9-1-2001

Exploring Alternative Conceptions in our Environmental Education Classroom

Gayle A. Buck
University of Nebraska-Lincoln, gabuck@indiana.edu

Patricia Meduna
Bishop Neumann Jr.-Sr. High School, Wahoo, Nebraska

Follow this and additional works at: http://digitalcommons.unl.edu/teachlearnfacpub

Part of the Teacher Education and Professional Development Commons

Faculty Publications: Department of Teaching, Learning and Teacher Education. 21.
http://digitalcommons.unl.edu/teachlearnfacpub/21

This Article is brought to you for free and open access by the Department of Teaching, Learning and Teacher Education at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Faculty Publications: Department of Teaching, Learning and Teacher Education by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.
Teaching is an inexact science. Even experienced teachers have difficulty assessing the effectiveness of their lessons and students’ mastery of concept. Teachers must be particularly careful to avoid introducing or reinforcing student misconceptions. The following describes how we scrutinized and modified our own environmental education teaching practices to ensure that our students were learning what we were teaching.

**Clarifying conceptions**

As middle level science teachers, we had encountered many misconceptions in our teaching and were well aware of their consequences. However, not all of our students’ incorrect conceptions were scientifically incorrect. For example, some students perceived environmentalists as “tree-huggers” and “nerds.” These are value statements; and, although we cannot say they are scientifically incorrect, they do go against the aim of our educational practices. After doing a little research, we located the term *alternative conceptions*, “experience-based explanations constructed by a learner to make a range of natural phenomena and objects intelligible” (Wandersee 1994). This term encompasses misconceptions; however, it also includes ideas that are counter to the goals of education.

**Analyzing understanding**

Gayle first recognized an alternative conception while looking over a set of photographs that showed her students surrounded by mounds of containers they had collected to recycle. She remembered a comment that one of her students had made about dumping soda down the drain so that he could gather the required number of aluminum cans. She thought, “What am I teaching my students?”

**Making changes**

From what we heard, we realized that we needed to change our approach. We began focusing on incorporating four sequential components into our environmental education curriculums. See Figure 1 for the results of our inquiry and how we changed our practices.

**We did not realize that students were creating and reinforcing these alternative conceptions from our environmental science lessons.**

When we analyzed our results, we found several alternative conceptions that were prevalent in our students’ responses. As teachers, we were aware that students might attach such alternative conceptions to science-based lessons. However, we did not fully understand the roots of their beliefs. Additionally, we did not realize that students were creating and reinforcing these alternative conceptions from our environmental science lessons. That is, we did not understand this until we started to listen to our students and take a critical look at our own practices.

**Gayle Buck** is an assistant professor in the Center for Curriculum and Instruction at the University of Nebraska—Lincoln. **Patricia Meduna** is a middle level science teacher at Bishop Neumann Jr.-Sr. High School in Wahoo, Nebraska.
The environment in your backyard

Objectives
1. To understand how the natural cycles work together
2. To understand how you fit into the natural cycles
3. To understand the effects of pollution on the natural cycles

Materials (per group of four or five students)
• colored pencils
• white poster board (55 cm x 70 cm)
• pencil or pen
• scratch paper
• four pieces of notebook paper
• clear plastic wrap
• tape
• black permanent marker

Procedure

Part one (group work)
1. Pretend that your house is on the edge of a wooded area with lots of wildlife.
2. Use colored pencils to design a group poster of what you see when you face the woods. Include a drawing of yourself and at least one plant and one animal.
3. Use scratch paper to brainstorm ideas on how to illustrate the cycles of matter—water, carbon, oxygen, and nitrogen—on your poster. Be sure to include all the living things you have drawn in each of these cycles.
4. On your poster, draw and label these cycles.
5. Present your poster to the class and explain what you have drawn.

Part two (group work)
1. Cover your cycle of matter poster with clear plastic wrap and tape the ends of the wrap onto the back of the poster.
2. Using the permanent marker, illustrate how pollution affects different aspects of the cycles of matter. Be sure to include how people affect pollution and how pollution affects people.
3. As a group, present your poster to the class and explain what you have drawn.

Part three (individual work)
On loose-leaf paper, answer the following:
1. Explain each of the cycles of matter that your group illustrated. Be sure to include how you are part of the cycles.
2. Demonstrate how a food web is illustrated in your poster.
3. Discuss how the animal populations stay balanced naturally. Be sure to explain thoroughly.
Our students’ alternative conceptions

The environment is separate from us
Students believed that they are not part of the environment and that they have very limited connections to it. They believed that hunters are the only people who get their food from the environment, and that most people have to travel to see an environment. In all, the students perceived the environment as something that is “wild.”

