

Ecology-A Unit for Biology In The Secondary Classroom

**Jill Copley
Rowan County Senior High School
2004**

**Presented To:
Dr. Brian Reeder**

**As A Requirement of:
Reading The River
Summer 2004**

Lesson I. Ecology

ACTIONS

Lesson Objectives

Broad Objective: Students will be assessed on their knowledge of ecology. Students will use their knowledge to determine the biotic and abiotic factors present in the environment.

Specific Objectives;

1. Students will be able to define the term ecology, and explain why ecology is important.
2. Students will be able to the term ecosystem and give examples of ecosystems.
3. Students will be able to describe the inhabitants of an ecosystem.
4. Students will be able to describe factors which affect an ecosystem.
5. Students will be able to contrast abiotic factors with biotic factors.
6. Students will be able to list examples of both biotic and abiotic factors.
7. Students will be able to describe the relationship that exists between biotic and abiotic factors.
8. Students will be able to use a Wetland Wheel to identify wetland plants.

Connections

The following Kentucky Learner Goals are met in this lesson:

2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

Students will understand how to use their observational skills to determine biotic and abiotic factors present in the environment and the relationship that exists between them.

2.3 Students identify and analyze systems and the ways their components work together or affect each other.

Students will understand that all living things interact with other organisms in their surroundings and with the nonliving portion of their environment. The interrelationships and interdependencies of these organisms reveal that all organisms affect and are affected by the living and nonliving components of their environment.

2.6 Students understand how living and nonliving things change over time and the factors that influence the changes.

Students will understand how environments affect the distribution of organisms and how organisms respond to their environments.

Kentucky Core Content Learning Objectives

SCH-3.5.3: Organisms both cooperate and compete in ecosystems. Often changes in one component of an ecosystem will have effects on the entire system that are difficult to predict. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.

Resources

Television, paper, pencils, Wetland Wheels, clipboards, assignment sheet.

Procedure

1. Complete bellwork. Students will construct a table like the one presented on the television screen. This table will be helpful in completing today’s assignment.

Ex:

Table 1: Abiotic vs Biotic Factors

Abiotic	Biotic	Relationship

2. State objectives for the lesson. Relate objectives to core content.
3. Introduce ecology.
 - a. What is ecology?
**Make a connection to English by describing the origin of the word (study of house).
 - b. What is an ecosystem?
**Students will list examples of ecosystems and give examples of the inhabitants in a particular ecosystem.
 - c. Do living things interact with the nonliving portion of their environment?
 - d. What are some factors which affect an ecosystem?
 - e. What do think abiotic means? Biotic?
Hint: bio=life a=without
4. Review assignment with students.

Your assignment:

Using the table you constructed for bellwork, you will complete the following requirements:

1. You and a partner will observe the activity around or inside the pond.
2. Record all biotic and abiotic factors that you see in one pond.
**Make certain you do not discuss your data with other classmates. The best scientists keep their information to themselves.
3. After a certain period of time, you will move to the second pond to observe the activity present. *Your teacher will instruct you on when it is time to make your move.
4. Repeat steps 1-3.
5. In the relationship column, state the relationship between the biotic and abiotic factors that you are observing.

Oops! You’re not finished yet!

6. You need to use the Wetland Wheel! The teacher will instruct you on how to do this or you can simply read the directions printed on the wheel.
7. You need to identify **TWO** wetland plants.
8. Write the names of the plants and a brief description of each! Please place this information at the bottom of your table.
9. Wait for instructions to return to the classroom!

Remember~Good behavior is rewarded! It also determines your chances of participating in other field experiences. So please be on your best behavior so that we can continue to have fun while completing our ecology unit!

5. Return to the classroom.

*Due to the lack of time, review of today's observations will be discussed the following day. An activity reviewing biotic and abiotic factors will also take place tomorrow for bellwork.

Connection To Real-Life: Students will be able to relate today's activity to real-life because it illustrates the following:

1. The significance of an ecosystem.
2. The interdependence of organisms.

Ex: Plants are biotic factors while sunlight is an abiotic factor. There is a relationship that exists between these two factors. Sunlight serves as an energy source for the plant and is essential for its growth and existence.

**Students who are absent will be required to complete the assignment on their own time. They may do this at home near a lake, pond, stream, etc.

