

Invention Learning Stations

These learning stations on inventions could be implemented after a study of simple machines and electromagnetism. They could also be used to introduce social studies topics on history (importance of inventions in history), government (how to obtain a patent), and cultural diversity (contributions by inventors of various ethnicities). The activities are appropriate for third- through fifth-grade students. Rotation through the learning stations should be followed by a closing scientist meeting for sharing.

Station 1: What Are These Tools Used For?

Objectives: The student will infer uses of various inventions from their characteristics.

Materials: kitchen tools such as an egg separator, cheese grater, cherry pitter, apple corer and peeler, lemon juicer, jar opener, soda fizz keeper, and other tools such as a level and oil filter wrench

Instructions: Examine the tools and try to figure out their use. Talk together about what aspects of the tools give clues to their use. Draw a picture of each in your journal and guess what each is used for.

Assessment: Check journal for recognizable drawings and reasonable guesses. A reasonable guess is any answer describing what a tool might be used for based on its characteristics. This is structure and function and might be pointed out as such, e.g., a pump (cherry pitter, hand lotion dispenser, spray bottle), scraper (apple peeler, putty knife), pincher (jar opener nut cracker, tongs, pliers), separator (lemon juicer, egg separator, sieve), and so on.

Station 2: Name the Simple Machines

Objectives: The student will identify the simple machines (including various types of levers) that make up common tools.

Materials: Labeled tools, such as a manual can opener, fly swatter, scissors, pancake turner, screwdriver and screw, balance, and egg beater

Instructions: At this station are useful tools, each made up of one or more simple machines. The tools are labeled. List some of them in your journal and identify which simple machines they are. If you think they are levers, use what you have learned about levers to determine what class of levers they are. How do these simple machines make work easier?

Assessment: Check journal for the correct listing of at least several tools and their simple machines. Check for understanding of the ways simple machines make work easier. Students should recognize that any of the jobs done by the tools would be much harder, if not impossible, without them. I also note whether students can identify the fly swatter, scissors, pancake turner, or balance as levers. More complicated is whether students identify a screwdriver as a wedge (fits into the screw) with a handle that is a wheel and axle. Manual can openers and egg beaters also have several simple machines.

Station 3: African American Inventors

Objectives: The student will identify contributions by African American inventors.

Materials: Computer with Internet access, *The inventive thinking curriculum project: An outreach program of the United States Patent and Trademark Office (1997)* is available online and could be printed for use.

Instructions: Explore the websites

<http://teacher.scholastic.com/activities/bhistory/inventors/> and

<http://inventors.about.com/library/blblackinventors.htm>. When inventors patent their inventions, other people can't steal their ideas. Look at the inventions and the patent drawings, describing the invention for the Patent Office. In your journal, identify an invention that made a major contribution to society. Who was the inventor? Why do you think this invention is important?

Assessment: Check journal for mention of an African American inventor, his/her invention, and why the invention is important. Some of the inventors students might mention are Garrett A. Morgan, who built a traffic signal to help prevent accidents; Elijah McCoy, whose oil dripping cup allowed trains to work better; Lewis Latimer, who invented an important part of the electric lamp; or George Washington Carver, whose peanut inventions are still used today.

Station 4: Useful Accidents

Objective: The student will consider the value of learning from mistakes in creating inventions.

Materials: Stereo microscope or magnifiers, Velcro™, burrs, Silly Putty™, Post-it Notes™, repositionable glue stick (see Internet Resources), small pieces of paper, Slinky™, shoebox as a “step” for the Slinky, *Mistakes That Worked* by Charlotte Foltz Jones

Instructions: This center has items that were invented because of something that didn't work as planned or because the inventor noticed something strange. Look at the following inventions: Post-it Notes™, Velcro™, Silly Putty™, and a Slinky™. Read how they were invented in *Mistakes That Worked*. Examine these items, play with the Silly Putty™ and the Slinky™, and look at Velcro™ and burrs under the microscope. Then, make your own “post-it notes” using small pieces of paper and the repositionable glue stick.

Assessment: Observe for participation. In the scientist meeting following the stations, note whether students give examples of learning from mistakes. Most of the time students mention that mistakes led to the creation of Silly Putty™ and the Slinky™ and they are glad the scientists didn't throw them away. Students rarely suggest any instances where they have learned from their own mistakes, however, the meeting is a good time to remind students that everyone makes mistakes and to point out that they can be useful in helping us learn from them.

Station 5: Invent a Game

Objective: As a social studies connection, the student will design an original board game with logical methods and rules and explain how to play it.

