

Pamela J. Partridge
Grade 4
Science and Technology
Inventions and Inventioneering
Heterogeneous Group

Purpose: Inventions are a human endeavor intended to meet a need. Inventions range from the simple to the complex. Ideas for inventions and their design come from imagination, inspiration, innovation and/or need. Inventions can be life saving, or controversial, and some have ethical implications. The topic of inventions crosses all content areas and lends itself well to differentiation. Alan J. McCormak, in his book *Inventors Workshop*, cites Paul Torrance who did a study of children and creative abilities. In his findings he states children have considerable creative abilities at age four and one-half and that there is an increase in the abilities until age nine. Then they plateau. Why? Is it because we tend to teach to the left side of the brain? All students need to learn what inventions are and understand their importance in our lives. This unit will allow students at all levels of learning to meet the standards and try their own hand at inventing something that falls along a range from practical to visionary. In doing this unit my students will be given opportunities to use both sides of their brain.

Management: We will need an introduction to simple machines and tools prior to doing this unit so that the students will be familiar with the shapes and names of basic machines. Activities for this unit will be done at school and at home. At home they will be done individually. (Parents will be asked to have minimal involvement.) At school there will be some whole class instruction, some small group activities, and some individual work involving task cards with some tasks assigned and some by choice. Plans include having one learning center for students who have their required work done. (I don't have enough time to set up a learning center for everyone.) Each student will receive an Invention folder with the instructions, selected readings assignment sheets, and an Inventioneering Journal. We will conclude the unit with an "Young Inventors' Convention" in April. It would be fun to have the students wear lab coats and keep their papers on a clipboard while working on the tasks and projects

Schedule: The unit will begin the second half of the second quarter after we have explored simple machines, and conclude by the end of March, allowing at least 10 weeks to complete the unit. In school, we will work on the unit each Tuesday from 9:15 until 10:15 in our classroom. I have selected this time because we have a 1-hour block between dance class and computer time each Tuesday until the first week of May. The fourth graders will take advantage of their scheduled technology time in the computer lab from 10:15 until 11:00 to do research and/or complete activities. Additional class time will be scheduled as needed, particularly in language arts or art class to complete written assignments and creative tasks.

Assessment: After selected readings are finished we will have a pre-assessment to check students understanding of core concepts of inventions. I expect the pre-assessment will be multiple choice, matching answer, short response questions, and a diagram to label. There will be grades for a Research Paper, Classroom Tasks, and an Invention.

Topics:

Inventions and Inventing
 Process/Problem Solving
 Inventors
 Historical Aspects of Inventions:
 Implications of Place, Time
 and Conditions on Inventions
 and Inventors

Sub Topics:**Inventions:**

Invention Vocabulary
 Purpose for an Invention

Invention Process:

Most Inventions Aren't "New,"
 a.k.a. Inventions as
 Modifications

Visualization and Design
 Modeling and Prototypes

Testing

Redesign

Patents, Trademarks, Copyrights

Implications of Technology and
 Science on Inventions

Inventors:

Attributes of an Inventor

Factors Influencing the Creative
 Process

Historical Aspects of Inventions:

Implications of Place, Time and
 Conditions on Inventions and
 Inventors

Implications of inventions on
 society

Theme: Modifications**Themes and Generalizations:**

Modifications require visualization
 and creativity.

Modifications can be found in all
 cultures.

Modifications can make things
 better or worse, or leave them
 unchanged with regard to their
 outcome or function.

Small modifications can result in
 big changes; likewise, big
 modifications can result in small
 changes.

Changes in location, time, political
 structure and events results in
 modifications to outcomes.

Essential Questions:

1. How do people use science and technology to solve problems? (J, K and M.)
2. What are the historical, social, economic, environmental, and ethical implications of science and technology? (M)
3. What factors contribute to advancements in science and technology? (M)
4. How do people communicate important ideas? (L)
5. What do creative people have in common? (J, K and M)

Essential Unit Questions:

- 1.a. What are some important inventions of the last millennium and who invented them? (1)
- 1.b. What is the invention process?
2. What are some of the ways inventions have changed the world? (2)
3. What conditions are present when cultures have a lot of inventions and when they have few inventions? (3)
4. How do inventors announce and protect their inventions? (4)
5. What characteristics do many inventors have in common? (5)

Tiered Questions/Objectives

Level 1: Critical Content

- 1. The student will **define** invention vocabulary in writing. (EUQ1)
- 2. The student will **label** and **describe** 3 similar and important inventions of the last millennium in a drawing. (EUQ1)
- 3. The student will **adapt** a toy or a tool made for fourth grader so that a child in kindergarten can use it. (EUQ1)
- 4. The student will **design** a Rube Goldberg gadget or a "thingamajig" that includes several simple machines.(EUQ1)
- 5. The student will do research on 2 inventions and nominate their favorite to the "Inventions' Hall of Fame" via a letter to a review panel that **summarizes** the importance of the invention. (EUQ2)
- 6. Describe an invention of the 20th century and **explain** 3 ways it made life different in a magazine ad for the time period it was invented. (EUQ2)

Level 2: Higher Level Questions

- 1. The students will **define** invention vocabulary and will **compare and contrast** an invention, a technology, and a discovery in a Venn diagram. (EUQ1)
- 2. The student will **appraise** 2 important inventions of the last millennium with a similar purpose and **assess** which one is better suited to its purpose by presenting an oral argument. (EUQ1)
- 3. The student will reinvent a tool by modifying it and **illustrate** a poster with a step-by-step drawing that shows how the modification was done. (EUQ1)
- 4. The student will **critique** the inventions of several inventors and prioritize the inventions from most important to least important in a roundtable discussion. (EUQ2)
- 5. The student will look through the newspaper for an article that describes a problem and will **design** and **construct** an invention to solve the problem. (EUQ2)

