How Does Energy Move in Ecosystems?

Modified Scientific Method

Overview

Students will follow steps of the scientific method to determine how energy moves in ecosystems prior to reading the associated textbook lesson on the topic. They will go outside to make observations of the movement of energy.

Lesson Planner

Time Required	1 hour
Key Concepts/Terms	Energy, Producer, Consumer, Decomposer, Energy Pyramid, Organism
Prerequisites	• Knowledge of scientific method steps • Knowledge of expectations for outdoor classroom conduct.
Setting	• 15-minute field study outside • Remainder of lesson inside

Standards

MD VSC 5th Grade Science

3.E.1. Recognize that some source of energy is needed for all organisms to grow and survive.

Objectives

The students will go outside to describe the movement of energy in an ecosystem in order to test their hypotheses.

Materials Required

- Clipboards
- Pencils
- Worksheet
- Science textbook

Background Information

The following are specific objectives from the VSC that should help guide the lesson and student discussion.

3.E.1.

a. Identify the sun as the primary source of energy for all living organisms.

   - Plants use sunlight to make food
   - Plants and animals use food for energy and growth

b. Cite evidence from observations and research that some insects and various other organisms depend on dead plant and animal material for food.
c. Provide examples that justify the statement "Most animals' food can be traced back to plants."

Procedure

Follow the steps in the table below to conduct the activity. **Sentences in bold are suggestions for what teachers might say to students.** *Items in italics are possible teacher answers to questions.*

Phase	Step	Action
Engage	**1**	Ten Minute Exercise: Introduction to concept maps/outdoor learning. If students are unfamiliar with concept maps and/or using the schoolyard as a classroom, begin by creating a concept map together as a class to go over rules and expectations for learning outside. As you go through the concept map, think aloud for how you are choosing where to draw your bubbles to connect different concepts on the map. For instance, **"I am going to write the idea first and then put a bubble around it to make sure my bubble isn't too big or too small for my information."** Or **"I am going to connect this idea to that one instead of the main topic since they are related."** Or **"That's a good idea! Where would you connect that idea on our concept map?"** Have in mind some expectations for outdoor learning specific to your schoolyard that you want to be sure students include. For instance, • *Regular school rules still apply (respect each other, listen to the speaker, follow directions, etc.)* • *No yelling, screaming, tapping on/waving into windows that will disrupt class learning inside the school building.* • *"Look, learn, and let go" when you see insects.*

Explore	2	Pose Question – Begin Investigation (15 minutes) Read the question for inquiry together. Be sure to note that this is a modified investigation – we won't be looking for a change over time; rather, we will be using the investigation for an observation. (1 min) Have students use the organizer to state their hypothesis. Where does energy begin? How does it move through an ecosystem? Students may write or draw in the boxes. (6 min) Discuss together as a class variables that would influence the answer to this question. Students should note 2-3 variables on their worksheet. (5 min)
	3	Directions (2 minutes) **"When outside, we will be looking for the answer to our question. We will stay together as a group and discuss the answer together, but you may make your own observations on your organizer."**
	4	15-Minute Field Study Bring students outside. Keep track of the time. • Discuss with students where energy begins. (the sun) • What types of organisms get their energy directly from the sun? (plants) • What types of organisms get their energy directly from the plants? (animals) • Where does the energy go from the animals? (to other animals or to decomposers) Have students look for organisms or signs of organisms to complete their organizers showing the flow of energy in their schoolyard ecosystem. Give students a warning when the time is running out.

Explain	**5**	Interpret Data (10 minutes) Once back in the classroom, discuss the data students came up with. To interpret, lead students to the following statements: • All energy starts with the sun • Producers get their energy from the sun • Consumers get their energy from producers or other consumers • Decomposers get their energy from dead producers or consumers giving nutrients back to the soil for the producers
Evaluate	6	Draw Conclusions (8 minutes) Have students write a conclusion. It may look something like this. Based on the needs of your students, have all students complete this together as a class or complete it individually. **My hypothesis was right/wrong. Energy begins with the sun. Producers (like maple trees) get their energy from the sun. Then consumers (like squirrels) eat producers for energy and consumers (like eagles) can eat other consumers for energy. Finally decomposers (like mushrooms) break down dead organisms to go back to the soil as nutrients.**
Elaborate	7	Students will continue using the scientific method throughout the year. This lesson may be used in different seasons to test a "seasonal" variable and determine if there are changes in how energy moves based on the season. Have students read the textbook lesson on the movement of energy in an ecosystem.

