



LESSON TWO

ADDING AN ECOLOGICAL LENS

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LESSON PLAN	25
ACTIVITY: MAPPING SCHOOL-YARD ECOSYSTEMS	27
ACTIVITY: MAPPING THE BIOMES OF THE WORLD	29
Biome Posters (homework)	31
“Unpredictable Rains Bring Seasonal Exodus” (reading).....	33
ACTIVITY: SELECTING A RESEARCH SITE	37
Journal Entry: Mapping Your Research Site (homework)	39

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ADDING AN ECOLOGICAL LENS

OBJECTIVE

By the end of this lesson, students will be able to identify the ecosystems of their local region and the biomes of the world, as well as understand the threats to each and the importance of ethical values in protecting both ecosystems and biomes.

ACTIVITIES

- Mapping the School-Yard Ecosystems
- Mapping the Biomes of the World
- Selecting a Research Site

CLOSURE AND TRANSITION

Now that we have applied an environmental lens to our community and the larger communities of the world, we're going to move on to a more in-depth study of specific ecosystems. Our first step is to practice environmental awareness and try to perceive the condition of our local ecosystems.

HOMEWORK

- Biome Posters
- Journal Entry: Mapping Your Research Site

OPENING DISCUSSION

Follow-up to Lesson One Homework:

How were the values put into operation? As we go through the lessons and activities in this curriculum, let's keep reminding ourselves of our code and what our code looks like in practice.

Introduction to Lesson Two:

What is a biome? What is an ecosystem? How is an ecosystem related to a community? What are the key components of an ecosystem? What role does the concept of *interconnectedness* play?

MAPPING SCHOOL -YARD ECOSYSTEMS

PURPOSE

The purpose of this activity is to begin to understand the difference between biomes and ecosystems, as well as the difficulty of placing boundaries on communities.

PREPARATION AND MATERIALS

You will need:

- Large pieces of paper for each student
- Colored markers or crayons

TIP: This activity builds on and is similar to Lesson One’s “Environmental Walkabout” activity. However, this activity is more detailed and focuses on the *ecological* communities. You might even be using the same area for this activity as you did in Lesson One. Urge students to be more detailed this time and perhaps even to refer back to their original maps, if they will be mapping the same area.

PROCEDURE

1. Talk about the differences between biomes and ecosystems. Write the definition of *ecosystem* on the board. Below is an example of one definition:

A typical definition of an ecosystem is a “community of organisms interacting with one another and with the chemical and physical factors making up their environment.” The chemical and physical factors include sunlight, rainfall, soil nutrients, climate, salinity, etc. An ecosystem is inherently leaky: At a minimum, energy and nutrients move in and out. More likely, individual organisms (such as seeds, spiders, and sparrows) move in and out as well. This definition does not directly state that the organisms tend to interact with other organisms in the same ecosystem more than with those of different ecosystems, but the concept is implied.

—Ecosystems, Biomes, and Watersheds: Definitions and Use
by M. Lynne Corn, *Environment and Natural Resources*
Policy Division, July 14, 1993

2. Give each pair of students a piece of paper and tell them that they will be drawing a map of the school grounds. (If the school campus is too large, disperse students to different areas. Similarly, if it is too small, choose a surrounding area that is close by and that the students know fairly well.)
3. Allow them to take a brief walk around the grounds and note what is there and how things are laid out. Or if they used this same area in Lesson One, ask them to refer back to their maps.
4. When they return, ask each pair of students to map the grounds in black and white with as much detail as they can (buildings, parking lots, fields, sidewalks, trees, streams, ponds, roads, etc.).
5. Then ask them to outline all of the different ecosystems that should be found on their maps. These should be outlined in different colors and numbered. There will most likely be areas that overlap one another.
6. Then ask the students to list, on another sheet of paper, the ecosystem numbers and describe why they considered each section to be a separate ecosystem. For example: They might outline the playing field as ecosystem 1 and then describe it as an area distinguished by the fact that it receives a uniform amount of sunlight and rainfall. It also has uniform vegetation, so there is probably a specific group of organisms that inhabit that area.

TIP: Allow the students to get as detailed or be as general as they wish. Ecosystem boundaries are somewhat subjective, and this exercise will help them see how big and how small ecosystems can be. Remind them of the brainstorming they did about all of the different communities to which they belong. Just as it was difficult to put boundaries on all of our social communities, it is also difficult to set boundaries on ecological communities.

7. When students have finished, come together as a class and compare the maps. Which aspects are similar and which are different? Are there any right or wrong maps in the class? Why or why not?

MAPPING THE BIOMES OF THE WORLD

PURPOSE

The purpose of this activity is to explore the locations, characteristics, and natural and human dangers to the Earth's biomes in order to better understand the relationship between daily life and the environment.

