Preparatory Lesson

Technology in a Bag

Preparation: 10-15 minutes

Lesson: 30-40 minutes

Vocabulary

- Engineering
- Material
- Problem
- Solution
- Technology

Guiding Question:

- What are technologies and who designs them?

In this lesson, students will

- examine everyday examples of technology.
- discuss how these objects were designed to solve problems.
- discuss the materials that objects are made of.

Students learn that

- almost all of the objects we use every day are examples of technology.
- technology can be made of many different kinds of materials.
- engineers design technology to solve problems.

Prep Lesson

Objectives

Students will be able to

- identify everyday objects made by people as technology.
- identify the problem(s) that a particular object solves.
- identify the materials used to make an object.
- identify that objects are designed as a solution to a problem.
- identify engineers as the people who design objects.

Tie-In Science Content

- There are differences between natural things and those that are human-made.

Overview

Many students believe that technology only refers to things powered by electricity. In this lesson, each group of students gets a "mystery bag" containing an example of technology. When students open their bags, they may be surprised to see that they contain everyday objects like sponges, slippers, or bubblegum!

Students examine these everyday useful objects as examples of technology. They consider the needs that the objects serve and how they might work. They determine what materials each object is made from. A handout guides them to write or draw their thoughts about these questions. Then, in whole-class discussion, students learn that technologies are designed by engineers.

This lesson is intended as a preparatory lesson before students begin any *Engineering is Elementary* unit, not only *To Get to the Other Side: Designing Bridges*. If your students have already completed a Preparatory Lesson from another *Engineering is Elementary* unit, you may wish to skip this lesson. Similarly, if your students' performance on the assessment sheets *What is Technology?* {A-1} and *What is an Engineer?* {A-2} shows they are already familiar with the concepts of engineering and technology, you may wish to skip or abbreviate this lesson.

Background

Technology does not *only* refer to electronic devices. It refers, in the broadest sense, to every object, system, or process that has been designed or modified to be useful to some person or group of people. Dish sponges and dish soap, high heels and loafers, deck chairs and dining room chairs—all are things that people have designed and use for purposes from cleaning to looking nice to being comfortable.

Many students have never thought about the objects they use as technology. With help, however, they should be able to talk about the uses of objects like cups, shoes, and scissors. With a little imagination, identifying the problems that objects solve can be quite fun. A cup holds drinks so you don't make a mess. How would you drink milk if you did not have a cup?

The concept of processes and systems as technologies may be more difficult for students to grasp. Any series of steps that must be performed in a specific order to accomplish a task (e.g., making a cake, braiding hair) is a process. Any object with parts that work together to accomplish a task is a system. Even something like a glue stick (which includes a cap, a tube to contain the glue, and a knob you turn to push out more glue) has parts that work together; thus it is a system.

Students also may not have thought about the materials that things are made of. They are probably familiar with such materials as metal, wood, plastic, and cloth, but will need help recognizing that common objects are made of these materials.

And of course, there is the question of how these objects came to be. Even adults rarely stop to think of the people who made their shirts and tables, much less the people who actually designed them. Behind an object as familiar as a stapler are hosts of engineers who determined the shape it would take and the materials it would be made from—not to mention how it would put staples into paper. Even the small tables and chairs common in early elementary classrooms were designed by someone for the specialized purpose of providing work space for children.

The mechanics of how things work is only one aspect of the design of everyday things that students sometimes ask about. If you would like to read more, try these resources:

- How Stuff Works (http://www.howstuffworks.com)
- McCauley, David. *The New Way Things Work.* Houghton Mifflin Co. 1988.
- Llewellyn, Claire. *How Things Work.* Scholastic. 1996.

Student Learning

Look for the following misconceptions:

- Technology is only things that move.
- Technology is only computers.
- Technology is only things that use electricity.

Look for the following insights:

- Anything that people design to solve a problem is technology.
- Technology doesn't always use electricity.
- Engineers design technology.
- Technology can be made of lots of different materials.
- Some kinds of materials (like plastic) are examples of technology.
- Anyone can engineer.

Prep Lesson

Materials

For Each Group

- sample of an "engineered object" (see Preparation for examples)
- opaque bag or container (e.g., brown paper bag)

Copy for Each Student

- {P-1} *Technology Around Us*

Preparation

1. Collect simple, everyday engineered objects—enough to have at least one for each student group or table. For example, you might collect some of the following:

   - toothbrush
   - flashlight
   - plastic container
   - sponge
   - paper clip
   - stapler
   - scissors
   - pen
   - CD
   - slippers
   - pencil sharpener
   - glue stick
   - eraser
   - plastic bag
   - nail clippers
   - hair brush

2. Place each of the everyday engineered objects in a "mystery bag"—a brown paper lunch bag works best, so students will not see the objects before everyone is ready to examine them.

Teacher Tip

If you think your students are ready, you may want to include technologies that represent systems (something with multiple parts, such as a glue stick or mechanical pencil) or processes (a recipe card, for example).

Prep Lesson

Introduction

1. Explain to students that in this lesson they will learn about engineering and technology. Begin by asking students:

   - **What is an engineer?** *Someone who uses his/her knowledge of science, math, and creativity to design objects, systems, or processes to solve problems.*
   - **What is technology?** *Almost anything created to solve a problem or meet a need. Examples include pencils, cups, cell phones, processes to clean water, etc.*

   Record students' answers to the questions above on chart paper. It is okay if students do not know the answers to these questions yet; the activity will guide them to better understand both engineering and technology.

