



Microplastics: What, Where, Why? With The Academy of Natural Sciences of Drexel University

Objectives

- Learn about microplastics and their impact on the environment
- Identify the different types of microplastics and understand the consequences of their use

Next Generation Science Standards (NGSS) addressed

- 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or cost.
- MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Materials

- Plastic items such as straws, water bottles and utensils
- Infographics
- Take-home challenge worksheet



Vocabulary List

- **Microplastics:** Tiny pieces of plastic smaller than 5 mm (0.2 Inches) in size
- **Plastic:** A synthetic material made from various organic polymers that can be molded into shape and used for many different purposes
- **Pollution:** The presence or introduction into the environment of a substance or thing that has harmful or poisonous effects
- **Biodegradable:** Capable of being decomposed by bacteria or other living organisms
- **Landfill:** A place where waste is disposed of by burying it in the ground
- **Ocean gyres:** Areas in the ocean where the water moves in a circular motion and debris accumulates

Background information

Microplastics are small pieces of plastic debris that measure less than 5 millimeters in size. They are the result of the breakdown of larger plastic items and can be found in the environment, including oceans, rivers and even in the air. Microplastics are a growing concern due to their potential negative impact on human health and the environment.

Microplastics can be divided into two main types: primary and secondary. Primary microplastics are intentionally manufactured at a small scale, such as microbeads found in personal care products, whereas secondary microplastics are formed through the breakdown of larger plastic items due to weathering, degradation and mechanical abrasion.

The potential negative effects of microplastics on the environment and human health are well documented. Studies have shown that microplastics can have harmful effects on marine life, as well as contribute to the transfer of chemicals and toxins up the food chain. In addition, there is emerging evidence that microplastics can negatively impact human health, as they can be ingested through contaminated food and water and potentially cause physical harm.



Introduction (5 minutes)

Begin the lesson by asking the students if they know what plastic is and how it is used. Show them some plastic items such as straws, water bottles and utensils. Brainstorm and write on the board EVERYTHING made of plastic that the students can think of (and try to keep up!)

Ask them if they can think of any negative consequences of using plastic.

Main Lesson (20 minutes)

Introduce the topic of microplastics by showing the students a sample of microplastics. Explain what microplastics are and how they are formed. Show pictures of different types of microplastics, including microbeads and microfibers, and explain how they end up in the environment. Show the attached infographic.

Discuss the different ways that microplastics can harm the environment, including how they can be ingested by animals and pollute the water and soil. Some examples of different types of microplastics:

- Microbeads are small plastic beads that are often used in personal care products such as exfoliating scrubs and toothpaste. They can be washed down the drain and end up in waterways, where they can be ingested by marine life.
- Microfibers are small plastic fibers that shed from clothing and textiles during washing and drying. They end up in wastewater, which can then be released into the environment.
- Fragmented microplastics are small pieces of plastic debris that have broken off from larger plastic items, such as bottles and containers. They can be carried by wind and water currents and end up in soil, waterways and oceans.

Show students pictures of ocean gyres, where plastic and other debris accumulates in large amounts. Share the infographic.

After discussing the negative consequences of microplastics, explain to the students that they can make a small change in their daily routine to help reduce the use of plastics. Challenge them to make a list of five items that they can replace with biodegradable or reusable alternatives. Give them a few minutes to brainstorm and then have them share their ideas with the class.



Conclusion (5 minutes)

Pass out the take-home challenge worksheet and discuss before departing:

- What plastic items are most abundant in your home?
- List 10 items and categorize whether they represent microbeads, microfibers or will deteriorate into fragmented microplastics.
- Research a way in which you could reduce your plastic use or the number of items with microbeads and microfibers. Are items with a longer lifespan better than repurchasing an item? What does biodegradable mean?

Questions to ask during activity

- How do microplastics affect animals and marine life?
- What are some ways that microplastics can be ingested by humans?
- What can we do to reduce the use of plastics in our daily lives?
- Can you think of any biodegradable or reusable alternatives to plastic items?
- What are some challenges to reducing plastic waste and pollution?
- How can individuals and communities work together to address the issue of microplastics?
- What can we learn from the issue of microplastics about the importance of sustainability and environmental stewardship?

Level Up: Higher level thinking prompts and questions

- Divide the class into teams and have them debate the pros and cons of using biodegradable or reusable alternatives to plastic products, or whether companies should be held accountable for their plastic waste. This can help students develop critical thinking and persuasive communication skills.
- Have students create a visual art project that highlights the negative effects of microplastics on the environment. This can be a powerful way to raise awareness and encourage action.
- Challenge students to identify the most significant ways that microplastics are affecting the environment and discuss the possible solutions.



Background info

1. "What are microplastics?" (2021). National Oceanic and Atmospheric Administration. Retrieved from <https://oceanservice.noaa.gov/facts/microplastics.html>
2. "Microplastics" (2021). National Geographic. Retrieved from <https://www.nationalgeographic.com/environment/2019/04/microplastics-defined/>
3. "Microplastics" (2021). Environmental Protection Agency. Retrieved from <https://www.epa.gov/microplastics>
4. "Microplastics" (2021). World Wildlife Fund. Retrieved from <https://www.worldwildlife.org/threats/microplastics>
5. "Ocean gyres" (2021). National Oceanic and Atmospheric Administration. Retrieved from <https://oceanservice.noaa.gov/facts/gyres.html>



CHAMPIONS

KNOW YOUR MICROPLASTICS

**MICROPLASTICS ARE PIECES OF PLASTIC
5 MILLIMETRES OR SMALLER.**



COMMON MICROPLASTICS:

FRAGMENTS



Small pieces of a larger plastic object.

FIBRES



The most common type of microplastic. Plastic strands from clothing.

FOAM



Pieces of food containers and coffee cups.

NURDLES



Plastic pellets usually used in manufacturing.

MICROBEADS



Beads used in soaps and cosmetics. Now labelled “toxic” in Canada, soon to be banned in personal care products. Look for “poly” on the label.



MACROPLASTICS ARE ANY PLASTICS LARGER THAN 5 MILLIMETRES.

Examples: plastics bags, bottle lids, bottles, food wrappers, etc.



Image courtesy of www.seasustainability.com