Vocabulary Understanding of the following terms is required in this activity.

Term	Definition
Energy	The ability to cause matter to move or change
Producer	An organism, usually a plant, that makes its own food
Consumer	An organism that eats other organisms

Decomposer	An organism that gets nutrients by breaking down dead organisms
Energy Pyramid	a diagram that shows the amounts of energy that flows through each level of a food chain
Organism	A living thing

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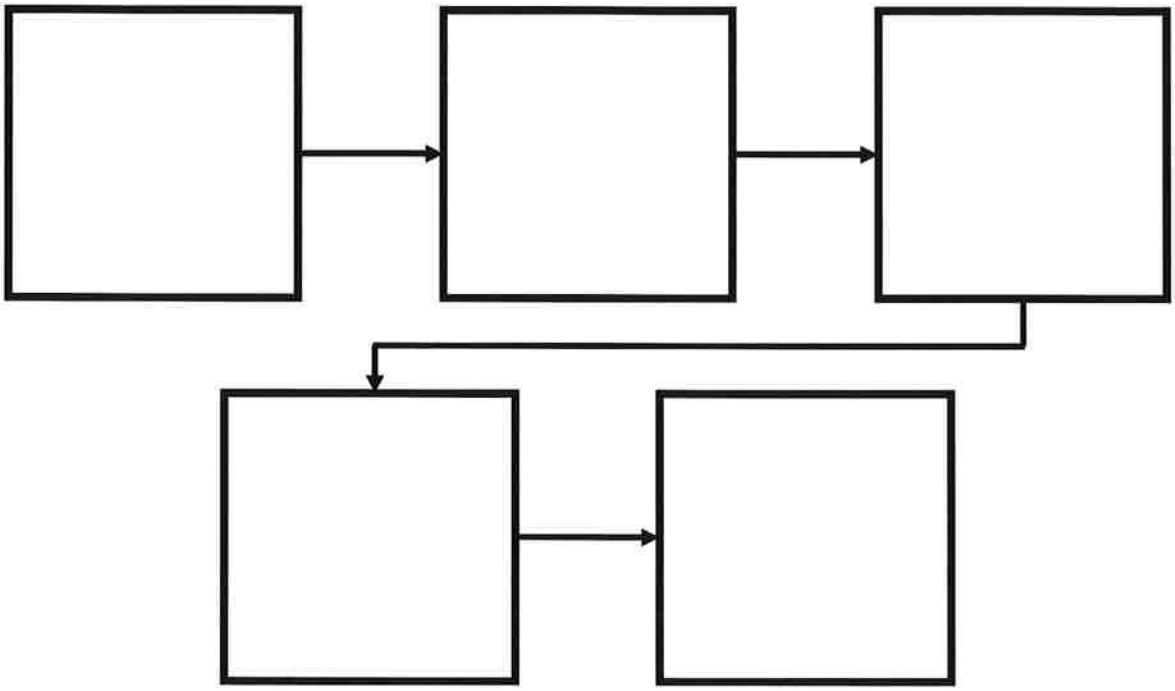
Name: _____ Date: _____

Interactions in Ecosystems
Using the Scientific Method

Question: How does energy move in ecosystems?

