espacenet.com and conduct a worldwide patent search for toasters.

How many results did it find? _____

Look at the first 15 results. How many are for the entire appliance and how many are for parts of one or processes?

Appliance: _____

Part/process: _____

Were any of the first 15 the same inventor? If so, how many? _____

What is the date of the most recent patent (look in the right-hand column)? _____

It can be difficult to evaluate the importance or worth of an invention. Many timelines of inventions exist, and all of them include and exclude different inventions. Go to bit.ly/pbsinvent, looking at the inventions and completing the tasks below:

- Look through the interactive timeline. Select five inventions that you feel are connected in some way. Create your own timeline of them in the space below, leaving space along the line between each invention. Be sure to include the invention and the year in which it was invented on the timeline. Draw a small sketch of each invention.

- Next, identify five inventions in your house that are not on the timeline above. Rank them in order of importance to your family below in the column that says "My List." Next, share the five inventions in mixed-up order with an adult. Ask him/her to rank them in the order of importance according to them in the column that says, "An Adult's List."

My List	An Adult's List
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____

Do the lists match? How do you account for any differences?

_____

_____

Henry George said, "The march of invention has clothed mankind with powers of which a century ago the boldest imagination could not have dreamt." Where will your bold imagination take you?

All of this talk of making stuff may have you itching to try to build something yourself. If so, go to pbskids.org/designsquad and choose a simple machine to construct. Who knows? Maybe you'll invent a better way to do it!

Extension: There's so much more to learn!

Here are some great books to read about inventions and inventors:

- *Kids Inventing! A Handbook for Young Inventors* by Susan Casey
- *1001 Inventions That Changed the World* by Jack Challoner (editor)
- *So You Want to Be an Inventor* by Judith S. George
- *Mistakes that Worked* by Charlotte Jones
- *They All Laughed ... From Light Bulbs to Lasers: The Fascinating Stories Behind the Great Inventions That Have Changed Our Lives* by Ira Flatow
- *National Geographic Concise History of Science and Invention: An Illustrated Time Line* by *National Geographic*

There are several invention competitions geared to kids and teens. Find more information about some of them here:

- nmoe.org/students/siba.htm: The National Museum of Education runs a year-round competition for kids from pre-K through 12th grade.
- imaginecup.com: Sponsored by Microsoft, the Imagine Cup bills itself as the world's "premier student technology competition." In this competition, students use their talents, skills, and ideas to create technology solutions to address a yearly theme.
- exploravision.org: ExploraVision is open to all grade levels and is sponsored by Toshiba. It's a science-geared competition. Students do need a teacher sponsor. Toshiba describes it like this: "From water fountains to hearing aids to nanotubes, your teams will choose a technology that is relevant to the world today and then explore what it does, how it works and how, when and why it was invented. Then your teams will imagine their chosen technology 20 years from now and prepare an in-depth report that conveys their visions to others."
- societyforscience.org/STS: Open only to high school seniors, the Intel Science Talent Search is a prestigious science competition that is the oldest in America.

Other Resources:

- United States Patent and Trademark Office (called the "PTO" by those in the know)

General Information Services Division
Crystal Plaza 3, Room 2C02
Washington, D.C. 20231
uspto.gov

- PTO kids' pages: bit.ly/ptokids
- MIT's inventions website: bit.ly/minvent
- Questions and answers about patents: bit.ly/patentfaqs
- Camp Invention's website allows kids to develop their own inventions: inventnow.org

Assessment

Comic Rubric (Lesson 1)				
CATEGORY	**4**	**3**	**2**	**1**
Creativity	The comic contains many creative details that contribute to the reader's comprehension of the invention's value.	The comic contains some creative details that contribute to the reader's comprehension of the invention's value.	The comic contains few creative details that contribute to the reader's comprehension of the invention's value.	There is little evidence of creativity or detail in the comic.
Illustrations	Original illustrations are detailed, attractive, creative and relate to the text on the page.	Original illustrations are somewhat detailed, attractive, and relate to the text on the page.	Original illustrations relate to the text on the page.	Illustrations are not present OR they are not original.
Originality/ Clarity of Thought	Comic shows considerable originality and inventiveness. The content and ideas are presented in a unique and interesting way.	Comic shows some originality and inventiveness. The content and ideas are presented in an interesting way.	Comic shows an attempt at originality and inventiveness in part of the presentation.	Comic is a rehash of other people's ideas and/or images and shows very little attempt at original thought.

Invention of Convenience (Lesson 2)				
CATEGORY	**4**	**3**	**2**	**1**
Preparation	The task chosen and invention to make it easier demonstrate superior depth of thought.	The task chosen and invention to make it easier demonstrate solid depth of thought.	The task chosen and invention to make it easier demonstrate some depth of thought.	The task chosen and invention to make it easier demonstrate little depth of thought.
Illustration	Illustration is detailed, attractive, creative, and clearly reflects name of invention.	Illustration is somewhat detailed, attractive, creative, and clearly reflects name of invention.	Illustration contains few creative details, lacks sufficient creativity, or does not clearly reflect the name of the invention.	Illustration lacks detail, creativity, and has no connection to the name of the invention.
Name	The name of the invention clearly represents its purpose.	The name of the invention somewhat clearly represents its purpose.	The name of the invention does not clearly represent its purpose.	The name of the invention reflects little or no thought or connection.

Timeline (Lesson 4)				
CATEGORY	**EXCELLENT**	**GOOD**	**SATISFACTORY**	**NEEDS IMPROVEMENT**
Content/Facts	Facts were accurate for all inventions reported on the timeline.	Facts were accurate for almost all inventions reported on the timeline.	Facts were accurate for most (~75%) of the inventions reported on the timeline.	Facts were often inaccurate for the inventions that were reported on the timeline.
Dates	An accurate, complete date has been included for each invention.	An accurate, complete date has been included for almost every invention.	An accurate date has been included for almost every invention.	Dates are inaccurate and/or missing for several inventions.
Ease of Use	The reader can quickly determine which of two inventions occurred first.	The reader can fairly quickly determine which of two inventions occurred first.	The reader must struggle to determine which of two inventions occurred first.	The reader cannot determine which invention came first.
Graphics	All graphics are effective and balanced with text use.	All graphics are effective, but there appear to be too few or too many.	Some graphics are effective and their use is balanced with text use.	Several graphics are not effective.
Resources	The timeline contained 5 inventions related in a clear way.	The timeline contained 5 inventions related in a somewhat clear way.	The timeline contained at 5 inventions, but it was unclear how they were connected.	The timeline contained fewer than 5 disconnected inventions.