

Energy

Flow

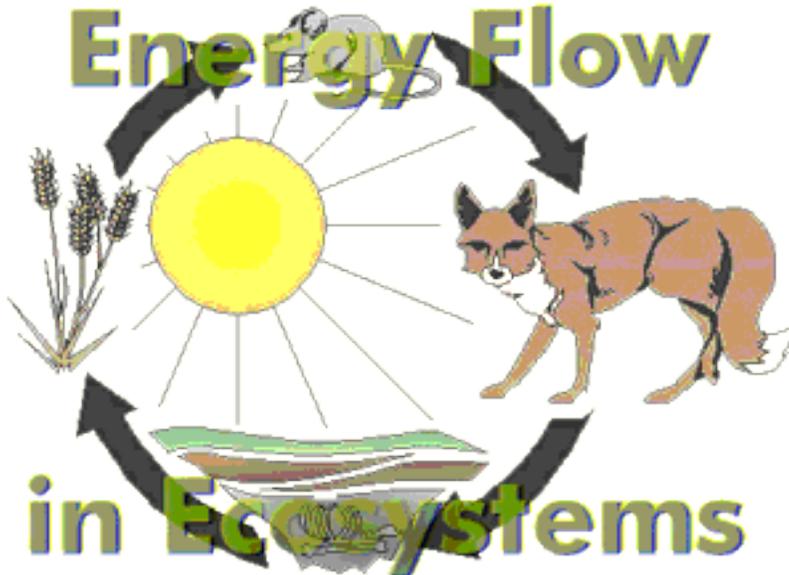


Image to right from <http://www.usoe.k12.ut.us/CURR/Science/sciber00/8th/energy/sciber/ecosys.htm>

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Overview:

Every single organism alive needs energy to survive. Whether it is to walk around or to create food, everything needs energy to survive. The origin of all energy comes from the sun. Plant, or producers, use the energy of the light to convert it into energy and then stores it in their cells. This process

is called photosynthesis. When herbivores, or primary consumers, eat the producers they convert the energy stored in the producers to a form that can be stored within animal cells. Like the primary consumers, the secondary consumer or carnivores transform the energy yet again into something they can store within themselves. Along with the consumers and the producers, the decomposers also supply energy to the fungus-eaters. Although they may be located in different parts of the energy pyramid, decomposers get their energy from decaying plants and animals.

At each level of the energy flow pyramid, there is 90% less energy available for the specific organism. For example, the producers can only convert 10% of the sun's rays into energy. When the primary consumers eat the producers, they can only obtain 1% of the original energy from the sun. This continues all the way up to the secondary consumers. As the animals climb up the energy flow pyramid, there become progressively less organism at that point. The base of the energy flow pyramid is made up of the producers. That level contains the most of all the levels. As we approach the secondary consumers and the tertiary consumers, we see dramatically less.

Purpose:

The purpose of this lesson is to help the students understand the relationship between the different categories of the energy flow pyramid. They are the producers, primary consumers, secondary consumer, tertiary consumers and decomposers. The students will learn how the energy becomes less and less as we ascend the pyramid. The students will also begin to understand the reason for the different amounts of animals at the different levels of the pyramid and why there are the most producers and the least tertiary consumers.

Standards:

Arizona Science Standards: 7th grade.

Strand 2; Concept 2; P.O. 3 – Apply the following scientific processes to other problem

solving or decision making solutions: communicating, comparing, classifying, organizing, identifying variables.

Strand 4; Concept 3; P.O. 2 – Explain how organisms obtain and use resources to develop and thrive in: niches, predator/prey relationships.

Strand 4; Concept 3; P.O. 3 – Analyze the interactions of living and organisms with their ecosystems: limiting factors, carrying capacity.

Strand 4; Concept 3; P.O. 6 – Create a model of the interactions of living organisms within an ecosystem.

Suggested Grade Levels:

4th – 8th

Lesson Times:

2 class periods. 1st will be going over key term and definitions and the 2nd will be for the activity.

Materials:

Pencils, colored pencils, 11 x 17 paper, notebook, juice, 40 paper cups, and graduated cylinder.

Learning Objectives:

- Students will be able to understand the relationship between the different levels of an energy flow pyramid.
- Students will be able to understand the importance of an energy flow pyramid and be able to tell the importance of one within an ecosystem.
- Students will be able to analyze the relationship between heat loss and the energy transfer to the animals.
- Students will create a model of an energy flow graphic organizer and describe how the creatures interact.
- Students will use communication, comparison, classification, organization, and identification to create the energy flow pyramid in an ecosystem.

Suggested Procedure:

Share the overview and the purpose of the energy flow pyramid. Hold a group discussion of what a energy flow pyramid is and the importance of one within an ecosystem. Go over key terms needed to complete the assignment. They are:

- Herbivore (primary consumer)
- Carnivore (secondary and tertiary consumers)
- Plants (producers)
- Different kinds of fungi (decomposers)

Discuss in detail the importance of each level and have the students come up with examples of each to clarify the difference. Also, stress the importance of the interdependence of each level.

1. Begin by setting out the 40 paper cups, graduated cylinder and the juice.
2. Have the students begin discussing possible ways that these 3 sets of items could be used to represent the energy flow through an ecosystem.

3. After some time, have the students explain what they came up with and why they feel it would work.
4. Have the students perform the most logical idea they had come up with to allow them to see whether it works or not.
5. After their experiment, talk about how the experiment worked and some different things they could have done to make it more accurate.
6. Now, begin by putting the 40 cups into 4 different groups.
7. Have the students divide the juice into equal parts within the first set of cups by using the graduated cylinder.
8. Take time to explain that these 10 cups represent the 10% of the energy that is converted by the producers.
9. Next, take one cup and have the students divide the juice in the one cup into 10 more equal parts. Explain why we only used one cup and what part of the cups we will use for the next stage.
10. Continue this process until you have used all 4 sets of cups up.
11. Discuss what has happened as we have progressed down the different sets of cups and what they would represent in an ecosystem. Have the students come up with examples of different animals each set of cups would represent.
12. After coming up with animals, have the students use the 11x17 paper and create a energy flow graphic organizer using some of the animals they came up with. Stress the importance of a food web and the relationship between ALL of the animals.

Assessment:

1. Involvement in the creation and execution of the first experiment.
2. Involvement in discussions.
3. Accuracy in creation of the energy flow graphic organizer.

Extensions:

1. Using the knowledge gained from the experiment, have the students come up with what part of the food pyramid we are.
2. Have the students calculate what amount of the sun's original energy we consume when we eat different foods (ie. – vegetables, fruits, red meat, chicken, fish.)
3. Have students come up with different impacts that humans might have on energy flow pyramids and ecosystems.

Sources:

Energy Flow in the Coral Reef Ecosystem

<http://www.teachersdomain.org/resources/hew06/sci/life/reg/foodweb/index.html>

Energy Flow in Ecosystem:

<http://www.usoe.k12.ut.us/CURR/Science/sciber00/8th/energy/sciber/ecosys.htm>

Slideshow on Ecosystem:

http://mrskingsbioweb.com/energy%20flow_files/frame.htm

Biology: Active Learner:

<http://bioactive.mrkirkscience.com/53/ch53intro.html>