Hypothesis:



Variables:

_____

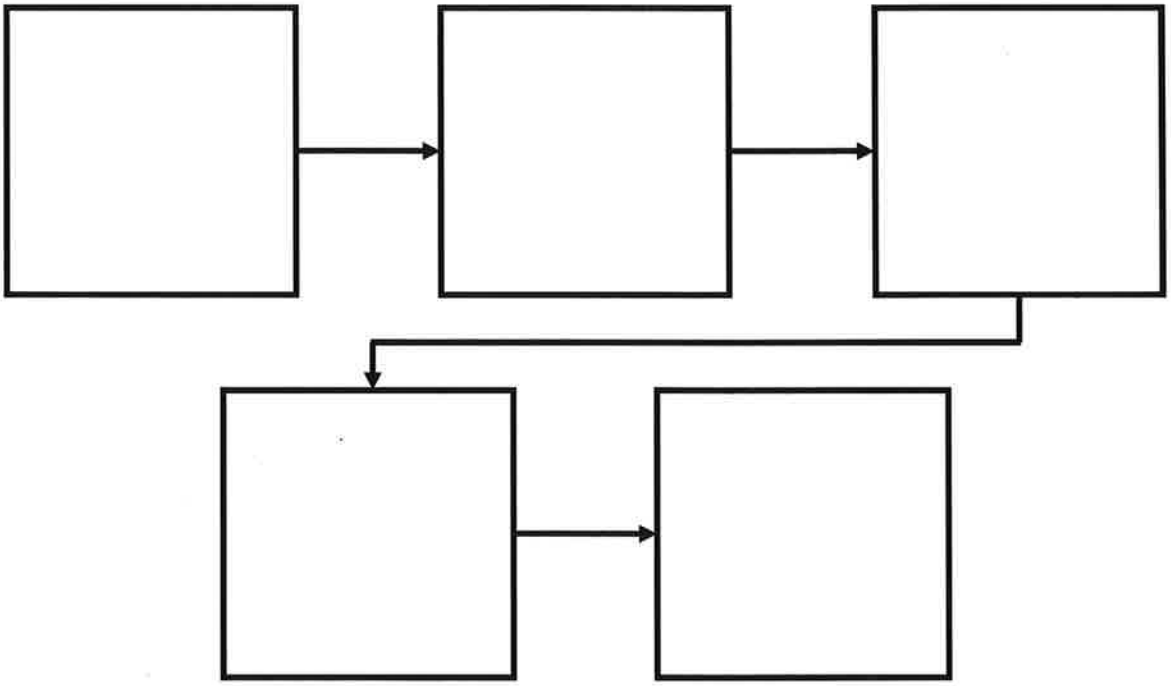
_____

_____

_____

Name: _____ Date: _____

Test Hypothesis and Record Data:



Interpret Data:

_____

_____

_____

_____

Draw Conclusions:

_____

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_____

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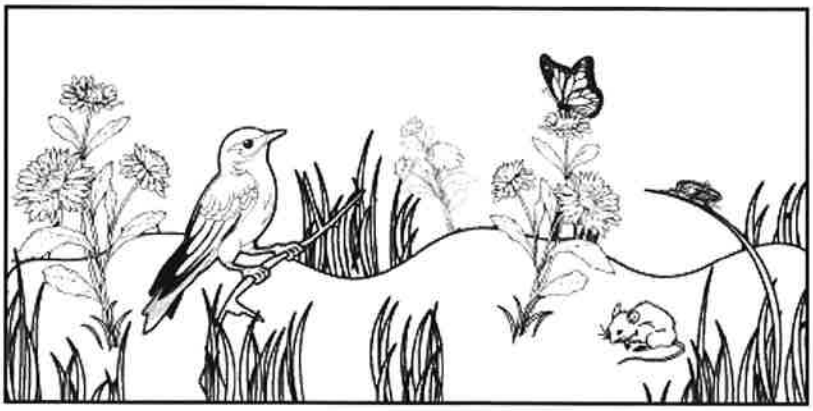
Public Release #1 - Selected Response (SR) Item
Science Grade 5 Objective 3.E.1.a

The drawing below shows a field habitat.



