

Water Bottle Life Cycle: Break the Cycle



One of the most fundamental concepts in sustainability science is the concept of a product's life cycle. The life cycle of a product begins when the raw ingredients of a product are gathered and ends when the product is no longer used for its original purpose. The term cradle-to-grave is used to describe products that are headed for the landfill, while cradle-to-cradle is used to talk about product life cycles in which the product is re-purposed in some way. Bottled water is an unsustainable, everyday product which can easily be replaced with better alternatives. In fact around 30% of bottled water actually comes from the tap!

This 50-minute lesson will allow students to explore the concept of a product life cycle analysis through the example of bottled water. After learning about the life cycle of a water bottle, students can debate and discuss the merits of different ways of breaking the cycle through reducing, recycling, and re-using. Initially, students will start this lesson by predicting the outcome of a blind taste test of bottled water vs. tap water. For a final evaluation students can be assigned to create the life cycle of tap water (or another product).

Websites are provided for students to research where their water is "born" and a video of where it goes once they've used it.

Before beginning, students should: have some understanding about the link between energy use and the carbon cycle as well as an understanding that plastic is made from petroleum products. For those with more background in energy concepts there is an opportunity to talk about where energy is lost in the system and how reducing, recycling and reusing have different energy requirements.



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Essential Question: Why should we care about the lifecycle of a product?

The objective of this lesson is to introduce the concept of a lifecycle and understand how to combat linear (cradle to grave) waste cycles.

At the end of the lesson, students will be able to:

- 1. define the terms “product lifecycle”, “linear”, “cradle to grave” and “cradle to cradle”*
- 2. describe the process by which bottled water is created*
- 3. compare and contrast bottled water vs. tap water in terms of sustainability.*

Standards Addressed: Science Strand 1: Inquiry Process, Concept 1: Observations, Questions and Hypotheses; Science Strand 3: Science in Personal and Social Perspectives, Concept 2: Science and Technology in Society

Themes: Systems thinking, tradeoffs, cascading effects

Skills: Evidence based thinking, oral communication

Key Vocabulary

Product Life Cycle: *the cycle manufactured products go through, from introduction to disposal.*

Linear: *arranged in or extending along a straight line.*

Cradle to Cradle: *a systems design approach for products that is cyclical.*

Cradle to Grave: *a design approach for products from the beginning to disposal, a linear approach.*

Materials Needed

- Cups and dispensers for tap and bottled water
- Access to tap and bottled water
- Break the Cycle PowerPoint Slide Presentation pdf
- Water Bottle Fact Sheet pdf
- Copies of the Water Bottle Life Cycle pictures (enough for each team of students) pdf
- Internet for videos, if desired.

Safety Precautions

Make sure each student gets their own cups in the taste test for hygienic purposes.

Teaching Instructions

Advanced Preparation

Before class, prepare the taste test using bottled and tap water in identical containers (e.g. plastic cups). Review the Break the Cycle PowerPoint slide presentation to guide the lesson.

Engagement

Begin by polling students on where they get their drinking water. How many use tap water? How many use bottled water? Are there different occasions when they will use one or the other? Which do they think tastes better? Introduce the taste test that will occur later. Have

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each student predict which will win: tap or bottled water. Save these numbers for later.
<p>Exploration</p> <p>Share the bottled water facts (slide 2). Have students form teams and hand out the water bottle life cycle photographs. Have the students arrange them in the appropriate sequence, identifying what is happening in each photograph. For more advanced students, you might have them identify forms of energy being used.</p>
<p>Explanation</p> <p>Walk through the PowerPoint slide presentation and pause at the life cycle of the water bottle to have a discussion about each of the stages. How many students got them all? Use the Water Bottle Fact Sheet when talking about each stage.</p>
<p>Elaboration</p> <p>As you go through the next slides ask the students for their opinions. How do the students think they could break the cycle? What do they think is the best way to break the cycle? Use the PowerPoint slides to talk about the difference between reduce, recycle and reuse. Which method uses the most energy? The least energy? Which do they prefer? Why do they think that so many water bottles go to the “grave”? Do they think it matters?</p>
<p>Exploration/Elaboration</p> <p>Conduct the water taste test and tally the results.</p> <p>Discuss the results with the class. Were their predictions correct? Why or why not?</p> <p>How do the perceptions of water quality and taste impact the desire to purchase bottled water vs. tap water?</p>
<p>Evaluation</p> <p>Have students create a life cycle of tap water in their area, or of any other product.</p>

If there is extra time, you can use the links listed in the Additional Resources and at the end of the PowerPoint to discover where the tap water comes from and watch the video about where it goes.

Additional Resources

To find out where the water in your area comes from, see the following websites:

<http://www.nature.org/all-hands-on-earth/water>

<http://water.epa.gov/drink/local/>

Video: Where does Tap Water GO?

<http://www.youtube.com/watch?v=oaXth88i7rk>

For more information on water treatment:

<http://www.epa.gov/ogwdw/watertreatmentplant/flash/index.html>

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