

Food Chains

Acorn – Squirrel – Coyote

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Grade Levels: 2nd

Length of Lesson Sequence: 30 minutes

Brief Description:

Students learn about a specific food chain (coyote-squirrel-acorn in this example, but can be any local food chain) in nature and that organisms can be classified as producers, herbivores or carnivores depending on their diet. A game will be played where students take on the role of different organisms in the food chain and act out different cycles. Experimental situations are played out in the game and are designed to help the students understand that there are more organisms lower than higher in the food chain. They will also learn the consequences of separately removing carnivores and plants from the food chain.

Content Statements/Standards Covered:

III.5.e1 (LEC 1) - Identify familiar organisms as part of a food chain or food web and describe their feeding relationships within the web.

III.5.e4 (LEC 5*) - Describe positive and negative effects of humans on the environment.

I.1.e6 (C 6) - Construct charts and graphs and prepare summaries of observations.

II.1.e2 (R 2) - Show how science concepts can be illustrated through creative expression, such as language arts and fine arts.

II.1.e4 (R 4) - Develop an awareness of and sensitivity to the natural world.

Objectives of Lesson:

At the conclusion of the lesson, students will be able to:

- ◆ Understand that energy flows naturally through a locally occurring food chain
- ◆ Define the terms producer, herbivore and carnivore
- ◆ Understand that there must be more individuals at the bottom of the food chain than at the top of the food chain
- ◆ Understand the effects of removal of the top predator in a food chain
- ◆ Understand the effects of reducing primary production (plant growth) from the food chain

Materials and Resources

- ◆ Photos of the sun and organisms in a food chain
 - Included at the end of this lesson are the sun, acorns, squirrel and coyote
- ◆ 24 index cards with the plant (Acorn) written in big letters
- ◆ 9 index cards with the herbivore (Squirrel) written in big letters
- ◆ 9 index cards with the predator (coyote) written in big letters
 - The amount of index cards is based on a maximum of 27 students

Strategy

- ◆ Inquiry cycles: finding and explaining patterns in data (arguments from evidence)
 - Experimental inquiry: predict-explain-observe-explain (POE)

Observations, patterns, and explanations

In the chart below, describe the connected observations, patterns, and explanations or models that you will use for your session.

Observations or experiences (examples, phenomena, data)	Patterns (laws, generalizations, graphs, tables, categories)	Explanations (models, theories)
# of individuals in each trophic level after three food chain cycles when the initial ratio of predators:herbivores:plants = 1:1:1	Final predator:herbivore:plant ratio = 1:0:0	Food chains with the same amount of individuals in each trophic level are not stable
# of individuals in each trophic level after three food chain cycles when the initial ratio of predators:herbivores:plants = 1:5:>21	Final predator:herbivore:plant ratio = 1:2:9	Food chains are organized so that there are more individuals lower in the food chain than higher in the food chain
# of individuals in each trophic level after three food chain cycles when the initial ratio of predators:herbivores:plants = 0:5:>21	Final predator:herbivore:plant ratio = 0:5:6	Removing the top predator results in increased herbivores and decreased plants
# of individuals in each trophic level after three food chain	Final predator:herbivore:plant ratio = 1:0:0	Removing some of the plants results in complete loss of

cycles when the initial ratio of predators:herbivores:plants = 1:5:10		plants and no food for the herbivores - unstable
← Application: Model-based Reasoning		
Inquiry: Finding and Explaining Patterns in Experience →		

Introduction/Anticipatory Set

Students are introduced to the idea of a food chain in a group activity:

- ♦ The teacher places the pictures of the sun and the acorn on the board and draw an arrow from the sun to the acorn.
- ♦ The students are asked what eats an acorn. After coming up with squirrel, the teacher places the squirrel picture on the board and draws an arrow between the acorn and the squirrel.
- ♦ The students are asked what eats a squirrel. After coming up with coyote, the teacher places the coyote picture on the board and draws an arrow between the squirrel and coyote.
- ♦ Students are introduced to the terms producer, herbivore and carnivore, which are written on the board above the pictures

Activities of the Session

Students will play a game where they take on the role of different organisms in the food chain. They will play the game to answer four scientific questions, which will be written in four rows on the board to the left hand side and below the pictures of the organisms. Leave room for four columns below the pictures for data after each experiment.

1. What happens when:
 - a. There are the same numbers of individuals in each level of the food chain?
 - b. There are more acorns than squirrels and more squirrels than coyotes?
 - c. All coyotes die from over-hunting
 - d. Half of the acorns are eliminated because oak trees were cut down
2. To illustrate this, students will be given appropriate numbers of index cards with the names of the different organisms on them. The carnivore:herbivore:plant ratios for the four questions should be:
 - a. 1:1:1 – include all students if possible

- b. 1:5:>15 (If more than 21 students total, add more plants, if less than 21 students, drop herbivores to 4 and maintain at least a 1:3 ratio between herbivores and plants)
 - c. 0:5:>15
 - d. 1:5:>10 (Have some plant students sit out of this activity)
- 3. Students are allowed to switch which organism they are between each scenario to avoid jealousy.
- 4. For each question, all students stand in the middle of the room and hold their index card on their chest so it is visible there will be three complete food chain cycles where one cycle includes:
 - a. All squirrels pick an acorn to eat and the acorns chosen sits down
 - b. All coyotes choose a squirrel to eat and the squirrels chosen sit down
 - c. Repeat two more times to complete three total cycles
 - d. Count the number of individuals left in each trophic level and write the data on the board in the appropriate column and row

Conclusion

After all experiments are conducted, all students will sit down in front of the board and talk as a group about what happened in each experiment. The outcomes of each of the experiments are listed in the observations-patterns-explanations table above.

Assessment

- A. Educator-generated Tests - multiple choice, fill-in-the blank, true/false, essays
 - a. Students should be able to answer questions based on the objectives of the lesson above

Modifications and Accommodations (Optional)

All Students will be participating in the experiments, and will be rearranged each experiment for which organism they are playing.
 Less responsive students will be called upon to answer questions

Extensions (Optional)

- ◆ Students can write in their science journals what they think the data from each of the experiments means
- ◆ Students can draw a picture of a different food chain that they can think of
- ◆ More scenarios can be developed to play the game with, including adding more trophic levels or manipulating existing trophic levels in a different manner
- ◆ Birth can be added back into the games after the end of each cycle

Post-lesson Comments and Reflection

12.10.06

This lesson worked very well. The children were very enthused to be playing a "game" in the classroom and they learned a lot from it as well. I hope that they learned more than just what a food chain is, but that if one part of the food chain is disrupted, the whole ecosystem can collapse. This was evident as in three of the simulations, the numbers of organisms (students) in each trophic level was 0 (a,c,d), whereas simulation b worked perfectly as planned, showing that the numbers of organisms in the food chain matters.