Materials: board games, card games, egg cartons, marbles, magnetic marbles, magnets, paper clips, cardstock, pencils, felt tipped pens, file cards, boxes, dice, counters, a printout from the following website:

<http://inventors.about.com/library/inventors/blpuzzles.htm>

Instructions: All games are inventions. Many games have been played continuously since ancient times. A game like checkers was played in Ur (Iraq) 5,000 years ago and in Egypt 3,400 years ago. The modern game of checkers was invented over 900 years ago in

France. Examine some of the games at the center for game ideas, and start the process of designing a game. Be prepared to explain how to play it. You will be given time later to finish and play your game.

Assessment: Note whether the student participates in game making. Students should show evidence of the information from the games history websites in their own game.

Station 6: What's Inside?

Objectives: The student will use tools appropriately to take apart small appliances. The student will identify electromagnets **[Safety Note]! Make sure the teacher has demonstrated the proper use of the tools at this station and that all students can use each tool appropriately before allowing any student to take apart an appliance. In addition, students must wear safety goggles when working at this station.**

Materials: Items that no longer work, such as telephones, hair dryers, tape recorders, mixers, and small fans with the cords cut off, flathead and Phillips screwdrivers, pliers, and safety goggles

Instructions: Many scientists and inventors say that they spent lots of time as children taking things apart to see what was inside. Sometimes they could not put them back together, but in any case they were learning a lot about science and technology. Put on safety goggles. Use the tools provided and try to take apart one of the items in this center. Look at items others have tried to take apart. The items that have motors and speakers have electromagnets and permanent magnets in them. In your journal tell what you took apart and whether you found an electromagnet and permanent magnet.

Assessment: Check journal for answer to the questions on what he/she took apart and whether he/she found an electromagnet. An example might be. "I took apart an old tape recorder and found a speaker and a motor with magnets and electromagnets in them." Observe student for appropriate use of tools to take apart the appliances.

Station 7: Design a tool that will make life easier for a person with disabilities

Objective: The student will empathize with the needs of people with disabilities and will design a useful tool, explaining how it can be useful to people with specific disabilities.

Materials: 2–3 wire coat hangers for each group, pliers, masking tape for wrapping sharp ends, safety goggles.

Instructions: In advance, teachers or a parent volunteer should prepare the coat hangers for the activity. Use pliers to disassemble each hanger into one long, strong wire. Add masking tape to each end of the wire to remove any sharp edges and prevent scratches.

[Safety Note] ! Teachers or parent volunteers—not students—must do this step!

Before beginning work at the station, have students put on safety goggles. Using a coat hanger wire, design something useful for someone with a disability. In your journal draw a sketch of your invention and write about how it can be used.

Assessment: Check journal for sketch of the invention with description of how it is to be used. Typical inventions are a hook to pick up things, a hook to open cabinets, a zipper puller, and a bag holder to attach to a walker.

Bender, L. 2005. *Invention*. New York: DK Eyewitness Books.
Jones, C. 1994. *Mistakes that worked*. New York: Doubleday Books for Young Readers
Jones, C.F. 1996. *Accidents may happen: Fifty inventions discovered by mistake*. New York: Delacorte Press.
Kassinger, R. 2001. *Reinvent the wheel: Make classic inventions, discover your problem-solving genius, and take the inventor's challenge*. New York: John Wiley and Sons.
Madgweck, W. 2000. *Questions and answers: Inventions*. New York: Kingfisher.
Tucker, T. 1995. *Brainstorm! The stories of 20 American kid inventors*. South Euclid, OH: Sunburst Books.
Wilkinson, P. 1995. *Incredible inventions*. New York: Snapshot.

Internet Resources

Black Inventors A to Z

<http://inventors.about.com/library/blblackinventors.htm>

Lemelson MIT Program Inventor of the Week Archive: Granville T. Woods

<http://web.mit.edu/invent/iow/woods.html>

Scholastic's Top Ten African American Inventors

<http://teacher.scholastic.com/activities/bhistory/inventors/>

Scotch Restickable Glue Stick™

http://www99.shopping.com/xPO-3M_3m_Scotch_Restickable_Glue_Sticks

The Great Idea Finder: Lewis Latimer

<http://www.ideafinder.com/history/inventors/latimer.htm>

The History of Boardgames

<http://inventors.about.com/library/inventors/blpuzzles.htm>

The Inventive Thinking Curriculum Project

<http://www.pravel.com/docs/inventive%20thinking.pdf>