EDITORIAL

Call for Action: Life Altering Environmental Experiences

We are experiencing a rebirth in concern and commitment to the environment. Environmental education has been part of the science curriculum since the 1970s but today's renewal seems more pressing and vital in affecting attitudes and knowledge among our students. What is the best way to impact our students? How can we effectively increase their understanding of environmental issues over the long term? How can we ensure they will be responsible adults in regards to the environment?

Experiences. Memorable experiences. Immersion experiences. Let's set aside individual lessons. Let's put away one-time environmental activities. What we need to do is connect our students with environmental issues in their community, state, nation, and world.

In the summer of 2006, I was invited to go on a Global Expedition sponsored by Miami University and the Cincinnati Zoological and Botanical Gardens. This expedition involved teachers from all over the nation and was inquiry based. The expedition focused on cheetah conservation in Namibia, which is near South Africa. Namibia is home to one of the largest remaining populations of cheetahs.

The population of cheetahs dropped by half in the 1980s due to the expansion and democratization of Namibia. With only 2500 cheetahs remaining, their genetic diversity was in peril, their hunting area was reduced, and conflict between farmers and cheetahs was ever present. The farmers saw the cheetahs as enemies affecting their livestock. When the Cheetah Conservation Fund (CCF) was established in the 1990s, an effort to inform the farmers of the role of the cheetah in the ecosystem became a driving force of the CCF's activities. By building rapport with the farmers, Laurie Walker, the director and creator of CCF, slowly began to create alliances so that today, many of the commercial farmers work with CCF in protecting the cheetahs rather than killing them in this community-based ecological effort.

The focus of our expedition was on cheetah conservation through relationships built between the teachers and local Namibian teens. We were introduced to the teens during a dinner at CCF that transcended into music and dancing around the campfire. The goal for the teens was to help educate them about the importance of the cheetah in their communities as well as educate the teachers about both the cheetah and life in Namibia. One of the key experiences of the expedition was a full moon watering-hole population count. Each teacher was paired with two Namibian teens. The groups were then taken to a watering hole where they spent 24 hours monitoring the animals that approached the water. A census count was taken. I teamed with two young men. We set up our base 40 feet high in a blind just big enough to hold the three of us. The counting went well while the sun was up. We saw hyenas, African bush pigs, elands, and other visitors sip the water. Between animal visits, the teens and I talked about popular culture, American music, African films, and, more than anything, the animals of the bush. These teens shared their first-hand knowledge of the animals. When night time came, the sounds of the animals under the brilliant full moon was the key tool we used to identify the animals. The teens knew the sounds. I was totally clueless. The teens taught me about the bush, the animals, their sounds, and Namibian culture. After 24 hours, we descended from the blind and headed back to CCF. I came away changed. I experienced a day and night out in the bush where there is only nature present. No blinding neon light, no car sounds, none of the noise present in much of American life. I also saw how comfortable these teens were in the wild. They knew the environment in which they lived. They knew the sounds, the textures, and the activity of the bush. I wondered as I was there, how well most American young adults could do in a 24-hour stay in the nature. Would they know what was making the sounds? Would they be at ease spending the night high in a blind overlooking pastures, fields, or watering holes in the various ecosystems of the United States?

After the watering-hole count, the teachers became immersed in an inquiry experience within the bush. The particular area was filled with 6-feet-high termite mounds, scat of various animals, insect and plant life. The teachers were to design an inquiry that focused on one aspect of the bush, exploring questions as: What patterns exist among the location of the termite mounds? What scat patterns are present in terms of kinds, frequency, and location? How can the bird life of the bush be described? For some of the teachers, this was their first time experiencing real life inquiry. The intent of the expedition was to provide the teachers with a stimulus to perform a similar inquiry at their home schools, especially using the environments of the schools' communities.

As a result of this expedition, I assisted the teachers with the inquiries, felt a kinship to the Namibian teens, and grew to appreciate the role of cheetahs in the environment. On the other hand, this African experience changed my life. I am now more aware of the waste that Americans generate. I no longer consume as many material things because they represent noise in my environment. I lived for ten days in the bush existing on one electrical outlet, outdoor showers under the southern sky constellations, and saw the Namibian people living a life with the bare essentials, yet at peace with themselves, their music, their art, and their place in the environment. I yearned for the same peace of mind one gets by living so close to nature.

We cannot provide this life-changing experience for all our students, but we can try. There are biology teachers using their spring break to take students to Costa Rica to continue inquiries established by scientists. There are teachers involving students in community-based projects, such as building trails in a prairie to protect the fragile ecosystem. There are professors taking students on field studies in the Bahamas. The key components of these environmental programs are active involvement, memory making, and experience with doing science.

