



Lesson Plan: Recycle, Grade 5 Science and Technology

Activity

Life cycle analysis of a common plastic water bottle.

Introduction

The products we use every day have a life cycle that often begins with digging up or cutting down natural resources and ends with the processing or final disposal of the finished products once they are no longer needed or wanted. This is called a “cradle to grave” life cycle. A life cycle analysis can be used to measure the environmental and social costs at each stage in a product’s life – from creation through distribution, use, processing and/or disposal. A life cycle analysis measures the amount of energy and resources used, and the pollution created throughout the product’s life. By investigating the life cycle of a common plastic water bottle, students will gain a better understanding of the importance of the Region’s Blue Box program and identify actions that society and individuals can take to mitigate or eliminate negative impacts associated with the manufacturing of goods.

Curriculum Connections

Science and Technology, 2022 (revised) and Social Studies, 2018 (revised)

Grade 5

- Strand A: STEM Skills and Connections
- Strand C: Matter and Energy

Learning Objectives

1. Identify where Recycle falls within the Region’s Waste Hierarchy
2. Define and explain recycling
3. Examine how plastic water bottles are made
4. Construct a drawing of the plastic water bottle life cycle
5. Identify potential environmental, social, and human health impacts
6. Recommend personal actions that society and individuals can take to mitigate or eliminate negative impacts associated with plastic water bottles

Resources Provided

- Worksheet
 - Lifecycle analysis of a common plastic water bottle
- Videos:
 - Durham Region’s Material Recovery Facility
 - Durham Region’s five “Rs”

The Regional Municipality of Durham - Waste Management Services

If this document is required in an accessible format, please contact schoolprograms@durham.ca

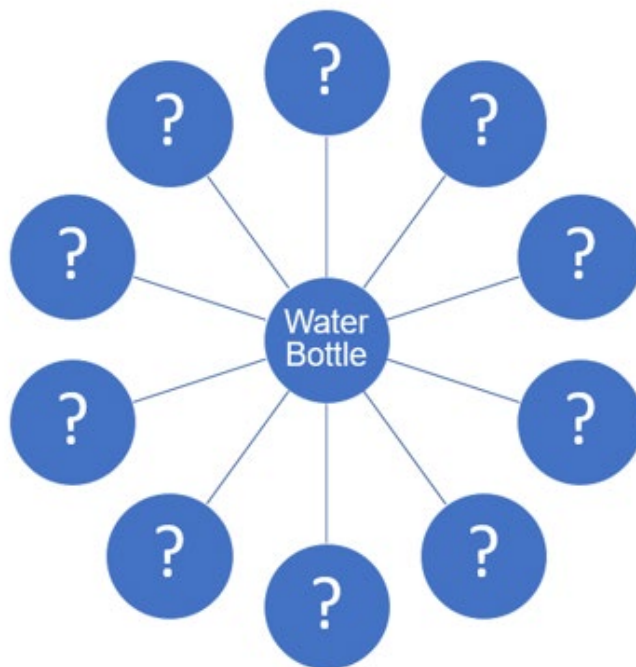
Activity Instructions

Students will investigate the various processes used in the manufacturing of a plastic water bottle and assess the social and environmental impacts associated with these processes.

1. Introduce the class to Durham Region's five "Rs" by watching the provided video.
2. Highlight and explain the fourth "R" Recycle and ask the class the following questions:
 - a. How many of you recycle at home?
 - b. How many blue boxes does your family use?
 - c. How do you sort your material?
 - d. Why do you think it is important to recycle?
 - e. Do you know where your blue box materials go after they are picked up from the curb?
3. After the students have provided their answers, show them the Durham Region's Material Recovery Facility video.
4. Introduce students to a life cycle analysis.
5. As a class, brainstorm what you know, and what you would like to know, about the life cycle of a plastic water bottle – from natural resource extraction to final processing/disposal. This should include the water inside the bottle, labels on the bottle, and any additional packaging.

Examples include:

- How is plastic made?
- Are there additional materials required for packaging and marketing?
- How do water bottles get from manufacturers to retail outlets?
- What happens to the plastic bottle once it is placed in the Blue Box?



6. Divide the class into small groups. Each group will research and answer the following questions and complete the life cycle worksheet provided in the resources folder.
- What natural resource(s) are required to make all the parts of the plastic water bottle? Think about what is inside the bottle and all the pieces of the packaging.

Most plastic water bottles are made from fossil fuels like crude oil and natural gas. The water we use to fill the bottles is also a natural resource. These bottles often have a paper label which are made from paper, using another natural resource – trees – and soil is used to grow these trees.

- What program(s) are in place to keep this material out of the garbage?

Blue Box (recycling) programs are in place to divert this material away from the garbage.

- Where does the Region bring this material to be processed?

Blue box materials are brought to the Materials Recovery Facility, located in Whitby, for further sorting and processing before sold to be made into something new.

- What other items can you make using recycled plastic water bottles?

Examples of items that plastic bottles can be recycled into include new plastic bottles, plastic toys, plastic decking and lawn furniture, and clothing.

- Discuss and list potential environmental, social, and human health impacts when manufacturing, purchasing, using, and processing plastic water bottles.

Environmental considerations include the loss of natural resources, pollution from extraction of natural resources, manufacturing and transporting plastic water bottles, contribution to climate change, and potential litter and migration of plastics into the natural environment if they are not properly managed.

Social considerations include the cost of bottled water versus tap water, where the water is coming from, access to clean drinking water in the community where the water is being taken, lack of infrastructure to manage plastic bottles after use, and cost of collection and processing.

Human health considerations include pollution from extraction of natural resources, manufacturing and transportation of plastic water bottles, consumption of microplastics as the plastic breaks down in the natural environment if the bottles are not managed properly, and improper handling and storage once opened that may promote bacteria growth.

- Discuss why people may still purchase and use single-use disposable water bottles despite the environmental, social, and human health impacts.

This might include convenience, marketing, lack of clean drinking water, emergency situations, etc.

- g. How does recycling help protect the earth and conserve resources?
7. Each group will recommend actions that society and individuals can take to mitigate or eliminate negative impacts associated with plastic water bottles and come up with a slogan to promote their idea. Their ideas and final slogan will be shared with the class.

Summary

When you cannot reuse something, you must decide whether it can be diverted from the garbage a little longer by making it into something new. Recycling helps to retain value associated with the material for a longer period, reduces the amount of new natural resources required to make new materials, and supports a circular economy.

Expanded Curriculum Connections

Grade 5, Science and Technology, 2022 (revised)

A: STEM Skills and Connections

A1. STEM Investigation and Communication Skills

- A1.1 use a scientific research process and associated skills to conduct investigations
- A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes

C. Matter and Energy

C1. Properties of and Changes in Matter

- C1.1 assess the impacts on society and the environment of various processes used in the manufacture of common products
- C1.2 assess how the use of specific materials in the manufacturing of common products affects the environment, and identify actions that society and individuals can take to mitigate negative impacts