Level 3: Embedded Generalizations

- 1. Using the theme of modifications, the student will **explain** how most inventions aren't new inventions, but rather are modifications of older inventions by breaking down an invention and **classifying** its smaller inventions/parts. (EUQ1)
- 2. Using the theme of modifications, the student will test 3 similar inventions, each with a modification, and **determine** in writing the impact of each modification on the function of the invention. (EUQ1)
- 3. Using the theme of modifications, the student will **analyze** a tool or toy and **demonstrate** how modifications to components of the item can change its function. They will make a model of the "new" item with the modifications. (EUQ1)
- 4. Using the theme of modifications, the student will do research and create a display that **compares and contrasts** how different cultures solve the same problem with similar inventions. (EUQ2)
- 5. The student will brainstorm ideas about leading problems or needs in the world today and **develop** 3 invention ideas that could "modify" the world by addressing the problems. Money and resources are limitless. (EUQ2)

Tiered Questions cont.

7. The student will **practice** brainstorming solutions to a problem alone and then in a small group setting and reflect on the process in a journal. (EUQ3)
8. After completing some readings, the student will **identify** on a graphic organizer the attributes of environments that support innovative thinking. (EUQ3)
9. The student will **describe** what a patent is and **explain** what it is used for in writing. (EUQ4)
10. The student will **diagram** a simple tool from 3 perspectives on graph paper. (EUQ4)
11. After reading about several inventors' lives, the student will **identify** common and unique character traits of inventors and make a "Help Wanted" poster advertising for a creative inventor to show they understand the traits of an inventor. (EUQ5)
12. The student will **list** in writing the things that would be found in an inventor's "junk drawer" and **explain** why the inventor would need those items. (EUQ5)
6. The student will research timelines illustrating the history and location of inventions and **formulate** ideas why some countries create a lot of inventors and inventions while others appear to have not done the same. (EUQ3)
7. (EUQ3)
8. As a member of a design team, the student will **compose** rules that should be followed by the team members in order to keep the invention ideas free flowing and protected. (EUQ4)
9. The student will complete a patent application for an invention of their choice **using** the US Patent website for kids. (EUQ4)
10. After doing biographical research on the lives of inventors and doing activities on creating new inventions from common tools, the student will **design** an inventors' tool kit and include training brochure that has helpful hints for being a good inventor. (EUQ5)
6. To show they understand the theme of modifications, the student will **recommend** changes that need to take place in third world countries to support/encourage innovation in order to address their needs. (EUQ3)
7. To show they understand the theme of modifications, the student will **compare and contrast** the lives of the Amish (or another group of people who live simpler lives) with their own in a song. (EUQ3)
8. (This is a stretch!) The student will **write and present** to their classmates an opinion paper on modifying copyrighted materials or patented items, addressing ethical implications of such practices.(EUQ4)
9. To show they understand inventors have the skills of visualization and creativity to modify existing inventions, the student will **"invent"** a prototype of an object to be worn that gives the wearer the skills of an inventor. The object will come with a card that describes the object's function, and how to tell when it is working correctly. (EUQ5)
10. The student will write an opinion that **forecasts** what will happen to students' abilities to think creatively and visualize modifications while problem solving if arts and humanities are removed from the school schedule. (EUQ5)
11. The student will **transform** the classroom schedule on a spreadsheet so that it has subjects that foster creative thinking and visualization in order that students can make modifications to solve new problems. (EUQ5)

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Websites:

Invention Dimension
(Inventor of the Week)
<http://web.mit.edu/invent/invent-main.html>

Inventors Hall of Fame
<http://www.invent.org/>

American Inventors and Inventions
Smithsonian
<http://www.150.si.edu/150trav/remember/amerinv.htm>

Inventors Online Museum
<http://www.inventorsmuseum.com/>

Countries of Inventors
<http://www.worldalmanacforkids.com/exploration/inventions2.html>

Invention Unit
<http://www.oubooces.org/MSTgrant2/CONTENT/inventions.html>

Inventors and Their Inventions
<http://falcon.jmu.edu/~ramseyil/inventors.htm>

Kids Inventor Resources
<http://inved.rjriley.net/k-12/>

Inventors' Digest
<http://www.inventorsdigest.com/ME2/Default.asp>

Kids' Page, US Patent Office
<http://www.uspto.gov/go/kids/>

Inventions and Inventors A-Z
<http://inventors.about.com/library/weekly/aa121599a.htm>

History of Inventions Last Millennium
<http://inventors.about.com/library/weekly/aa111100a.htm>

Idea Finder, History Facts
<http://www.ideafinder.com/history/>

Culture of Innovation
http://www.abheritage.ca/abinvents/innovation/cultureofinnovation/culture_innovation.htm

Channels of Inventions:

computer
communications
agriculture
electricity
imaging
medical
industrial
nobel prize winners

Vocabulary:

invention, function, patent, copyright,
trademark, entrepreneur, innovation,
brainstorming, machine

Books:

Inventors, by Silly J. Patton and Margaret
Maletis
ISBN: 0-9137057-35-7

Inventioneering, by Bob Stanish and
Carol Singletary
ISBN: 0086653-402-4

Inventors Workshop, by Alan J.
McCormack
ISBN: 0-8224-9783-2

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