Student Assessment

Objectives 1-8: Students will be assessed on their knowledge of ecology by completing an exam. The exam will consist of multiple-choice, short answer, and fill-in the blank questions. This will be a summative assessment.

Objectives 5-8: Students will be assessed on their knowledge of biotic and abiotic factors, their relationship, and how to use the Wetland Wheel by completing today's field experience. The table completed by the students will reveal their understanding of living and nonliving things and their interactions with the environment. Their ability to use the Wetland Wheel will be illustrated by the information concerning the wetland plants identified.

Lesson II: Levels of Organization In An Ecosystem

Lesson Objectives

Broad Objective: Students will be assessed on their knowledge of a hierarchy of organization in the environment. The students will use this knowledge to determine the levels of organization in the environment and will be able to list them in order from simplest to most complex.

Specific Objectives:

1. Students will be able to recognize that scientists classify the environment into a hierarchy level of organization.
2. Students will be able to list the levels or organization in the environment from simplest to most complex.

3. Students will be able to provide a brief description of each level or organization.
4. Students will be able to recognize that ecologists focus their research on one level or organization.
5. Students will be able to recognize that each level of organization is influenced by the other.

Connections

2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

Students will understand how to work with a partner to determine the levels of organization within the environment.

2.6 Students understand how living and nonliving things change over time and the factors that influence the changes.

Students will understand how the different levels of organization within the environment affects the distribution of organisms, how organisms respond to their environments, and how each level is influenced by the processes at each level of organization.

Kentucky Core Content Learning Objectives

SCH-3.5.3: Organisms both cooperate and compete in ecosystems. Often changes in one component of an ecosystem will have effects on the entire system that are difficult to predict. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.

Resources

Pencil, paper, overhead projector, transparencies.

Procedure

1. Complete bellwork. Students will complete a bellwork activity which review both biotic and abiotic factors.
2. Review field experience from previous day. Students will be led in a group discussion concerning the interrelationship that exists between both biotic and abiotic factors and how these factors influence the ecosystem.
3. State objectives for the lesson. Relate objectives to core content.
4. Introduce the concept that scientists recognize a hierarchy of different levels of organization within organisms.
Ex: Cells are composed of molecules, molecules are composed of atoms, etc.
5. Inform students that ecologists recognize a hierarchy of organization in the environment. Each level has its own unique properties that result from interactions among its components. Ecologists often focus their research on one level of organization. But they recognize that each level is influenced by processes at other levels.
6. Review assignment with students.

Your assignment:

With a classmate, please place the levels of organization in order from simplest to most complex. Also, provide a brief description of each level of organization.

Here are the levels of organization:

- a. ecosystem
 - b. organism
 - c. community
 - d. biosphere
 - e. population
7. Discuss the outcome of the group assignment and provide the correct answer to the students.
 8. From the overhead projector, students will copy notes discussing each level of organization. Discussion of each level will take place during this time. The students will have the opportunity to ask any questions they feel are pertinent to the lesson.
 9. Lesson Wrap-up. Students will complete a lesson wrap-up reviewing the material discussed in class.

Student Assessment

Objectives 1-5: Students will be assessed on their knowledge of the levels of organization in an ecosystem by completing an exam. The exam will consist of multiple-choice, short answer, and fill-in-the blank questions. This will be a summative assessment.

Objectives 1-5: Students will be assessed on their knowledge of the levels of organization in the environment by completing the lesson wrap-up. The lesson wrap-up will cover all material discussed in class for the day. This is a formative assessment.

Lesson III. Energy Flow in Ecosystems

Essential Question: How does energy flow in ecosystems?

Major Objective: Students will be able to describe how energy moves through ecosystems.

Core Content: SCH-3.5.2, 3.5.3

Activity:

Part I: Students will read pages 365-369 in their textbook. These pages describe how energy flows through ecosystems. The students will complete a reading guide as they read.

*Note: We are required to have our students complete a certain amount of reading time per week.

Part II: Discussion of the reading guide. I will point out all pertinent information and clarify any misunderstandings the students may have.

Part III: The students will review the meanings of both prefixes and suffixes of several biological terms to help them construct the meanings of pertinent key terms.

Ex: herb=plant sym=with, together

Students will also study diagrams which illustrate food webs and food chains. The students will be required to list organisms that occupy each energy level, and which level contains the most energy.

Lesson IV. The Water Cycle

Essential Question: What advantages does a cycle provide for living systems?

