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Battling Ecophobia: Instilling Activism in Nonscience Majors WhenTeaching Environmental Issues

By Mark A. Bloom and Molly Holden

When learning about large-scale environmental problems such as climate change, species extinctions, overpopulation, and habitat destruction, students can become hopelessly dismayed and experience ecophobia—a state of mind in which the student is fearful of the looming environmental problems but senses that there is nothing that can be done to correct them. This paper describes an approach to teaching about environmental issues that, rather than foster ecophobia, helps instill a sense of agency in the young learner. Five Small Steps to Reduce Your Environmental Footprint is a classroom activity that challenges nonscience majors to take action in their personal lives to “walk more lightly” on the planet. Students were asked to identify five lifestyle behaviors that contribute to environmental degradation and to come up with an alternative behavior to reduce their personal environmental impact. Students’ response to the assignment along with the work they submitted indicates that the strategy is highly effective in encouraging them to face environmental problems in a healthy way with self-identified solutions in mind instead of feelings of hopelessness and helplessness.

It has been well argued that all citizens should become scientifically literate (American Association for the Advancement of Science 1993; Driver et al. 1996; Hazen and Trefil 1991; NRC 1996; Trefil 2008). Scientific literacy may be defined as possession of the “facts, vocabulary, concepts, history and philosophy” needed to “understand public issues” (Hazen and Trefil 1991, p. xii). This form of literacy is crucial because all citizens have to make decisions about scientifically based issues throughout their lives. These issues may take the form of personal decisions about health care to broadscale decisions about the future of energy and other environmental actions. Scientists have discovered much about the natural world that exposes humans to imminent risks such as emerging diseases, antibiotic resistant bacteria, and the harmful effects of mercury and other environmental toxins on human health. Similarly, discoveries about the environment have informed us of biodiversity loss, species extinctions, holes in the ozone, and climate change. There is, however, a problem when we contextualize science instruction to the looming personal and global issues that may be faced by young learners: The content can seem, both cognitively and emotionally, too difficult to grasp.

When teaching these topics to nonscience majors, too much content detail can cause the material to seem overly technical to the nonscientific audience. Conversely, too little content leaves them ill-prepared to develop informed opinions. Finally, a mediocre treatment can result in students learning enough to be alarmed, but not enough to feel capable of dealing with the issues. This condition can result in students developing a sense of hopelessness and anxiety about what they have learned. The question, then, is this: How can we, as science
educators, teach enough science content for learners to be sufficiently literate to make decisions about such critically important issues without leaving them feeling vulnerable and helpless to face them?

Since the 1960s, conventional knowledge has led us to believe that educating students about environmental problems would motivate them to act more responsibly toward the environment (Hungerford and Volk 1990). Not all environmental educators, however, share this view. For over a decade, Sobel (1996, 2007) has discussed the phenomenon of ecophobia in relation to educating young people about environmental concerns. He described ecophobia as a condition in which a student learns about environmental problems, but instead of developing a sense of agency to face them, the student is left with a helpless sense of dread about the future. He claimed that in our efforts to educate young people about issues related to environmental degradation, we are inadvertently instilling in them a sense of fear and helplessness. Ecophobia represents a paradox that educators can foster, in which the student becomes aware of looming environmental concerns but feels incapable of becoming a part of a solution. When I reflect on these two distinct arguments, I come to the understanding that perhaps it is not what we teach these young learners, but rather how we teach them that is the cause of (and perhaps the solution to) this ecophobic paradox.

Fostering ecophobia

From 2003 to 2008, I (first author) had the pleasure of teaching a majors biology course at a small, private university in Texas. Rather than offer the traditional abbreviated version of the majors biology course, this course used biological topics found in current, mainstream, popular press magazines such as Time, Newsweek, and U.S. News & World Report to guide the course content. The result was a course that used contemporary media topics to connect science content to real-world situations.

Although the course was highly popular among the student body, there was a downside I found particularly troublesome. Students frequently commented that certain aspects of the course were highly negative. They gave examples of topics such as the escalating diabetes epidemic in the United States, the prevalence of binge alcohol drinking on campuses nationwide (including their own campus), the direct and often lethal impacts of anorexia on vital body systems, and new strains of bacteria developing resistance to modern antibiotics. Even health-promoting activities were called into question as we examined the cause behind escalating cases of arthritis among young athletes! The students were beginning to think that anything they did could result in some form of disease. I realized that through the course discussions, I was providing my students with the technical content to understand the problems currently being tackled by the scientific community but was giving them very little guidance on how to address the social and emotional impact of this knowledge.

Combatting ecophobia

To accommodate these concerns, I began to more clearly emphasize solutions to these problems by explicitly guiding the students to the aspects of the issues over which they had some level of control. This approach was somewhat effective for certain topics such as lung cancer, diabetes, and infectious diseases; the students merely had to avoid cigarettes, monitor their diet, and practice good hygiene to avoid these problems. However, I found myself struggling as we approached the unit on environmental issues. This unit covered issues such as global warming, ozone holes, air and water pollution, emerging diseases, acid rain, and species extinctions. Global issues such as these left students with a grim understanding of the planet’s potentially dire situation, which to many students seemed unavoidable and completely out of their control. This was the crux of Sobel’s argument: Students need to

### TABLE 1

Top 14 eco-friendly actions taken by students ($n = 132$) and submitted for extra credit.

