Look at the room around you. Every object in the room was created to solve a problem. Some problems were as basic as needing a device to wipe chalk from a blackboard and others as advanced as the need to receive information from other parts of the world. Whether a person was creating an eraser or the computer and Internet, they used a problem solving process. The process could have been one of engineering design, research and development, troubleshooting, or invention and innovation.

Whichever process the creator used, it began with a problem. A problem is simply a situation that has no clear solution with the technology at hand. There is no problem present if a fisherman has a fishing pole, reel, hook and bait. However, think of the early civilizations that did not have those tools. A problem existed.

There are many paths to solving problems. Some paths are very scientific, others are systematic, and several are creative.

Invention and innovation are two problem-solving processes that are very creative. The process of invention deals with the creation of new and unique devices and systems. Innovation is the improvement of existing products and systems. These processes combine creativity and imagination with the use of technology. Inventions and innovations can be small and simple or large and complex. However, they all start with a problem.

In the past, most inventions were created by people to solve problems in their own lives. Alexander Graham Bell, for example, was a teacher of the deaf and wanted to convert speech to electric signals which he could use to help his students. His research led to his creation of the first telephone in 1876. Other inventors created devices and inventions because they enjoyed tinkering with tools and materials. Thomas Edison was one such tinkerer. He set up his own laboratory dedicated to inventing many types of devices.

Invention, however, didn’t begin in the 1800s with Bell and Edison. Invention began when early civiliza-
Inventions began to solve problems by rounding stones to create wheels and chipping stones to create pointed devices they could use to kill animals for food and clothing. Many inventions from the early years of human existence are still used today. Innovations in the use of materials and production are all that separate early tools from those we use today, such as the axe.

It is impossible to know the individual who invented objects like the wheel or the stone axe. One of the first recorded inventors was Archimedes who lived in Greece about 2,250 years ago. He was the first to use the pulley and screw for practical uses. Today, inventors and inventions are cataloged and recorded by the U.S. Patent and Trademark Office. It began recording inventions in 1646 and granted the first patent to Joseph Jenks for creating a better sawmill and scythes. A patent is the record that explains and diagrams an inventor’s new invention. For a patent to be granted, a large amount of research must be done to insure that the invention is new and unique and that it is completely the idea of the inventor. A patent insures that the idea is not stolen from the inventor and created without the inventor’s permission.

Invention and innovation are two important paths in problem solving. Without invention and innovation, it would be very hard for society to advance. Imagine if the telephone, radio, or even the wheel would have never been invented. Where would we be today?

✔ Rube Goldberg, an ingenious inventor, does not have any patents. His inventions were created for comic strips and not actually produced.

✔ Leonardo Da Vinci, who painted the Mona Lisa, was also an inventor. He sketched many different inventions that were hundreds of years ahead of their time, including flying machines, parachutes, military tanks, and submarines.
Introduction

Inventions and innovations are important to us and help our technology advance. Inventions are brand new ideas that have never been used before. Innovations are changes to old ideas that make them better. Innovations often come from inventions. Take your shirt for instance; it is probably made of cotton and polyester. Polyester is a type of fiber that was invented. It is used to make innovations in clothing. It is added to cotton shirts so they don’t shrink when washed. In this activity, your students will take an existing toy and make an innovation with it. The innovation can be as simple as adding something new to it or they can create the toy using a different material.

Benchmark

This activity will help students reach the following benchmark:

> Invention and innovation are creative ways to turn ideas into real things.

Teacher Preparation

To prepare to introduce the students to this activity, you should:

- Collect a series of toys that show innovation. For example, train sets and dolls have evolved and have gone through many innovations. A few examples from different time periods would show innovations.

- Create a display of pictures showing innovations in many different areas (housing, automobiles, bicycles, toys).

- Gather the tools and supplies listed below.

Supplies and Tools Needed

The following tools and supplies are needed to complete this activity:

- Cardboard
- Construction paper
- Modeling clay
- Craft sticks
- Glue
- Tape
- Markers
- Crayons
- Pipe cleaners
- Scissors
Preparing the Students

To prepare the students for this activity:

- Introduce the concepts of invention and innovation. Invention is a new and unique idea. An innovation is a modification of a current idea or product. Discuss that inventions and innovations always begin with a need.
- Show the students, through products and pictures, innovations in different areas including toys.
- Discuss how the different objects found in the classroom and in their homes have been innovated.
- Have the students bring in a toy or object from home that they would like to innovate.

Conducting the Activity

1. Have the students get their toys or objects out.
2. Distribute the Innovations worksheet to the students.
3. Have each student make a “before” sketch of the toy or object they wish to innovate.
4. Once the students have completed the sketch, have them create a sketch of the innovation they plan to create.
5. Hand out the modeling supplies and have them build their innovation.
6. Help the students come up with ways to model the innovations.
7. When the students are done building the models, have them show their innovations to the rest of the class.

Checking for Understanding

Throughout the activity, check to make sure that the students understand the activity and are creating an innovation to their object. When the students are done, have them answer the questions on the Why Innovate? Worksheet.

Inventions and innovations are very important to us. Can you think of inventions and innovations:

a. At home?
b. At school?
c. On the bus?
d. At the library?
e. Other places?
INNOVATIONS WORKSHEET

Draw what your toy or object looks like now.

Draw what your toy or object will look like after you make innovations.
What was your toy or object?

