

RAFT IDEAS

Topics: Properties of Matter

Materials List

- ✓ Styrofoam packing peanuts or pieces
- ✓ Eco-Foam starch based packing peanuts
- ✓ Divided box with two compartments or two separate containers
- ✓ Coffee stirrer
- ✓ Water
- ✓ Optional: soil

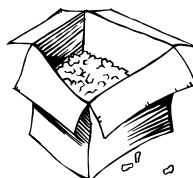
This activity can be used to teach:

CO Science Standard 1:
Physical Science

- Investigation
 - Molecular Structure
- Grades: k, 1, 3, 5, 6, 7, 8, HS
21st Century Skills:
- Invention

Pick a Packing Polymer

Which packing material is an Earth friendly choice?



Students compare polymer packing peanuts made from different materials in order to determine the environmental impact of each material and identify the life cycle or linear life of each product.

Assembly

1. Fold a sheet of paper lengthwise and write Styrofoam at the top of one side of the paper and Eco-Foam on the other side.
2. Carefully examine each packing peanut sample and list the characteristics of each under the correct heading.
3. Fill each compartment of the divided box with water.
4. Place a Styrofoam packing peanut on one side and an Eco-Foam starch peanut on the other side. Stir gently.
5. Observe what happens and continue to write observations and descriptions under the correct heading.
6. Optional Extension: Empty the divided box and place a Styrofoam peanut on one side and an Eco-Foam peanut on the other. Gently cover each peanut with soil. Sprinkle or mist evenly with water to make the soil damp, but not soggy. Let the box sit overnight and make observations the next day.

To Do and Notice

1. Before being placed in water or soil, what are the similarities and differences between the packing peanuts? Would they both do a good job protecting items packed in a box? How could you test this idea?
2. What happened to each peanut after being placed in water for 1 minute? After 2 minutes? Does stirring make a difference with either peanut?
3. What happens to each peanut after being placed in moist soil overnight? How would this activity be similar to placing the peanut in a landfill?
4. How would you make a choice, as a consumer, about which packing product to use? What material choice would have the least environmental impact? Are there other factors that might influence consumer choice, e.g. cost, availability?
5. Discuss the difference between products with a life cycle compared to those with a linear cycle. Illustrate each step in each cycle for the Styrofoam and the Eco-foam product. Which product has less impact in the environment? What can be done to lessen the impact of products with a linear life?

The Science Behind the Activity

The total annual solid waste in the United States nearly doubled from 1960 to 2000. Approximately 20% of the total volume of trash that is placed in landfills is composed of plastics. Plastics are not bio-degradable and stay in the environment for as long as 500 years or more. Many plastics can be recycled into new products. Some

communities are adopting programs that encourage citizens to separate out plastic trash for recycling. Not all plastics are alike and the type of plastic determines the method of recycling used. Most plastic containers are now marked with a recycling symbol indicating the type of polymer they contain, so that they can be categorized for processing. The major ways plastics are recycled include burning to produce energy, melting to reform into a similar product, shredding to create fill materials, or by treatment with chemicals.

The production, use, and disposal of products results in environmental consequences. Some products have more natural life cycles and other have a linear life. Product life, from producer to consumer to disposal, requires energy and resources at each step. Non-biodegradable polymers, such as Styrofoam, have a linear life cycle and biodegradable polymers, such as Eco-foam have a natural life cycle and require no processing. Many manufacturers are investing in the development of new, environmentally friendly products called biopolymers to replace products that have traditionally been made of plastic polymers. Some examples include fast food and beverage containers using plant based polymers rather than oil based plastics. These products still need processing for recycling, but can be decomposed in a landfill under special conditions. Biopolymers may offer an affordable, more Earth friendly option to plastics.

Taking it Further

Compare the characteristics of different types of plastics in the RAFT activity *One Word...Plastics* and *What the Heck is a Preform?* Continue to explore the differences between starch-based and plastic-based peanuts in the RAFT activities *Puffed Up Polymers* and *Starchy Structures*. Ask students to find other examples where starch polymers are being used in common products. How would these new products be identified?

Assessment Opportunities

Notice whether students make careful observations about the properties of each material. Are students able to reach a conclusion and support their decision about their choice for a packing material? Do students demonstrate an awareness of the need to promote sustainable products?

Environmental Responsibility / RAFT Repurposes Materials for Learning

This Idea Sheet promotes the concept of sustainable product design and provides an opportunity for age appropriate discussion about citizen choices around product selection and recycling. This activity repurposes packing peanuts and plastic containers as learning materials.

Reflective Practice

Which part of the activity seemed to interest the most students? Did the activity support growth in the area of environmental responsibility? Did the activity provide new information to students? How do you know? Did the group self-initiate any ideas or actions that would demonstrate increased awareness after the lesson, e.g., did students ask to set up a class or school wide recycling program?

Web Resources

- Excellent list of trash facts from the solid waste industry – <http://www.environmentalistseveryday.org/solid-waste-management/garbage-trash-waste-facts.php>
- Full Designed by Nature Unit on product life cycles presented by Eastern Michigan University and Creative Change Educational Solutions - <http://www.emich.edu/biology/DbyN/pdf/DbyN-Lesson1.pdf>
- Information from a producer of starch-based packaging materials - <http://www.starchtech.com/>
- Biopolymer products and applications by NatureWorks - <http://www.natureworksllc.com/product-and-applications.aspx>