

Duration: 50 minutes

MATERIALS

Large container of apple juice
(3.7 L)
Empty container of apple juice
(3.7 L)
Class set of apple juice boxes
Funnel
Exacto knife
Newspapers
Math journals

RESOURCES

Book: The Three R's: Reuse, Reduce, Recycle by Nuria Roca
Blueprint For Life/Work Designs – The Quick Reference Guide

INSTRUCTIONAL METHODS

Direct Instruction
Cooperative Learning
Brainstorming
Discussion
Small Group Discussion



LESSON OBJECTIVES

- ✓ Students will discover how work contributes to individuals and the community (BP 6.1)
- ✓ Students will understand that an Environmental Engineer plans, designs, and evaluates solutions for waste management
- ✓ Students will demonstrate an understanding of measurement as a process of comparing by:
 - identifying attributes that can be compared
 - ordering objects
 - making statements of comparison
 - filling, covering, or matching
- ✓ Compare sets containing up to twenty elements to solve problems using:
 - referents (known quantity)
 - one-to-one correspondence
- ✓ Estimate quantities to twenty by using referents

BACKGROUND INFORMATION

Professional Engineers and Geoscientists are involved in every part of our daily lives ... the houses we grow up in and schools we learn in, the cars we drive and roads we travel, the natural resources we use and the environment we affect. We depend on engineers and geoscientists to ensure we have clean drinking water, efficient treatment of wastewater, and electricity at the flick of a switch.

Environmental engineering is a type of engineering that is concerned with keeping the environment safe for the future. Environmental engineers plan, design, and evaluate solutions for waste management, air quality management, automobile emissions and alternative fuels, as well as the development of energy alternatives and energy conservation, transportation, and water resources supply and treatment. They may also help other engineers develop environmentally friendly food packaging, so that we are not harming the environment.

One of the best ways to manage our waste is to reduce the amount of waste going to our landfills. This is something that every one of us can do to help our environment.

MOTIVATIONAL SET

Read the book: The Three R's: Reuse, Reduce, Recycle by Nuria Roca. Discuss how important it is that we all find ways to stop creating so much waste. Explain that today we are going to be environmental engineers to find a way to use less packaging when we drink juice. Ask students if they have ever used a juice box before? Tell them that today we are going to find out if we throw out less garbage if we buy a large container of juice or if each drink from a juice box.

PROCEDURE

1. Show students a large container of apple juice (3.7L). Pass the container around so that students can get a sense of how much juice is in it by the weight of the container. Pose the question: "I wonder how many glasses of juice could be poured from this container?" Students can share their predictions.
2. Pass out an apple juice box to every student. Have them feel how heavy the juice box is.
3. At the front of the class set the container of apple juice next to the apple juice boxes. Pose the question: "How many juice boxes would it take to fill an empty large container of apple juice?"
4. Give students time to discuss this problem in small groups. Pass out paper so that they can record their thinking. Have students estimate and share their predictions. Record on chart paper.
5. Begin to funnel the apple juice from the juice boxes into the container. As you begin to fill the container, ask the students if they would like to change their prediction. Have students notice that having more information helps them to make a more accurate estimation.
6. Continue to pour the juice from the juice boxes into the container until it is at the same level as the original large container.
7. Record how many juice boxes it took to fill the container to the same level. Discuss with students.
8. Discuss whether buying a single large container or several juice boxes uses less packaging. Would there be more or less to take to recycling if we bought large containers instead of juice boxes? Discuss.
9. Lay out newspapers onto student's desks. Pass out empty juice boxes. Walk around and slice open each juice box for the students. Students peel back the box and look inside to see how juice boxes are made. Have them notice how many layers of different materials are used to make a juice box. Ask students to be environmental engineers and brainstorm another way to make juice boxes that uses fewer materials and ones that are easier to recycle. Record their ideas on chart paper.
10. Students draw what they learned in their math journals.

DEBRIEF

1. Pose the question: As an environmental engineer, what would your recommendations be based on our experiment?

(Example responses: It is better to buy products with less packaging. It is better to buy in larger quantities than in lots of smaller quantities. There is less recycling and waste for a large container of juice, than for individual juice boxes.)

2. Can you name other workers that protect our environment?
3. Why might someone become an environmental engineer or work in another profession that protects our environment?

ASSESSMENT / INDICATORS

ASSESSMENT RUBRIC

3	EXCEEDING	Math journal is complete with no significant errors.	Student made reasonable and accurate predictions.	Student made accurate observations about comparing waste minimization between a large apple juice container and juice boxes.	The student was actively engaged in exploring the impact of work on personal, social, economic and environmental problems.	The student was actively engaged in understanding how work can satisfy personal needs and how work can contribute positively to society.
2	MEETING	Math journal has all areas filled in with few significant errors.	Student made reasonable predictions.	Student recorded observations about comparing waste minimization between a large apple juice container and juice boxes.	The student was mostly engaged in exploring the impact of work on personal, social, economic and environmental problems.	The student was mostly engaged in understanding how work can satisfy personal needs and how work can contribute positively to society.
1	BEGINNING TO MEET	Math journal is mostly incomplete and contains significant errors.	Student made unreasonable predictions.	Student recorded observations about comparing waste minimization between a large apple juice container and juice boxes are incomplete or have significant errors.	The student was rarely engaged in exploring the impact of work on personal, social, economic and environmental problems.	The student was rarely engaged in understanding how work can satisfy personal needs and how work can contribute positively to society.
0	NOT YET MEETING	Little or no attempt at completing math journal.	Student made no predictions.	Student made little or no attempt to record observations about comparing waste minimization between a large apple juice container and juice boxes.	The student was not engaged in exploring the impact of work on personal, social, economic and environmental problems.	The student was not engaged in understanding how work can satisfy personal needs and how work can contribute positively to society.

This lesson plan is available for download at www.apegs.sk.ca (click "About Us", "Youth Programs").