Major Objective: Students will learn to summarize the steps of the water cycle.

Core Content: SC-H 3.5.1

Activity:

Part I: Students will be introduced to the water cycle by taking an imaginary journey with water as it travels around the world. A tape of water sounds will be played while *The Water Cycle Journey* script is being read. This script is available from Project WET. After the script is read, the students will identify the different states of water as it is being cycled.

Part II: Students will be asked to think of how water is cycled right in their own backyard. Whether it is from a puddle, a stream, rain, etc., students will be required to draw a picture illustrating how that drop of water is cycled. The picture must also have an explanation of the illustration, listing each step in the cycling of water and the state of water in each step.

Part III: Students will read page 371 in their textbook. The text gives a brief explanation of the water cycle and explains how it affects an ecosystem.

Lesson V: Watersheds

Essential Question: What is a watershed and what factors affect watersheds?

Major Objective: Students will learn to describe what factors affect watersheds and how land use can affect the runoff of water.

Core Content: SCH-3.5.2, 3.5.3

Activity:

Part I: Students will be introduced to watersheds. Students will be asked what factors they think may affect watersheds.

Part II: Students will complete the *Color Me A Watershed* activity from Project WET. Students will be using maps to determine how settlement and population growth affect watersheds.

Lesson VI: Human Impact On The Environment

Essential Question: What impact do humans have on the environment.

Major Objective: Students will learn to describe the effects of chemical pollutants and the increase in the human population.

Core Content: SCH-3.5.4, 3.5.5

Activity:

Part I: Students will complete the *Choices and Preferences* activity from Project Wet. Students will decide which water use is most important to themselves and their classmates and graph their data. A class discussion of the data will occur.

Part II: Refer back to the *Color Me A Watershed* activity. How does an increase in populations affect our watersheds? How has the human population been able to grow beyond what the natural environment can support? (Instruct students on humans and carrying capacity).

Part III: Discuss the following environmental concerns with the students:

- a. agricultural chemicals.
- b. Ground water pollution and depletion.
- c. Loss of topsoil.

Lesson VII: Assessing Stream Quality

Essential Question: Are the streams near our homes safe?

Major Objective: Students will learn to use various methods to assess stream quality and whether or not it is safe for recreational and various other activities.

Core Content: SCH-3.5.4, 3.5.5

Activity:

Part I: Review ways in which humans pollute our local streams. Bring straight pipes to the students' attention.

Part II: Assemble students into groups of four. Instruct students on how to determine the pH and number of fecal coliforms in their local stream. *A sample will be taken from Triplett Creek. Allow students to practice this method.

*Students who live near a stream or creek will be shown the appropriate way to take a water sample and will be asked to bring a sample from their home.

Part III: Discuss conductivity with the students. Give the students the conductivity data taken by the teacher at Triplett Creek.

Part IV: Using *Back To The Future*, provided by project WET, students will gain an understanding of stream flow. They will use this activity to analyze and interpret stream flow data. Through this activity, they will also gain an understanding of how flooding impacts water quality.

*Stream flow from Triplett Creek will be provided.

Part V: To learn about macroinvertebrates, students will complete the *Macroinvertebrate Mayhem* activity from Project Wet. Students will learn about the various types of

macroinvertebrate organisms and how they tolerate different water conditions. The diversity of organisms gives an indication of the health of the ecosystem.

*Samples will be brought to the classroom from Triplett Creek.

Lesson VIII: Solving Environmental Problems

Essential Question: What can we do to solve the various environmental problems?

Major Objective: Students will gain an awareness of the necessary steps to solve environmental problems.

Core Content: SCH-3.5.4, 3.5.5

Activity:

Part I: Students will complete *Whose Problem Is It* from Project WET. Through this activity, students will gain an understanding of how some water-related issues can turn into a global problem and what can be done to prevent this from happening.

Part II: Students will learn the five components to successfully solving an environmental problem:

- a. Assessment.
- b. Risk analysis.
- c. Public Education.
- d. Political action.
- e. Follow-through.

Part III: Students will learn various actions that they can do daily to help solve some of the world's largest environmental problems.

Bibliography

Johnson, George, and Peter Raven. Biology Principles and Explorations. Austin: Holt, Rinehart, and Winston, 2001.

, . Project WET Curriculum and Activity Guide. : The Watercourse and the Council for Environmental Education, 1995.