Ecology: Diversity and Interdependence

An Interactive High School Biology Lesson

Science Content Standards

National Standard A: Understanding about Scientific Inquiry
- Scientists inquire about how physical, living, or designed systems function.
- Scientists rely on technology to enhance the gathering and manipulation of data.

National Standard C: Life Science the Interdependence of Organisms
- Organisms both cooperate and compete in ecosystems. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.
- Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite. This fundamental tension has profound effects on the interactions between organisms.
- Human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption.

California Standard: Ecology
6. Stability in an ecosystem is a balance between competing effects.
   a. Know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
   b. Analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.
   c. Know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.
   e. A vital part of an ecosystem is the stability of its producers and decomposers

Prerequisites

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<th>Knowledge</th>
<th>Skills</th>
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<td>Ecology Trophic Levels</td>
<td>Use of Microscope</td>
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Materials

1. Microscopes
2. Eyedroppers or disposable pipettes
3. Aquarium, pond, stream, and/or lake water – bottom scum

Schedule

1. Micro Lab
2. Lab Reflection
Micro Lab

1. Go to:  
   
   Click on each type of organism listed to see some representative groups.

2. Write out a one-sentence definition for each group, which includes their distinguishing characteristics. Your teacher will help with this.

3. Go to: http://www.sidwell.edu/us/science/vlb5/Labs/Classification_Lab/Eukarya/
   
   Click Kingdom Protista
   
   Make a list of which organisms are in the Protist Kingdom by clicking around on the interactive Phylogenetic Tree.

4. Learn to make wet-mount slides. Use an eyedropper or disposable pipette to collect the water samples. They should be as grungy as possible. Bottom scum is good.

   - A
     - Put 1-2 drops of the water sample in the center of the slide.
     - Drag a cover slip along slide. The drop should not look clear.

   - B
     - Drop will adhere to the base of the cover slip.

   - C
     - Let the cover slip drop over the liquid.
5. Make several slides from the following sources using the wet-mount procedure.

Make sure the water sample is totally gross. Clear samples have too few organisms.

Aquarium glass or algae clump
Pond bottom
Stream bottom

6. Learn to make hanging drop slides.

A. Place a very tiny drop on cover slip that is resting on the lab table. The drop should look mucky not clear.

B. Quickly invert the cover slip with the drop now hanging underneath.

C. Carefully place the cover slip with the drop underneath on the depression slide as shown in the diagram. Cover slip should be flat on the slide with the drop hanging freely underneath. If the drop smears it was too large so make a new slide.

7. Make several slides from the following sources using the wet-mount procedure.

Aquarium Glass or algae clump
Pond Bottom
Stream Bottom
8. Complete the Protist and Micro-Animals Data Sheet

   Draw and describe at least one protist from each location and slide preparation type.
   Draw and describe all of the micro-animals that you find.

9. Click on the Pond Life Identification Kit at the above website after you have made your slide and drawings and are ready to identify organisms.

10. Answer the questions on the Lab Reflection Sheet.
Protists and Micro-Animals Data Sheet

Drawing organisms that you are viewing under a microscope is an art form that gets better with practice.

Try to draw them as large as the circle.

Make sure you are looking at one organism and not a clump of stuff. Ask your teacher for help with identification.

After you have drawn the organism then go to the website to identify it. If you identify it first you will draw from that picture and it may be the wrong organism!

Record where each organism came from.

EXAMPLE

Paramecium
Aquarium Scum
Micro Lab Reflection Sheet
Each answer should be a long paragraph or more.

You may refer the following websites for more information:

http://www.microscopy-uk.org.uk/mag/indexmag.html
http://www.microscopy-uk.org.uk/mag/wimsmall/small1.html
http://www.explorebiodiversity.com/

1. What is an ecosystem? Go to:
   Click Ecosystems
   Click on “Ancient Farmers of the Amazon” and watch the video
   Refer to the ecosystem described in the video and the data you collected from your micro-ecosystems in your answer.

2. How would you describe the bio-diversity of the ecosystems that you sampled?
   “Biodiversity is the sum total of different kinds of organisms.”
   Were there more organisms than you expected? Fewer?
   Were there more types of organisms than you expected? Fewer?
   Be sure to include each ecosystem (aquarium, pond, stream, etc.) in your answer.
   Read and include information from:
   http://explorebiodiversity.com/Mexico/Pages/Habitats/Biodiversity.htm

3. What kinds of changes in the habitat might affect these organisms?
   Think about and refer to the following when answering this question:
   Climate
   Human activity
   Introduction of nonnative species (new food or new predators)
   Changes in population size
   Include information from the Quick Time Video “Biological Invaders” at:
4. What might cause the size of the populations of these microorganisms to change?

Think about and refer to the following when answering this question:

Initial population size
Rates of birth
Immigration
Emigration
Death

5. How do the organisms that you drew fit into their ecosystem? Include each one.

Think about and refer to the following when answering this question:

Producers – photosynthetic and chemosynthetic organisms
Consumers – organisms that do not make their own food
Decomposers

Go to the following website, watch the Quick Time video “Decomposers” and include information from it in your answer:


Go to the following website, watch the Quick Time video “Producers” and include information from it in your answer:


6. Explain what you think the following statements mean:

“Stability in an ecosystem is a balance between competing effects.”
“Organisms both cooperate and compete in ecosystems.”
“Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite.”

Refer to your data, and the information you have gathered in questions 1-5. This answer should be longer than the others.

**Additional Resources**

Lesson Plan: Populations and invasive species