Forestry Institute Teaching Unit
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Target Grade/Subject:
This unit is intended for Midland Public Schools High School Life Survey Classes. Life Survey is a low level biology class for students in grades 9-10 who struggle with academics.

Unit Overview:
In the past the Life Survey course in Midland Public Schools focused simply on an introduction to each of life's six kingdoms. Students were exposed to each kingdom as a separate unit and no time was spent on the interconnections between the organisms and their environments. As a result of the Forestry Institute, I have designed a unit on ecology for the Life Survey Courses. The unit focuses on identifying biotic and abiotic factors in an environment, addresses their interrelationships, looks at energy flow, and concludes with a student study at the Dow High forest. Due to the nature of students taking Life Survey (many students with learning disabilities) the unit will be based on student activity as opposed to teacher lecture. This unit is a perfect way to blend our current study of kingdoms in Life Survey with the state's high school ecosystem standards.

Books/Sources Consulted:
1. Environmental Science, A Study of Interrelationships, Enger, Eldon and Smith, Bradley. Wm.C.Brown Pubishers. 1983.
2. Ecology: Earth's Living Resources, Prentice Hall. 1994.
3. Forest Ecology Lecture, Dr. Linda Nagel at the Forestry Institute on July 12-17, 2004.
4. Conservation Biology & Biodiversity, Jim Hammill at the Forestry Institute on July 12-17, 2004.

Objectives:
At the end of this unit, students will be able to….
- Identify biotic and abiotic components of an ecosystem
- Identify relationships between organisms
- Identify relationships between organisms and their environment
- Understand energy flow through an ecosystem
- Develop a scientific investigation to evaluate the diversity of organisms in a small plot
- Understand the importance of interconnectedness in ecosystems

Michigan Content Standards:
1. Science/Strand I, Content Standard 1
   All students will ask questions that help them learn about the world; design and conduct investigations using appropriate methodology and technology; learn from

books and other sources of information; communicate findings of investigations using appropriate technology.

2. Science/Strand III, Content Standard 5, Benchmark 1
   Describe common ecological relationships between and among species and their environments.
3. Science/Strand III, Content Standard 5, Benchmark 2
   Explain how energy flows through familiar ecosystems.

Describe five days of classroom or field activities:

❋For all lessons, see section called: Student Sheets

Day One

Lesson Objectives

1. Identify abiotic and biotic factors
2. Understand the definition of ecosystem

Activities

We will begin by going outside to the Dow High forest. Students will complete the activity called "Examining Living and Nonliving Parts of my World" (page 5). After coming back into the classroom, we will have a discussion on abiotic and biotic factors. Students will then label their list items with the appropriate labels, abiotic/biotic. This exercise transitions us into an exploration of the word ecosystem. We will create the definition of this word together on the white board. Students will then move to a guided reading activity called: "Ecosystems" (p. 6).

Day Two

Lesson Objectives

1. Define and give examples of three types of relationships between organisms: commensalism, parasitism, and mutualism.

Activities

Students will receive a blank sheet of paper at the beginning of class. They will draw a gigantic umbrella on their paper. On the inside of the umbrella they will write the word "symbiosis" and define it. We talk about the meaning of "umbrella words" throughout the semester. They understand them to be a group category name. Under the umbrella we will write three terms: commensalism, parasitism, and mutualism. We will then work to define those three terms as well. Students will then receive a symbiosis card. This is a 4x6 card with two organisms involved in a symbiotic relationship printed on the front. We will go into the computer lab and students must research their organisms using the internet and identify the specific type of symbiotic relationship at hand. See "Symbiosis Exploration" (page 7).

Day Three

Lesson Objectives

1. Explain energy flow through an ecosystem.
2. Explain interconnectedness in ecosystems, and describe its importance.
3. Identify a producer-primary consumer-secondary consumer-decomposer relationship from a Michigan hardwood forest

Activities

Students will take notes off Powerpoint using the sheet, "Energy Flow Notes Part 1" (page8-9) and then have a discussion of those topics. Students will then receive four 4x6 cards. Students will identify a producer-primary consumer-secondary consumer-decomposer from a Michigan hardwood forest and write the names on their cards. They will then link their cards together with string. Upon completion students will tape their chain to their chests and stand in a circle facing the group. We will then take a brightly colored yarn and link the food chains together forming a gigantic web across the classroom. This will provide an awesome visual tool for students to see the interconnections between different food chains.

