

Energy Flows Demonstration

Lesson Summary

Students take the role of organisms in a very large food chain or web. Packing peanuts are used to represent solar energy. Students will stand in line and wait for their portion of solar energy as it is delivered from the organism before them in the chain. Pieces of solar energy (packing peanuts) will decrease in number as they approach the end of the chain. Some of the energy (packing peanuts) will end up being dropped, or lost as heat. This models the actual flow of energy in living systems.

Time Allotment: 30 minutes

Materials Per group

- One large box of packing peanuts

Advance Preparation

Arrange students in one long chain or several smaller chains.

Assign one student or the first student in the chain(s) to be the “plant” or producer.

Lesson Objectives

- Identify the sun as the source of *all* energy on Planet Earth.
- Understand that plants are the link to the solar energy.
- Explain how the amount of energy decreases as it flows through living systems.
- Discuss that energy can be lost as heat as it flows.

Vocabulary

Conservation
Consumers
Food chains
Food webs
Heat

Producers
Solar energy
Thermal energy

Background Information

Everything in nature or the environment is connected. The connection to the Sun is one of the most important to understand. Energy from the sun is called **solar energy**.

All energy on Earth originates with the sun. It is the diversity of plant species that can harness this energy and make it available for living systems. This is why plants are called **producers**. They are some of the unique organisms that can directly produce usable energy (glucose) from solar energy. They are always first in a **food chain** or **food web**. They are then consumed by plant eating organisms. These organisms and all organisms following are known as **consumers**.

Even though the energy from the sun is being captured by producers and transferred to consumers, not all of the energy makes these transitions. Some is lost. Usually, this lost energy is called **thermal energy** or **heat**.

In our demonstration you will use packing peanuts to demonstrate solar energy. Only designated ‘plants,’ the first people in line, can capture this energy. They, in turn, will pass it to the next in line, a consumer. This passing continues until the energy has reached the last one in line. By counting the number of packing peanuts the first and last people receive, the process of energy flow will be demonstrated.

Conservation is the act of handling resources, energy, etc. in a sustainable way. After the demonstration, it will become clear why conservation is necessary to sustain living systems, especially humans.

Energy Flows Demonstration

Initial Discussion

1. Ask students if they use energy and how.
2. Write their ideas about personal energy use on the board.
3. Discuss that all energy comes from the sun. Prove it by tracing back the light energy in the room comes from electricity generated by burning coal or fossil fuels that were once living algae, plants, etc. that got energy from the sun.
4. Do other examples if necessary.

Hands-On Activity

5. Dump a box of packing peanuts on the ground and explain that they represent energy from the sun.
6. Arrange students in one line or several small lines around the pile of packing peanuts.
7. Assign one student as the plant or producers for the chain / web.
8. This student can begin capturing solar energy. They should count how many packing peanuts they have. Record.
9. Allow producers to capture energy 5 times and each time pass to the next in line.
10. Have final consumer count the amount of solar energy they received. Record.
11. Discuss with students that as energy flows it decreased and can be lost as heat.
12. Ask students what becomes clear about energy flow.

Relate Activity to Concept

13. How much energy was there at the end of the chain?
14. Where are humans on the food chain / web?
15. How might conservation of energy help other organisms or systems?
16. The producers always get the most energy i.e. the most packing peanuts.
17. As energy travels, it gets less and less and some is lost as heat i.e. packing peanuts are dropped along the chain and become unavailable for the next in line.
18. The lost energy (dropped peanuts) is trapped in our atmosphere by CO₂ and other greenhouse gases and cause the temperature of Earth to rise.
19. If we, as humans, are some of the last in the chain, we are receiving the least amount of energy. How much more important is it then that we take care of or conserve the energy we do receive so that we are being good stewards of our supply?

Variations

- Also count the number of peanuts lost / dropped

Assessments

Have students graph the number of packing peanuts captured, lost, and remaining for each round.