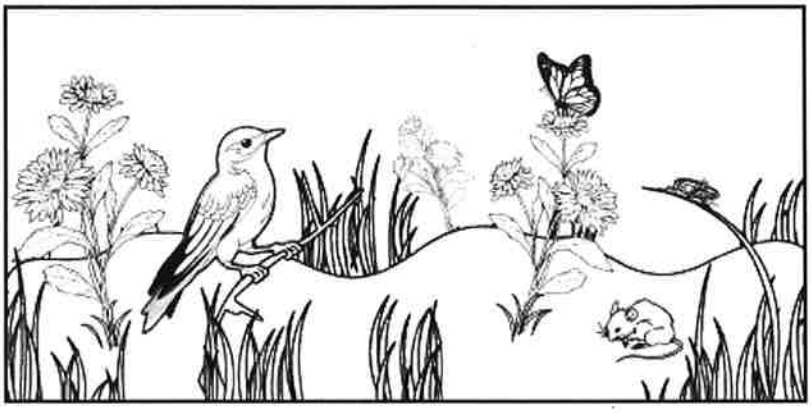
Which of these organisms is a producer in the field habitat?

A. bird
B. butterfly
C. grass
D. mouse

Correct Answer:
C.

Public Release #2 - Selected Response (SR) Item
Science Grade 5 Objective 3.E.1.a

The drawing below shows a field habitat.



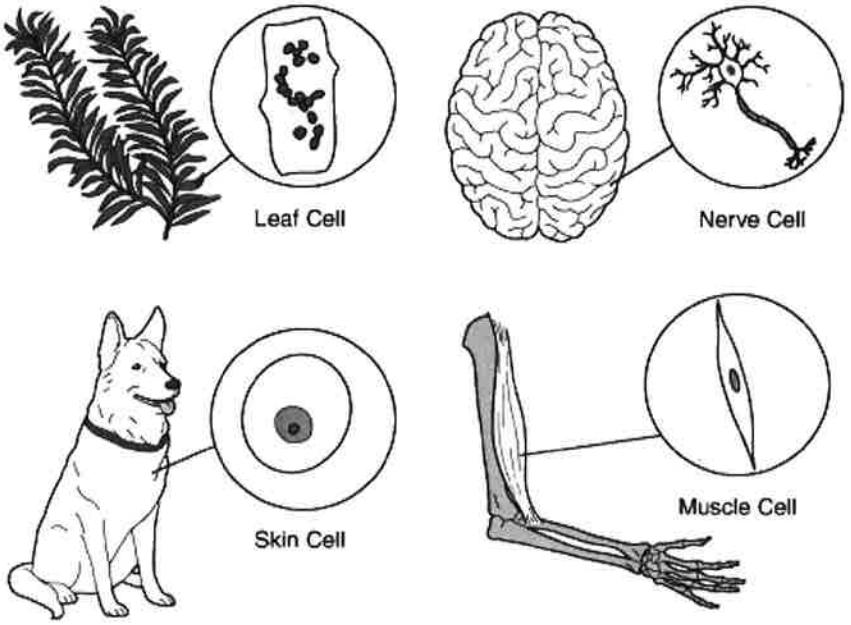
What is the main source of energy in the field habitat?

A. the sun
B. the plants
C. the butterfly
D. the soil

Correct Answer:
A.

Public Release #3 - Selected Response (SR) Item
Science Grade 5 Objective 3.E.1.a

Most organisms are made of many different types of cells. Each type of cell has a special role within the organism.



Which of these cells uses sunlight to produce food?

A. leaf cell
B. skin cell
C. nerve cell
D. muscle cell

Correct Answer:
A.

Public Release #4 - Selected Response (SR) Item
Science Grade 5 Objective 3.E.1.a

Use the information below to answer the following:

A scientist studied an estuary, the area where fresh water from a river empties into salty ocean water. The scientist classified nine estuary organisms into the three groups shown below.

Birds	Plants	Animals
 Great Blue Heron	 Salt Grass	 Blue Crab
 Laughing Gull	 Eelgrass	 Horseshoe Crab
 Osprey	 Sallow Sedge	 Hard Clam

Which organism in the estuary relies on the sun to make food?

A. horseshoe crab
B. hard clam
C. salt grass
D. osprey

Correct Answer:
C.

Public Release #5 - Selected Response (SR) Item
Science Grade 5 Objective 3.E.1.a

All living things need energy to survive.

What is the primary source of energy for all living things?

A. plants
B. the sun
C. water
D. the wind

Correct Answer:
B.