Imaginative Inventions

By Christine Anne Royce

Invention assists students in understanding the relationships between the individual subjects of STEM education (science, technology, engineering, and mathematics). The playful nature of this month's trade books adds that additional spark of creativity that is needed in the invention process.

This Month's Trade Books

Imaginative Inventions
By Charise Mericle Harper.
Little, Brown and Company. 2001.
ISBN 0-316-34725-6.
Grades K–4

Synopsis

This colorfully illustrated book will engage young children who want to know where common things came from. In all, 14 different inventions ranging from potato chips to roller skates to the vacuum cleaner each occupy a two-page spread in this book.

So You Want to Be an Inventor?
By Judith St. George and David Small.
Puffin Books. 2002.
ISBN 0-14-240460-8.
Grades 2–6

Synopsis

The reader is introduced to inventors and inventions ranging from automobiles to lightbulbs to Velcro in this whimsical and fun narrative. Using creative illustrations, the book poses, "If you want to be an inventor, find a need and fill it" and then provides examples of inventors who took that advice and what they developed.

Curricular Connections

Inventors think of how to improve some aspect of everyday life, and then build a device to accomplish that. Each of these concepts is related to the design process. Grades K–3 can begin to (a) increase their understanding of the design process and make devices to answer a specific purpose; (b) compare and contrast two objects that are used for the same purpose; or (c) construct simple structures to solve a problem. *Imaginative Inventions* walks the reader through such examples (e.g., wheelbarrow or eyeglasses).

In *So You Want to Be an Inventor,* more elaborate inventions are described, ranging from dynamite to computers. What are not presented are the trials that happened prior to the finished product, pointing out that "perfectly designed solutions do not exist" and that "all technological solutions have tradeoffs" (NRC 1996, p. 166). In the activity for grades 4–6, students will engage in a process in which they must consider these tradeoffs as they build their device.

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Reference

National Research Council (NRC). 1996. *National science education standards.* Washington, DC: National Academies Press.

For Grades K–3: What Was It Used For?

Purpose:

Students will begin to think about the purpose for different objects that they may or may not recognize.

Procedure:

1. Begin with a discussion about the familiar inventions in *Imaginative Inventions*. Then pose the question, "What are some other inventions you have used?" Some possible answers might be a toothbrush, hair dryer, or juice box. The key point is that these objects don't seem strange because students know the purpose of each.
2. Explain to the students that each team of two to three students will be provided with a household object that isn't often used today but that maybe their parents or grandparents used when they were young. The task is to come up with as many possible suggestions for what the object was used for in the time provided.
3. After five minutes, ask the students to switch objects with another team, thus allowing them to have another chance at developing their creative thinking. Have both groups of students combine and share their list of possibilities for the two different objects they had. Ask each group to explain the reasoning associated with their thoughts. Remind students that in an activity like this, there is no wrong answer and they should be supportive of each other. Last, student groups should select one answer that they have come to a consensus on and their reason for the answer.
4. The student groups should then present their object to the class and provide the answer reached by consensus, along with their reasoning. When all groups have finished their presentation, the teacher should provide them with the information card about each object asking whether they had considered the answer.
5. Lead a discussion about when in the past these objects were used and why they were considered good inventions at that time. What purpose did they serve? Why were they better than something else? What objects do we have that do the same thing today? Point out to students that all inventions have a lifespan during which they serve a specific purpose and then they are modified or something new is invented that will serve the same purpose in a better way. Ask them whether they can think of objects that have changed over time that still do the same thing (e.g., records to tapes to CDs to MP3 files).
6. Students can then brainstorm a list of objects they currently use that they think will become outdated or obsolete inventions years from now.

Materials

- A collection of different objects found around the house or in the garage that students do not immediately recognize (e.g., a handheld egg beater, egg separator, lobster measurer, orange peeler, shoulder pads).
- Information cards about each object assembled by the teacher from reference materials or websites.

Connecting to the Standards

This article relates to the following *National Science Education Standards* (NRC 1996):

Content Standards

Grades K–4

Standard E: Science and Technology

- Understanding about science and technology

Standard F: Science in Social and Personal Perspectives

- Science and technology in local challenges

National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academies Press.

For Grades 4–6: The Egg Drop

Purpose:

Students will design and test a container that protects a raw egg from breaking when dropped.

Materials

- A collection of building supplies (egg cartons, string, plastic cups, paper towel, toilet paper rolls, Styrofoam packing peanuts, cotton balls, tape).

Procedure:

1. Read the Internet Resources for detailed descriptions of the activity before beginning with the class. Read *So You Want to be an Inventor* to the class. While reading, focus on why the inventors developed or designed their particular device. For example, some inventions were designed to fill a need, such as the McCormick mechanical reaper.
2. Focus students' attention on the idea that some inventions are used to solve a particular problem and then pose the following problem for them to solve: "What type of container can you design to protect a raw egg from breaking when dropped from differing heights?"
3. Ask the students what they have seen fall and not break. Sample answers might be pillows or stuffed animals. Have the students think about other types of containers that are meant to protect their contents from breaking (e.g., egg cartons or CD cases).
4. Explain the guidelines of the challenge to the students, which include that they must build a container to protect an egg from breaking when dropped from a set location. Teachers will need to identify a location from which to drop the containers (e.g., a stairwell, balcony). Teachers can start with a set height, such as 3 ft. and then increase the height for future tries if they would like to make this a competition. Other guidelines for students are that they may only use the supplies provided by the teacher; should provide a detailed drawing of their invention prior to building it; and must conduct a trial with a golf ball first and then a raw egg. Teams should be between two and four students and are dependent on the classroom structure.
5. The design process will probably take several days to complete, with initial discussions led by the teacher (about force, motion). Students should then brainstorm what type of attributes the container would need to be sturdy enough to withstand a fall from a set height while also protecting or cushioning an egg inside. After the brainstorming session, students can begin designing and labeling the parts. They can also start to support their reasons for their design. Students can drop the golf ball into different materials to determine whether it absorbs the impact. The students should consider possible substitutions of ideas and trade-offs for their design. After developing a final idea, they should begin to build their container.
6. Once built, students should do a trial test using the golf ball to see whether their container holds up to the impact and force of hitting the ground. Students have one more opportunity to adjust their design, allowing for slight modifications. Last, students test their design using the raw egg.
7. Discuss what aspects of the design worked well and what aspects would be changed if they were to create a new model and why.

Internet Resources

Egg Drop
http://scienceolympiad.kulbago.com/Events%202010/Egg%20Drop%202010.pdf

Naked Egg Drop
http://sciencespot.net/Media/clubnkegg.pdf

The Egg Drop
http://books.nap.edu/openbook.php?record_id=4962&page=162

Connecting to the Standards

This article relates to the following *National Science Education Standards* (NRC 1996):

Content Standards

Grades 5–8

Standard E: Science and Technology

- Abilities of technological design
- Understanding about science and technology

Standard F: Science in Personal and Social Perspectives

- Science and technology in society

National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academies Press.