PREPARATION AND MATERIALS

You will need:

- Student journals
- Paper, pens, or pencils
- Classroom blackboard
- A copy of the “Undependable Rains Bring Seasonal Exodus” reading (for students to circulate and read aloud from)
- Resources with information on different biomes (science and geography textbooks, environment and ecology references, Internet access, etc.)
- Six small, black and white maps of the world for students to color code to indicate biomes
- Six different colored markers or colored pencils
- Six large pieces of poster board or construction paper

PROCEDURE

1. In their journals, ask students to respond to the following questions, using outside resources if necessary: “What is a biome? What are the characteristics of a *biome*? What different biomes exist?”
2. Have students share their responses. As a class, develop a definition of biome and list characteristics of biomes on the board. Do not erase this information, as students will need to refer to it later in the class period.
3. As a class, read and discuss the “Undependable Rains Bring Seasonal Exodus” reading, focusing on the following questions:
 - a. Which biome do they live in?
 - b. How can you tell?
 - c. Does the biome impact their lives? If so, how?
 - d. How are they impacting the biome?

4. Divide students into six groups, and assign each group one of the following biomes: rainforest, tundra, taiga, desert, temperate, and grasslands. Using all available classroom resources, ask each group to investigate the answers to the following research questions about their biome:
 - a. Where does your biome exist on Earth? Does it exist in only one place? (Give each group a black and white map of the world and a marker or colored pencil to shade in their biome.)
 - b. Describe each of the biome characteristics listed on the board as they apply to your biome.
 - c. What natural dangers to this biome exist?
 - d. What human dangers to this biome exist?
 - e. What examples can you find of both natural and human dangers that have impacted this biome?
 - f. Do we live in this particular biome?

TRANSITION

- Ask students to present their homework biome posters during the next class.
- Tell students that they'll be selecting a natural community of their own as a research site during an upcoming class.

Activity from *Climate Control: Studying the Earth's Biomes and Exploring the Relationship between Daily Life and the Environment* by Alison Zimbalist, The New York Times Learning Network, and Debbie Branker Harrod, The Bank Street College of Education in New York City, January 5, 2000.

BIOME POSTERS

After completing the biome research, each group should develop an illustrated classroom poster dedicated to their biome, incorporating all of the information gained through research. In a future class, groups should present their posters and display them in the classroom, and discuss why it is important to know about the world's biomes and what they can learn by knowing about ecological communities.



GOMITOGO JOURNAL : UNDEPENDABLE RAINS BRING SEASONAL EXODUS

January 4, 2000
The New York Times
by Norimitsu Onishi

GOMITOGO, Mali—Slumped in the shadow of a mud wall, any desire he might have had to stand up drained by the midday sun and the Ramadan fast, Mamadou Tombo explained the simple truth about his village of rice farmers.

“When there was good flood and rain,” said Mr. Tombo, the mayor, “there was no exodus.”

But the rains came late this year and brought a poor harvest. The rivers overflowed before much of the rice could germinate, setting many young people off to more fortunate parts of the Niger River basin.

For centuries, the great Niger and Bani rivers have flooded the flat stretch of West Africa at this time of year, turning scorched soil into fertile ground for a few months. Areas that could easily be crossed on foot or by donkey abruptly become inaccessible, except to pirogues, which slowly navigate the innumerable channels and creeks.

And medieval villages like this one, built on plateaus in the basin and seemingly unchanged in centuries, become islands surrounded by water and rice paddies. From a distance, as the outline of their labyrinthine mud houses and castlelike mosques becomes clearer against the vast blue sky, the villages look like Disneylands lost in the Niger basin.

This one about nine miles west of the ancient town of Djenné is home to 3,000 peasants. In years of meager harvest, the population drops as villagers strike out to hunt for jobs in Bamako, the capital, or in more fertile corners of the basin. That pattern—what people here call the seasonal exodus of the able-bodied—began with the droughts of the 1970s, which affected the entire north-central region of Africa south of the Sahara. As desertification forced nomads to the Saharan fringes north of here, the lack of rain in this region—or disruption of the age-old cycle of rains and floods—has changed the way the people live.

“Growing rice was very easy before the droughts,” said Boukadari Diakité, one of the few men in the village who speaks French, as he sat a few feet from the mayor. “In the last two years we have had great floods because it rained in the south, but it did not rain early enough here. As long as we are not masters of nature, we will never be able to feel secure.”

So only the old and the very young could be found in Gomitogo earlier in December. Donkeys meandered alone through the maze of dusty narrow alleys, braying occasionally, as women pounded rice, dull thuds resounding against the walls. The quiet was otherwise broken only by children reciting verses at Koranic school and the muezzin’s calls to prayer.

In 1993 the heads of seven villages, including this one, gathered in a field and formed an association that eventually grouped thirty villages across 74,000 acres, said Mr. Tombo, who has served as the organization’s president.

“The little rice we had grown was being threatened by the Peuls, who were letting their cattle graze in our areas,” Mr. Tombo said, referring to the nomadic herdsman with whom the rice farmers share a centuries-old rivalry and partnership that grew increasingly strained after the droughts.

“If we stopped them in one village,” he said, “we know they would move to another village. But by uniting we felt we could chase them away.”

