Create It

Grades: 6
State Standards: Ecology (life Sciences) 5.b. Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
Groups: 2-4 per group
Preparation Time: 25 minutes
Activity Time: 90 minutes
Key Words: global warming, greenhouse effect, recycle, reuse, engineering design, pollution, climate, trash, landfill

Objectives

Students will:

- Reuse discarded items to create a working model
- Understand and explain how reducing waste conserves natural resources
- Reduces landfill waste and saves wildlife habitat

Materials

Each group needs:

- duct tape, 12 inches
- string, 12 inches
- glue or hot glue gun

To share with the entire class:

- aluminum cans (note: cans are very sharp when cut and may need to be omitted from the materials list or used with a rule that the aluminum cans cannot be cut)
- used copy/scrap paper
- newspaper
- used cardboard
- egg cartons
- (rinsed out) plastic bottles
- chip bags
- (rinsed out) drink boxes
- other recyclable/used items of choice

Background

Our landfills are filling up faster and faster and without adequate controls emissions increase. Engineering plays an important role in our environment. Designing projects from a global perspective including low-energy manufacturing, renewable sources and utilizing recyclables and reusable materials is critical for a cleaner, healthier planet.

Our climate is changing as we speak, and within your lifetime, the Earth could become 2-4°F warmer! The Earth has already warmed by about 1°F during the past 100 years. 98%

of scientists think this is due to human activities and impacts on the planet, and they expect the average global temperature to increase an additional 2-6°F over the next one hundred years. While we do not know exactly what the result of these small changes in temperature might be, scientists have made some predictions. Rising temperatures could melt ice caps at the Earth's poles, causing sea levels to rise, which in turn could cause flooding in coastal regions. Plants and animals in fragile ecosystems may find it difficult to adapt to warmer temperatures. People will also have to get used to an increased number of hot days each year.

Fortunately, policy makers and engineers are taking precautions to try to slow down global warming. The release of greenhouse gases is an important thing to remember in engineering design. We need to be aware of how much pollution results from the manufacture of all the products that engineers design. Today, you will all be engineers responsible for designing a product entirely out of used items. How does this help keep pollution levels low? It helps save our resources — such as trees, oil and coal — that would be used to build a new product as well as puts fewer products in our landfills, which lowers the greenhouse gas caused by decomposing garbage.

How can we prevent landfills from needing to be built and prevent pollution? Can you think of things we do every day that create greenhouse gas, such as carbon dioxide and methane? (Possible answers: Driving our cars or using too much electricity made by fossil fuels. See the associated lesson for more ideas.)

Engineers can help us rethink the way we do these things so that we can reduce the amount of greenhouse gases we produce. For example, engineers are designing more efficient cars that use less gas and produce fewer greenhouse emissions. Engineers can also create products that can be reused more often, or they can create products using materials that have already been used by other people — just like you will do today.

Vocabulary
Climate Change: The change in long-term weather patterns; changes can cause warmer or colder temperatures; annual amounts of rainfall or snowfall can increase or decrease.

Global Warming: Refers to an average increase in the Earth's temperature, which in turn causes changes in climate; a warmer Earth may lead to changes in rainfall patterns, a rise in sea level, and a wide range of impacts on plants, wildlife, and humans.

Greenhouse Gas Effect: The effect produced as greenhouse gases produced from human activities allow energy from the sun to pass through the Earth's atmosphere, but prevent most of the outgoing heat from the surface and lower atmosphere from escaping into outer space.

Procedure

Gather all necessary materials. (Note: put a large container in class for students to start filling up a couple weeks before with items they would have thrown away or recycled. Make sure cans are rinsed and no food items go into the materials box.) Discuss how recycling effects greenhouse gases and the importance of reducing pollution due to global climate changes. Make copies of the Your Carbon Footprint Worksheet, one per group.

With the Students

Divide the class into groups of 2-4 students each and give them the problem statement: *As a group, build a product with the following criteria:*

- Use only materials listed in the materials list. (These should all be reused materials, plus the limited amount of bonding materials.)
- The product must be useful (that is, not be an artistic sculpture, decoration, etc.).
- A minimum of three items must be used.

Ask the students to brainstorm ideas in their groups and create a blueprint or instructional drawing of their design. Give them a limited amount of time, such as 15 minutes. After their drawing is reviewed by the teacher, they can start construction. Once every group's product is finished, ask each group to present their design and how it can be used to the entire class. (Note: students should trade off speaking roles within their group; i.e., one student tells the name of the product, another student describes what it is used for, etc.).

Discussion

In design groups, have the students engage in open discussion on ideas for their product design. Remind students that in brainstorming, no idea or suggestion is "silly." All ideas should be respectfully heard. Take an uncritical position, encourage wild ideas and discourage criticism of ideas. Ask them to write down all their ideas and then agree on a design together.

Have the students reflect on the waste that they create on a daily basis. Ask them:

- How much waste do you think you create each day?
- What kinds of things do you throw away?
- Which of these could be recycled instead of thrown away?
- How could you change your habits to reuse more materials and recycle more materials?

Assessment

After this activity, students should be able to:

- List harmful consequences of global warming.
- Explain how recycling and reusing reduces habitat loss from landfills
- List ways to reuse items before throwing them away.
- Use the engineering design process to create a useful product from reused materials.

Your Carbon Footprint

Your "Carbon Footprint" is a calculation that tells you how much carbon dioxide you produce. Since carbon dioxide is a greenhouse gas, this worksheet can help you see how you contribute to global warming.

Family Survey
Answer each question for a yearly total (multiply a monthly total by 12).

1. Number of miles driven per year _____ X (multiplied by) the vehicle's average gas mileage _____ = _____ gallons of gasoline used. (Do this for each vehicle your family owns)

_____ X _____ = _____

_____ X _____ = _____

_____ X _____ = _____

Total _____

2. Number of miles of air travel per year for your family per year _____ .

3. Average number of miles your family travels by bus/other mass transit per year_____

4. Kilowatt-hours of electricity used _____ .
(Look at your utility bill to find out a monthly amount and multiply by 12.)

5. Therms of natural gas used _____ .
(Look at your utility bill to find out a monthly amount and multiply by 12.)

6. Gallons of propane or bottled gas used _____

7. Other sources of energy your family uses?

8. Total number of people living in your household _____

Your "Footprint" on the Global Environment – The Greenhouse Effect

Use the information you gathered in your Family Survey to calculate how much CO2 (Carbon Dioxide) you generate per year. Carbon Dioxide is one of the main gases involved in creating the global Greenhouse Effect.

1.Gallons of gasoline used _____ x 22 pounds CO2/gallon = _____ .

2.Miles of air travel _____ x 0.9 pounds/mile = _____ .

3.Miles on mass transit _____ x 0.5 pounds/mile = _____ .

4.Kilowatt hours _____ x 1.5 pounds/ kWh = _____ .

5.Therms natural gas _____ x 11 pounds/therm = _____ .

7.Gallons of propane _____ x 13 pounds/gallon = _____ .

Total pounds of CO2 generated (add up all the numbers on the right) _____ .

Total pounds generated X (divide by) number of people in your household = _____ (Total You Generated)

Reducing Your Impact

In the space below, write down some actions that you and your family could do to reduce waste in a useful manner that would reduce greenhouse gas emissions and conserve landfill space.

Brainstorm

Would reducing meat consumption reduce your carbon footprint?