Nature will collapse without human management
Students believed that, without human management, the environment could not function. Initially, these beliefs did not surprise us: Many of our students participate in hunting programs sponsored by wildlife management organizations, which advocate deer-population control. However, our students also believed that trees could not grow if people did not nurse them, and that, without wildlife management, all life on Earth would cease because animal populations would overrun the planet, eat all the plants, and consume all the air.

The more you buy, the more you help the environment
Although our students did not label themselves “environmentalists,” they did believe that recycling is a means to improve the world. We were not surprised to hear this. However, students also thought that their families should buy more products so they could produce more recyclables and, therefore, help the environment more. Our students did not make many, if any, connections to reducing or reusing.

A critical look at our teaching approach

The environment is separate from us
We emphasized environments as small sections of the world far from where our middle school students lived. Our lessons highlighted such places as Brazil’s rainforests and Africa’s disappearing lakes. Additionally, we seldom taught students about the people of these places and how their lives are connected to those environments. Overall, we failed to show our students how each of them is part of an environment.

Nature will collapse without human management
We often emphasized the need for people to “save” the Earth. Therefore, students believed the environment, if left alone, literally would collapse. Additionally, during our wildlife management unit, we covered methods for controlling animal populations in and near towns. However, we seldom pointed out the reasons—such as human population growth and predator reduction.

The more you buy, the more you help the environment
During our unit on recycling, we portrayed it as a good thing. We taught students how to recycle and showed them what happened to their recyclables. In earlier grades, students had earned prizes for bringing in the most recyclables. They learned that more is better. However, we realized that we barely mentioned the concepts of reduce and reuse.

Our new approach to environmental science

Step 1: We are all part of the environment
Now, we concentrate on fostering a more detailed and complex understanding of students’ own environments and how each student is a part of the Earth’s systems. We accomplish this by focusing on the cycles or matter (water, carbon, oxygen, and nitrogen) and the complex webs of life in students’ own backyards and on how people, plants, and animals fit into those cycles and webs.

Step 2: The environment is self-monitoring; humans must monitor their own actions
We build on students’ understanding of the Earth’s cycles and webs by studying the balance of the Earth’s systems—how they interact and how people fit into these systems. We concentrate on the effects that people’s lifestyles have on the systems we study. Students explore local environmental concerns and human management techniques. Additionally, students learn how humans have to change the way they interact with the environment, not how humans have to save the environment. We continue to teach about wildlife management; however, now we investigate reasons for animal population control.

Step 3: It is important to reduce, reuse and recycle
We continue to teach our students about recycling; however, we emphasize that it is one part of the conservation strategies that should become part of everyone’s lifestyle. We focus on reducing our level of consumption and reusing materials that we frequently discard. Like our recycling lessons, we emphasize these concepts through hands-on activities.
Our students’ alternative conceptions

People who are interested in nature are not “cool”

Students had a very poor impression of people who care for, or even about, the environment. They pictured a person that hugged trees and did not take baths—a person very few middle school students admire. Additionally, we realized the extent of peer pressure not to be concerned about the environment: Because students perceived environmentalists as outcasts, students felt that they would be stereotyped that way if their peers thought they were environmentalists.

A critical look at our teaching approach

People who are interested in nature are not “cool”

During our unit on environmentalists, we were highlighting people who went against the mainstream of human culture. However, we realized that most of our students do not identify with people who make great self-sacrifices and stand apart from the crowd.

Our new approach to environmental science

Step 4: The environmentalist next door

Many great people have made sacrifices to learn about and improve the environment. To spotlight those people who would be good role models for middle school boys and girls, now we highlight local individuals who have jobs that involve the environment.

Our approach meets the following National Science Education Standards:

• Unifying concepts and processes
• Systems, order, and organization
• Change, constancy, and measurement
• Evolution and equilibrium
• Form and function
• Life science regulation and behavior
• Populations and ecosystems
• Science in personal and social perspectives
• Personal health
• Populations, resources, and environments
• Risks and benefits
• Science and technology in society

Conclusion

Our inquiry into students’ alternative conceptions about the environment was a very enlightening experience for both of us. The process revealed some beliefs that surprised us. However, the real surprise came when we realized that our own lessons reinforced (and sometimes formed) many of our students’ alternative conceptions. With our new insights, gained from listening to our students, we developed a better way to teach environmental education.

References