Day Four

Lesson Objectives

1. Draw a diagram of energy flow through an ecosystem.
2. Compare food chain to food web.
3. Create a food web illustrating producer-primary consumer-secondary consumer-decomposer relationship from a Michigan hardwood forest

Activities

Students will use their artistic talents to create a food web on poster board. See "Food Chains→Food Webs" student sheet (page 10).

Day Five

Lesson Objectives

1. Design a scientific investigation to evaluate the diversity of organisms in a small plot.
2. Explain the importance of biodiversity in ecosystems.

Activities

Students will work in groups of two on developing a diversity profile for a 2m x 2m plot of the Dow forest. There will be 15 groups working and therefore a nice profile will emerge. See "Diversity Profile Data Collection Sheet" (page 11).

Day Six

Lesson Objectives

1. Organize data into a table, analyze and draw conclusions.

2. Communicate the findings from their diversity profile.

Activities
Students will share the data collected in Day Five and summarize their findings on the white board. This will allow a class discussion to take place on the connections between organisms in the Dow High Forest. Arrows will be drawn in different colors linking organisms and their connections.

Day Seven

Lesson Objectives
1. Define and give examples of biotic and abiotic components of an ecosystem.
2. Give examples of relationships between organisms, and classify as: commensalism, parasitism, and mutualism.
3. Understand energy flow through an ecosystem
4. Develop a scientific investigation to evaluate the diversity of organisms in a small plot
5. Understand the importance of interconnectedness in ecosystems

End of Unit Assessment
Read to students the story of Chief Seattle from "Environmental Science, A Study of Interrelationships." Pass out the writing assignment called "Chief Seattle's Message" (p.12). Students will write an essay on Chief Seattle's Message. Next, will complete an unit objective: Ecology Test (p.13).

Overall Unit Assessment:

Students will be assessed throughout the unit as follows:
Rubrics are included on the student sheets.

Day One: Teacher check of proper labeling of biotic/abiotic and of the ecosystems guided reading.

Day Two: Teacher check of the proper symbiotic relationship identification on symbiosis cards.

Day Four: See "Food Chains → Food Webs" student sheet

Day Five: See "Chief Seattle's Message" and "Ecology Test"

Student Sheets: see following pages.

Examining Living and Nonliving Parts of my World

In your designated spot, list 20 things that you can see.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

Go back to each item and place an “A” for abiotic and a “B” for biotic

Name_____

Ecosystems

1. An ecosystem is

_____

_____.

2. Example of a Michigan hardwood forest ecosystem would include:

_____

_____

_____

3. How big can an ecosystem be?_____
4. How small can an ecosystem be?_____
5. Who decides the size of an ecosystem?

_____

_____

6. A community is

_____

_____

7. An example of a community working together would be

_____

_____

8. A population is

_____

_____

9. What is the difference between a community and a population?

_____

_____

Symbiosis Exploration

Give students a card with the following symbiotic relationships written on one side. Students must research their organisms to determine the relationship and identify if it is a mutualism, commensalisms, or parasitism.

Flashlight Fish and bacteria

Ratel and the Honeyguide

Sharks and the Remora

Ants and aphids

Clownfish and sea anenome

Athlete's Foot Fungus and Human feet

Oxpecker bird and Rhino

Lice and birds

Mistletoe and trees

Goby fish and snapping shrimp

Heartworm and dogs

Yucca and yucca moth

Energy Flow Notes - Part 1

Living things need energy

One of the six criteria for _____ items that we studied was that all organisms use energy. We called this requirement _____-

- Some _____ can make their own energy _____
- Some organisms eat _____ to get energy _____
- Some organisms eat _____ to get energy _____

Food Chains

_____ occur when _____ is past from one organism to another in a _____.

- Food chains are always _____ (1 line)
- Example:

  _____

  Why does this chain begin with the sun?

  Why does this chain end with a decomposer?

Food Webs

- A food web occurs when _____.

Food webs show how _____ the earth's organisms are.

When a _____ in a web, the entire web can be destroyed

Energy Flow Notes - Part 2

1._____ are Organisms that make their own Food

- Most producers make their own food through _____. The _____ is the ultimate source of energy. Photosynthesis uses the sun's _____.
- Some producers use _____ to make their own food. This process is called _____.