__________________________________________________________________________________________________________________________________________________________

What did you change?

__________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________

Why did you change it?

__________________________________________________________________________________________________________________________________________________________

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__________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________
Helpful Inventions

Introduction

The reason many people invent things is to help themselves and others around them meet their needs and wants. Inventors start with a need or problem and work from there. They may watch people to see what they need or they may listen to others and hear them say, “I wish I had a…” For many inventors that is all it takes and they work until they have solved the problem. Once they have created a solution, the next step is to get a patent. A patent insures that the object they created is their own idea and no one else can take it. In this activity, your students will observe the world around them and invent an object to help themselves or others. They will make sketches and then build a model of the device. Once they are complete, they will apply for a patent.

Benchmark

This activity will help students reach the following benchmark:

*Invention and innovation are creative ways to turn ideas into real things.*

Teacher Preparation

To prepare to introduce the students to this activity, you should:

- Become familiar with the process of invention.
- Create a display showing different inventions and famous inventors.
- Prepare invention ideas for students who do not come up with their own. For example, a device that helps open a jar, a device that holds the students’ desks open for them, or a device that makes turning a door handle easier.
- Gather the tools and supplies needed.

Supplies and Tools Needed

The following tools and supplies are needed to complete this activity:

- Cardboard
- Construction paper
- Modeling clay
- Craft sticks
- Glue
- Tape
- Markers
- Crayons
- Pipe cleaners
- Scissors
- Pieces of Styrofoam
Preparing the Students

To prepare the students for this activity:

- Discuss the process of invention and innovation with the students.
  - ✔ Invention and innovation begin with a problem.
  - ✔ The inventor creates sketches and chooses a best solution.
  - ✔ The inventor builds the invention to test if it works.
  - ✔ Inventions don’t always work. When they don’t, the inventor tries to find out what went wrong and fixes the invention.

- Introduce the students to the idea of a patent.

- Describe the way inventors come up with ideas.
  - ✔ Many of them observe people and find out their needs.
  - ✔ Ask the students to watch their classmates and family members at home and find problems that they could invent devices to solve.

- If the problem the students are using is at home, remind them to bring in objects from home to simulate their problem.

Conducting the activity

1. Distribute the Invention Log sheets to the students.

2. Have the students complete the first section with their own problem statements. If any students do not have a problem they want to work with, assign them one you have thought of.

3. Have the students develop sketches of the problem and the solution. Remind the students that the first sketch is to show the problem before they invent their device.

4. Once the sketches are complete, give the students an opportunity to build the devices. Make the materials available to the students and help them come up with ways to build their devices.

5. When the students are done building the models, have them name and explain their device on the Invention Log.

6. After the devices and Invention Logs have been completed, have the students show and explain their inventions to the rest of the class.

7. During this time, complete the patent forms and distribute them to all students.

Checking for Understanding

To check for understanding conduct a class discussion on the importance of invention to solve real problems. Discuss life without inventions or innovations and the importance of patenting inventions. Also, examine the students' Invention Logs and their inventions.
Invention Log

Name of Device: ____________________________

Explain the problem you are trying to solve:

Create a sketch of the Problem:

Create a sketch of the Solution:

Explain how your device solves the problem:
This Patent is awarded to

for the invention of

on the date of
Extending the Activity

Often the invention of new products creates a want that people did not have before the invention. For example, people did not know that they wanted a phonograph before Thomas Edison invented it. People’s interest in the phonograph led to the development of the gramophone, which can be seen as an early ancestor to the CD and DVD players of today.

✔ Have the students trace inventions that we use today to their early roots and create a display and presentation.

✔ Lead the students in developing a model of a new entertainment device that people would want to have and then imagine how that device would evolve.

Evidence of Attainment

Students who have developed an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving can:

1. Explain the process of invention and innovation.
2. Create a model of an innovation.
3. Build an invention to solve a problem.
4. Examine the history and evolution of inventions.

Connections to Other Subjects

Science — Examine inventions that have led to scientific discoveries.

Mathematics — Study the evolution of mathematical aids from counting stones to the calculator and computer.

Social Studies — Look at the effects that inventions have had on society.

Language Arts — Study the technical writing and explanations on a patent.

Art — Examine how inventions have changed how art is produced.
### Key Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Using tools, materials, and knowledge (know-how) to extend the human potential.</td>
</tr>
<tr>
<td>Invention</td>
<td>A new and unique idea, product, or system that is created.</td>
</tr>
<tr>
<td>Innovation</td>
<td>A modification of an existing product or system.</td>
</tr>
<tr>
<td>Problem Solving Process</td>
<td>A set of steps that begins with a problem and ends in a solution.</td>
</tr>
<tr>
<td>Patent</td>
<td>A government document that certifies an idea as being original and as belonging to the inventor.</td>
</tr>
</tbody>
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### Resources

#### Books


#### Web resources

- A presentation of some of America’s most famous inventors and inventions.  
  *URL: http://www.150.si.edu/150trav/remember/amerinv.htm*
- A national inventors hall of fame that recognizes inventors and invention.  
  *URL: http://www.invent.org/*
  *URL:http://www.uspto.gov*
- The Great Idea Finder.  
  *URL:http://www.ideafinder.com*
- A site that lists the greatest Inventions.  
  *URL:http://library.thinkquest.org/C002942*