2. Encourage speculation by asking students:

   - **Do you know someone who is an engineer?**
   - **If so, what kind of work does that person do?**
   - **Do you think a shoe is considered technology? Why or why not?**

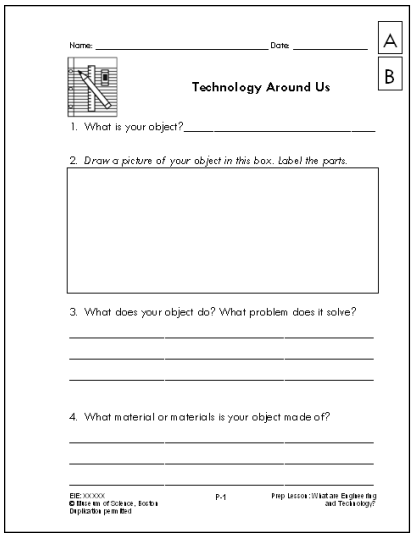
3. Introduce the activity by stating that your house is full of technologies and you have brought some to share today.

4. Show students a mystery bag that contains an example of technology.

5. Open the bag and pull out an object. Have students name the object that you pull out. Ask:

   - **Are you surprised that this is technology? Why or why not?**

6. Show students *Technology Around Us* {P-1}. Model how to fill out the sheet using your example technology.



Name: _____ Date: _____ A B

Technology Around Us

1. What is your object?_____

2. *Draw a picture of your object in this box. Label the parts.*

3. What does your object do? What problem does it solve?

4. What material or materials is your object made of?

EIE: XXXXX P-1 Prep Lesson: What are Engineering and Technology?
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Prep Lesson

Teacher Tip

Save the chart with students' responses to the questions "What is an engineer?" and "What is technology?" for reflecting and revisiting later.

Activity

1. Divide the class into small groups and give one "mystery bag" to each group. Have students open the bag, pass the object around, and examine it.

2. Ask students to think about what problem (or problems) their technology solves and what materials it is made of. Have students record their findings on *Technology Around Us* {P-1}.

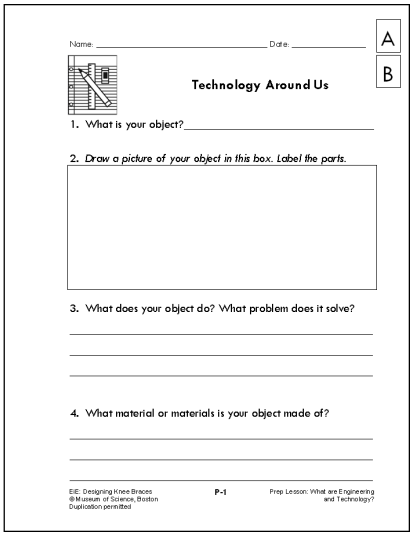
3. Have students from each group talk about their technology. As a class, discuss:

   - **Is the object natural or human-made?**
   - **What material(s) is it made of?**
   - **What problem does it solve?**
   - **How else could you use it?**
   - **What other materials could it be made of?**

4. Help students connect technologies with engineers. Ask:

   - **Who do you think creates these technologies?** *Students may suggest scientists, inventors, or engineers.*

   Explain that engineers are the people who create technologies. Tell students that they will learn much more about engineering and technology as they complete the activities in this unit.



Name: _____ Date: _____ A B

Technology Around Us

1. What is your object?_____

2. *Draw a picture of your object in this box. Label the parts.*

3. What does your object do? What problem does it solve?

4. What material or materials is your object made of?

EiE: Designing Knee Braces © Museum of Science, Boston Duplication permitted P-1 Prep Lesson: What are Engineering and Technology?

Reflection

1. Return to the students' responses to the introductory questions "What is an engineer?" and "What is technology?"

2. As a class, cross off ideas that don't make sense anymore and add to the lists with definitions, ideas, and examples. It is okay if students' answers still are not perfect—they will be learning much more about engineers and technology in the coming lessons.

3. Emphasize that even though we might not have realized it before, nearly everything we use, work with, or wear is engineered. Someone had to think of how to design that object to solve a particular problem—*technology is all around us*.

Extension and Reinforcement

Artisans vs. Technicians vs. Engineers
Talk about who would be considered an artisan or craftsman, a technician, or an engineer. Ask students if they've heard of these terms and if they can give examples of each type of job.

Explain to students why there is often confusion around these roles:

- Sometimes a person can do multiple kinds of work. For example, an electrician may install wiring as well as fix problems with it.
- Engineers may build prototypes and fix problems with their prototypes, but this is not the same as building the finished product itself or fixing an existing technology.

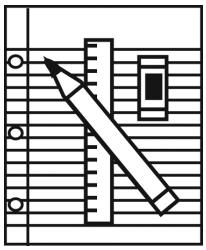
Create a list for each type of job. Examples might include:

- Artisan: a tailor, carpenter, or steelworker
- Technician: a mechanic, electrician, or computer-repair person
- Engineer: someone who uses math, science, and creativity to design new technologies or improve existing technologies

Name: _____ Date: _____

A

B



Technology Around Us

1. What is your object?_____

2. Draw a picture of your object in this box. Label the parts.

3. What does your object do? What problem does it solve?

_____

_____

_____

4. What material or materials is your object made of?

_____

_____

_____