2. _____ eat other organisms

- Consumers eat other living organisms to gain energy

Some consumers eat only plants, they are called _____

Examples:_____

Some consumers eat both plants and animals, they are called _____

Examples:_____

Some consumers eat only animals, they are called _____

Examples:_____

Food Chains → Food Webs

Life Survey Project

1. Identify an ecosystem that you would like to profile. Examples- Michigan hardwood, pond, ocean, desert, rain forest, ect.

2. My ecosystem is_____

3. Come up with 3 food chains that are at least 4 members long. Write those in the lines below. You should have a producer, consumer, and decomposer.

_____

_____

_____

_____

Using your big sheet to draw pictures (the best you can) of your organisms. Use one constant color for the arrows in each of the food chains. Then link your food chains together with a different color to show a food web.

Rubric for Food Chains → Food Webs

1. Food Chains contain
   * A producer ___/3
   * 2 or more consumers ___/6
   * A decomposer ___/3

2. Food Web contains
   * Pictures of each of the organisms ___/12
   * Links different in color than the food chain arrows which link the food chains together ___/10

Diversity Profile Data Collection Sheet

Working in groups of 2 you will need to design a method for collecting data in a 2m x 2m plot of forest. You will need to record how many and what type of organisms you find. Below describe your method for data collection and design a data collection tool.

Chief Seattle's Message

You listened to a reading on Chief Seattle's message. Read the passage from Chief Seattle and explain what he means by his words. You should address our discussions on interconnections between organisms. Use vocabulary such as food chain, food web, symbiosis, and biodiversity. You must write a paragraph that is at least 15 sentences long. See rubric on back.

"This we know: The earth does not belong to man; man belongs to the earth. This we know: All things are connected like the blood that unites one family. All things are connected. Whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web, he does to himself."

Rubric for Diversity Profile

1. Student has identified and described a method for collecting data ____/10
2. Students has created a tool for recording data ____/2
3. Students has collected data responsibly and accurately (field work) ____/5
4. Student participates in pooling class data on the white board ____/5
5. Student participates in class discussion during data analysis ____/5

Rubric for Chief Seattle's Message

1. Student addresses the interconnections between organisms ___/5
2. Student explains his/her interpretations of Chief Seattle's message ___/10
3. Student uses all required vocabulary properly ___/8
4. Student uses complete sentences and proper grammar ___/5

Ecology Test -Life Survey

Characteristics of Life
True or False…. Mark A for true and B for false

1. All living things can move
2. All living things reproduce
3. All living things need to eat
4. All living things must maintain stable internal conditions (homeostasis)
5. All living things are made of cells
6. All living things are highly disorganized
7. All living things grow and develop
8. All living things have brains

Ecosystems

9. An ecosystem is composed of all of the _____ and _____ things in an area.
   a. living and breathing b. dead and dying
   c. living and nonliving d. plant and animal

10. Another word for living things is
    a. plant b. animal c. microscopic d. biotic e. abiotic

11. Another word for nonliving things is
    a. plant b. animal c. microscopic d. biotic e. abiotic

12. The size of an ecosystem is
    a. determined by the scientist studying the area
    b. determined by the edges, ex. The ocean beach
    c. determined by the populations of the animals present
    d. determined by the populations of the plants present

Energy Flow

13. Organisms that can make their own food are called
    a. producers b. consumers c. decomposers

14. Organisms that eat other organisms for food are called
    a. producers b. consumers c. decomposers

15. The proper sequence for energy flow among the following organisms would be
    Rabbit Sun Carrot Owls Decomposer
    a. Rabbit-Carrot-Owl-Sun-Decomposer
    b. Sun-Carrot-Owl-Rabbit-Decomposer
    c. Sun-Carrot-Rabbit-Owl-Decomposer
    d. Sun-Carrot-Decomposer-Owl-Rabbit

Look at the food web drawn below and answer questions 16 and 17:

16. What do the arrows in the diagram represent?
    A. the flow of energy in a food web
    B. movement from less to more complex organisms
    C. symbiotic relationships among ocean animals
    D. the movement of ocean animals at during low tide

17. The jellyfish population might increase as the result of
    a. an increase in the plankton population
    b. an increase in the shark population
    c. a decrease in the starfish population
    d. a decrease in the stingray population

Draw the umbrella that we use to organize information and fill in the terms below. Next to each term, write its definition.

Mutualism Symbiosis Parasitism Commensalism