Richard Louv (2005) describes many of our youth as having "nature-deficit disorder." Our youth spend little time outdoors. We see youth unable to relate to nature. The tradition of youth exploring the outdoors, wandering in woods, wading in streams, and daydreaming while chasing after butterflies is almost nonexistent. The current movement of "Going Green" will fail if we don't get our students

actively engaged in the outdoor environment. Our classes must spend time doing inquiry outdoors. Our college students need to move from the lecture hall to outdoor field study. Without direct connection with nature, the media influx of the Going Green mentality will have little effect in the long term.

We do not need our students to be "environmental wikipedias" filled with facts that keep them from seeing the causal relationships existing in the environment. What are the causes of water and air pollution? What contributes to species loss, like the cheetahs? What causes the unacceptable death of young children all over the globe? What is the impact of a recycling program? Understanding these causal relationships is the biggest need in environmental education. The knowledge of Americans surrounding environmental issues is embarrassing. The NEETF/Roper Report (2005) found 45 million Americans believing the ocean is a viable source of drinking water. One hundred million Americans believe disposable diapers are the leading problem in landfills, when they only account for 1% of what ends up in landfills. Paper products are the primary culprit. Only 10% of Americans realize that wildlife entanglement is due to abandoned fishing line, not plastic rings. Fifty-five percent of Americans continue to think that a lack of food, rather than contaminated water, causes most childhood deaths in the world.

Falk and Dierking (2002) believe that schools deliver only 3-7% of the average person's education over a lifetime. As a result, more than 90% of a person's knowledge comes from experiences, media, and "free choice learning" everywhere. If we provide our students with real world environmental experiences, is there a greater chance they will choose environmentally-related experiences when they are adults? By giving our students firsthand knowledge of the environment through experience, we have a chance of seeing the Going Green movement become a reality.

By following in the footsteps of Thoreau, Aldo Leopold, Gary Snyder, Rachel Carson, Wendell Berry and other nature authors, we must connect our students directly with the environment if real change is to occur. Without this connection, environmental education will remain a step-child to the science curriculum in our schools and universities. Students must be immersed in nature, immersed in environmental action, and immersed in community-based projects if we are to affect their knowledge, attitudes, and motivations about the environment. In the meantime, try to change their lives by finding them a blind high in the treetops where they are doing a community-based population count to understand the relationship of an organism, such as a cheetah, in the ecosystem. Oh, and be sure they do the count under a full, glistening moon. They will become forever changed and our most compelling environmental activists.

Ann Haley Mackenzie
Editor

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Quick Fix

CANDY BUGS: USING A SKIT TO ILLUSTRATE BIOLOGICAL RESISTANCE

JAMES MCNEIL

The concept of resistance in biology, which explains how populations survive and even flourish in the face of stressors, is very important. It is at the center of several current issues, including the emergence of drug-resistant diseases and the adoption of genetically-modified crops. However, many students have difficulty understanding how resistance develops in populations of organisms. In introductory entomology classes, I talk about the example of insects developing resistance to pesticides. Many students miss the point that the resistance develops between generations and is not a change that spreads directly from individual to individual within the same generation.

To make this distinction clearer, I created a short classroom skit that helps the students better visualize resistance development. I begin the skit by describing a farmer who is producing a valuable crop, represented by a bowl of mixed, hard candies. I then ask for ten student volunteers, who are designated as "crop pests." Each of them takes a piece of candy from the bowl. I give eight of the students a piece of colored paper labeled "SUSCEPTIBLE" and the other two students other colored papers labeled "RESISTANT." I emphasize to the class that both of these categories represent the current generation of pests. Next I explain that the farmer has decided to spray a pesticide to get rid of the crop pests. The resistant pests, however, can survive the pesticide. The SUSCEPTIBLE students sit down, and I ask the two RESISTANT students to create the next generation of crop pests by each selecting four more of their classmates to come forward and take a piece of candy. At this point, I stop the skit and point out that this second generation of crop pests has developed resistance, not from changes within individuals, but because some individuals were already resistant and produced the next generation, which shared their resistance.

This lesson can also be adapted to illustrate other points about resistance by modifying the rewards and categories. For instance, to demonstrate that resistance has fitness costs, SUSCEPTIBLE individuals could be allowed to take two pieces of candy, while RESISTANT students could take only one, demonstrating reduced feeding abilities in resistant insects. The skit could also be modified to illustrate resistance management tactics, such as treating with multiple pest control strategies to target resistant individuals with an alternate control method, and eliminate them from the population.

Using this skit in my classes helps make a challenging concept more accessible, especially to visually-oriented students. It is a very flexible teaching tool and could be adapted for several instruction levels. It could also be adapted for other classes, such as microbiology, by changing the example organisms and treatments. I have found it a simple and effective way to encourage class participation, while also conveying information about an important subject.

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