

Sixth Grade: Innovations and Inventions

Standard

6E6. Obtain, evaluate, and communicate information about the uses and conservation of various natural resources and how they impact the Earth.

6a. Ask questions to determine the differences between renewable/sustainable energy resources (examples: hydro, solar, wind, geothermal, tidal, biomass) and nonrenewable energy resources (examples: nuclear: uranium, fossil fuels: oil, coal, and natural gas), and how they are used in our everyday lives.

6b. Design and evaluate solutions for sustaining the quality and supply of natural resources such as water, soil, and air.

6c. Construct an argument evaluating contributions to a rise in global temperatures over the past century. (Clarification statement: Tables, graphs, and maps of global and regional temperatures, and atmospheric levels of greenhouse gases such as carbon dioxide and methane, should be used as sources of evidence.)

Teaching Tips

Preparation Collect a variety of used items for creative re-use. There is no particular Materials list.

Directions for this lesson and design challenge (on next page) are written for teachers. Provide students with the Eco-Engineering Challenge Lab Report Form from the appendix. Break students into groups of 3-4 for the Challenge.

Phenomenon: Present phenomenon in lesson without explanation before or after students view it.

What Do you Notice? Engage students in writing a tentative explanation (or making a labeled drawing) that tells what they observed.

What Do you Wonder? Engage students in asking their own questions, which will form the basis for their research.

Student Research After each student writes a question, consider placing each question on a sticky note, grouping them in categories, and allowing students to learn more in small groups according to their interests. A curated collection of articles is provided for use in small groups, using the Jigsaw protocol. <https://www.jigsaw.org/>

Teacher-Directed Activity Engage students in this PBS Lesson Plan: How Student Inventors Can Solve the Earth's Plastic Problems, showing its 6 minute video explaining plastic life cycle as well as the 9.5 minute video evaluating the limited effectiveness of recycling plastics. Then share the Fast Company article about 10 clever student inventors, for inspiration. Frame the eco-engineering challenge as an invention or an innovation (a change in practice or new way of doing something that does not necessarily require invention). Break the class into teams of 3-4 for the Challenge. <https://www.pbs.org/newshour/extra/lessons-plans/lesson-plan-how-student-inventors-can-help-solve-the-earths-plastic-problem/> This is the article included in the lesson: Clever Student Inventions that Reduce Waste <https://www.fastcompany.com/3060571/10-clever-student-inventions-that-could-reduce-our-waste>

Zero Heroes Lesson Activity This is an Eco-Engineering Challenge to innovate or invent a way to reduce plastic waste.

Revised Explanation Allow students to return to and revise their initial explanations of the phenomenon. Clear up any misconceptions about plastics (students should know they are made from fossil fuels), the problem single-use plastics present, excess packaging, the limitations of plastic recycling (downgraded quality and types that cannot be recycled).



6th Grade Eco-Engineering Challenge: Innovating to Reduce Waste

The Phenomenon



credit: Plastic Pollution Coalition

What do you notice? (tentative explanation)

Show the image and engage students in writing about what they notice. This will serve as their tentative, initial explanation. At the end of the lesson, allow students to revise and refine their explanations to reflect what they have learned. Explanations may take the form of labeled drawings. Distribute copies of the Investigation lab report template in the appendix.

What do you wonder? (student questions)

Engage students in asking their own questions about the unexplained phenomenon. These questions will form the basis for student research. Use copies of the student lab report template in the appendix.

Curated Articles for [Research Jigsaw](http://www.jigsaw.org) www.jigsaw.org

Boyan Slat Cleaning the World's Oceans video

<https://www.youtube.com/watch?v=hdZxYQmu8kE>

Genius Inventions to Stop Us from Using So Much Plastic

<https://www.usatoday.com/story/money/2019/06/17/19-genius-inventions-that-can-stop-us-from-using-so-much-plastic/39358833/>

Earth Force Sustainability Challenge

<https://earthforce.org/csc/>

Lynne Cherry's Young Voices for the Planet

<https://www.youngvoicesfortheplanet.com/>

Eco-Engineering Challenge: Prevent, Reduce or Remove Plastic/Packaging Waste

Students have invented some of the most effective ways to reduce waste by preventing it, cleaning it up, or providing durable alternatives to single-use items. Wasteful packaging, harmful pollution, and persistent materials that don't decompose are some of the problems. Read about some inspiring innovations, identify a problem, and design a solution. Build and test a prototype (or a small-scale model, if needed) to find out how effective your idea could be. Refine the design based on the test.

Constraints

Time Allotted: _____

Materials: Students should find and use recycled, repurposed or biodegradable materials for their project.

Materials Needed (will vary by project)

Collection of used, recycled, repurposed or biodegradable materials such as paper, fabric, foil, containers

Tools: Scissors, pliers, drill and bits (if available)

Fasteners: tapes, glue, clips

Structural elements: used wire hangers, dowel rods, corrugated cardboard

Revised Explanation

Allow students to return to and revise their initial explanations of the phenomenon.