The association also began digging channels to control the flow of water. The efforts intensified in the last year, when the aid group CARE built about \$150,000 worth of dikes and canals in the region, said Boubacar Coulibaly, an official with CARE in Djenné.

While the organization was waiting to collect productivity results at the end of this season, Mr. Coulibaly said CARE’s five-year goal was to help triple rice production in the area.

Because of their remoteness, the villages have changed little during the lives of the men and women there now. Far from lands where changes are measured in faster Pentium chips, people here note that at some point in the 20th century the production and weaving of cotton was largely abandoned in favor of ready-made cloth bought in Djenné. A primary school opened in 1962.

Gomitogo’s population has grown faster than people’s capacity to fill land on the plateau’s edges and build houses, limited as they are by the mud bricks to one-story structures. But there is hope, Mr. Diakité said.

“When I was a boy,” he explained, “I would go into the field and bring back mud in baskets on my head for landfill. Now we have oxen and carts.”

There are no written records in Gomitogo, or in its neighboring villages, Soa and Kossouma, so questions about the history of the villages merely draw stares. But the villages are believed to have been founded around the time that Djenné came into existence in the 11th century.

For the chief of Kossouma, Djanguino Karankou, a cheerfully ebullient man who greeted a visitor to his island with endless welcomes, such questions about history are unimportant. Life is good here, he said. His only complaint was, naturally, that the rains had come too late this year.

“But we cannot blame God, because God decided so,” Mr. Karankou said. His smile conveyed the belief that so long as faith remained strong and unquestioning, Kossouma would endure.

Even though the rains arrived late, the last two years brought floods of a magnitude unseen since the droughts of the 1970s, Mr. Karankou said.

“We hope that the floods and rains have returned and that they will stay,” he said.

Even by the standards of Africa, arguably the continent least concerned with dates and time, the people in Kossouma showed little regard for such details. Asked how old he was, Mr. Karankou said 110, though he hardly looked older than 70.

He insisted. Some confirmed his age; others denied it. One man said with great authority that the chief was actually 85.

In Gomitogo—which now boasts its 68th chief—Mr. Karankou’s claim drew smiles, the kind someone from a big city might bestow on someone from the country.

“We know him,” Mr. Diakité said. “He’s not 110.”

“He’s a contemporary of my father, in his 60s,” Mr. Tombo said.

“We’re all in agreement on that,” said another elder, Cissé Kampo, as the men sitting in the shade of the mud wall nodded.

Asked his own age, Mr. Diakité said immediately that he was 44. But a look of doubt quickly spread across his face. His forehead wrinkled, he looked down at his hands and busily drew and withdrew his fingers.

“I believe I made a mistake,” said this lifelong resident of Gomitogo. “I’m 47. No, I was born in 1947. That’s it. So I’m 52—52 years old this year.”

SELECTING A RESEARCH SITE

PURPOSE

The purpose of this activity is to guide students in selecting and preparing a location outdoors in which to carry out research for the upcoming lessons.

PREPARATION AND MATERIALS

You will need:

- Enough stakes for every pair of students to have four
- String
- Colored plastic tape to tie to stakes marking students' names
- Measuring tapes or yardsticks

Before class:

- Arrange for enough time for students to explore the school grounds or surrounding areas to find suitable spots for their sites. Sites should be as far apart as possible. If you are going to allow students to pick a research site outside the school property, make sure that you allow enough time for them to get to and from this site during subsequent activities. Also, make sure students get permission from the owner if they want to set up a site on private property.

PROCEDURE

1. Break the class into pairs and give each pair four stakes and enough string to tie between the stakes.
2. Explain that the site should be about 12 by 12 feet or 144 square feet and should be marked with a stake in each corner and have string running between each stake. Send students off to locate a site they want to use as their research site for the next few months. The sites can include whatever features students wish. Remind them that by the end of this unit, they will have a very close relationship with this site and know a lot about what goes on within the boundaries.
3. Have the class share the measuring tapes or yardsticks to measure out their plots.
4. Once each pair has marked their site, have them tie a colored piece of tape to one of the stakes that has both their names on it.
5. Then, in their journals, ask them to draw a map of where their research site is in relation to the school.

6. Finally, ask students to sit quietly inside their research site and write in their journals about why they picked this spot. What characteristics of this place appeals to them and why?
7. Then, in their journals, ask them to draw a map of where their research site is in relation to the school. Ask students to sit quietly inside their research site and write in their journals about why they picked this spot. What characteristics of this place appeals to them and why?

TIP: Depending on the size of the area you have available for students' research plots, consider placing all of the plots back to back, so that students are covering one contiguous area. This way, you can combine students' research and emerge with a fairly accurate study of a larger ecosystem. Take advantage of any access you might have to statistical software for measuring species in the area. The activities presented here are only a beginning for the work that can be done using these individual plots.

JOURNAL ENTRY : MAPPING YOUR RESEARCH SITE

Ask students to map their research site on a page in their journals. This should be a detailed map showing the vegetation and ecosystems that exist within their site. Have them use colors and, if they would like, legends to give the map detail.