<table>
<thead>
<tr>
<th>Actions</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Begin recycling</td>
<td>52.3% (69)</td>
</tr>
<tr>
<td>Switch to compact fluorescent lightbulbs</td>
<td>34.8% (46)</td>
</tr>
<tr>
<td>Use natural light (opening blinds/curtains)</td>
<td>33.3% (44)</td>
</tr>
<tr>
<td>Walk instead of drive</td>
<td>32.6% (43)</td>
</tr>
<tr>
<td>Turn off water when brushing teeth and washing face</td>
<td>28.8% (38)</td>
</tr>
<tr>
<td>Unplug “vampire electronics”</td>
<td>23.5% (31)</td>
</tr>
<tr>
<td>Use less air conditioning (by adjusting thermostat)</td>
<td>18.9% (25)</td>
</tr>
<tr>
<td>Carpool</td>
<td>18.2% (24)</td>
</tr>
<tr>
<td>Use reusable water bottles</td>
<td>18.2% (24)</td>
</tr>
<tr>
<td>Take shorter showers (or shower in lieu of tub baths)</td>
<td>15.2% (20)</td>
</tr>
<tr>
<td>Use reusable shopping bags</td>
<td>15.2% (20)</td>
</tr>
<tr>
<td>Purchase organic foods</td>
<td>14.4% (19)</td>
</tr>
<tr>
<td>Launder only full loads</td>
<td>12.1% (16)</td>
</tr>
<tr>
<td>Use reusable plates instead of disposable</td>
<td>11.4% (15)</td>
</tr>
</tbody>
</table>
understand climate change, but it is such an overwhelming issue that it seems impossible for individuals to feel they could have an appreciable effect in impacting it. The fact that these particular students were non-science majors likely amplified their sense of despair. The students were not anti-environmentalists, per se, but neither were they particularly well-informed about environmental issues prior to enrolling in the course, much less prepared to take on issues of this magnitude. To complicate matters, some of the more politically conservative students equated environmentalism with liberalism and, therefore, considered the lessons’ factual integrity as suspect. Most, however, simply did not identify themselves as science people and had never really paid enough attention to environmental issues to have developed awareness in the first place.

Changing my perspective

While considering the students’ comments, I realized that the class was highly focused on content delivery and offered little opportunity for the students to experience the process of science. In essence, its design was based on the conventional assumption that knowledge acquisition would result in behavioral changes. When the students complained of the negative perspective of the class (in relation to human health issues), I recognized the flaw of this assumption. Instead of fostering behavioral changes, the students were only learning of new issues to be worried about. My initial attempts to alleviate this discomfort took the form of didactically teaching them ways to avoid the negative health consequences (i.e., limit alcohol intake, use stop-smoking therapeutic techniques, exercise). Although this seemed to help the students (at least somewhat), I cannot say that I was affecting authentic learning—the kind of learning that could be transferred to other unrelated health issues. I was only passing on knowledge that was situational at best. This realization caused me to question whether I could guide my students to scientific literacy when my instruction was based primarily on vocabulary and facts. Furthermore, when I approached the larger environmental issues of the last unit of the course, I found I could not teach students the solutions they needed; the problems were too big for me to solve. What the students needed was time to struggle with the issues. By providing them time to think through the problem, I hoped they would be better able to make meaningful connections and thereby be better able to transfer their knowledge to other contexts (Brunsford, Brown, and Cocking 2000).

A new approach

After teaching the lessons on emerging diseases (focusing on Ebola and HIV) and acid rain (largely attributed to power plant emissions), I asked students how they felt about these large-scale environmental issues that faced our generation. The responses were not unexpected and were typical of what I had heard in the previous classes. They expressed concerns such as “the problems are so big” and “what can we do to fix these problems?” To address these concerns and to give students the time they needed to work through the issues, I introduced a new activity called Five Small Steps to Reduce Your Environmental Footprint. The activity was designed to play on the idea of power in numbers and individual action (there were 180 students among my two sections of the course). It was a voluntary assignment and was offered as a way for them to earn extra credit toward their final grade. The activity required each student to identify five personal behaviors that negatively affected the environment and find ways that they could change them to be more eco-friendly.

Modeling “how to do it”

To demonstrate, I shared with my class two examples of changes I had recently made in my own home. Recognizing the waste of resources (water and gasoline) in maintaining my backyard lawn, I opted to lay landscape carpet over the area and cover it with pea gravel. Because most of my students lived in dormitories or apartments, they asked for another example that most of them could do themselves. I told them that I turn off the water while brushing my teeth. When they laughed about what minimal impact this action could possibly have, I informed them that if I left the water running while brushing my teeth, approximately 1 gallon of water would be wasted during each brushing event. Multiplied by two or three brushings a day (four if I was being especially diligent) for 365 days a year, the volume of water saved by turning off the faucet began to look quite impressive. I was hoping to demonstrate to them that environmentally friendly behaviors did not have to mean drastic lifestyle changes, but rather simple shifts in habits-of-mind that allow us to tread more lightly on our planet. After relating to them how simple changes such as these could result in significant environmental benefits, I sent them off to identify and begin to implement their own five small steps. To receive credit for the assignment, they were required to justify and document that they had, indeed, implemented the steps and explain how their actions would benefit the environment. I told them that the documentation could be as simple as a signed statement from a witness (e.g., a roommate, parent, friend, or another professor) describing their new behavior and its effects.

Students’ developing sense of agency

Several weeks later I was pleasantly surprised by the students’ enthusiastic response and the creative work
they submitted. Of the 180 students enrolled in the two class sections of
the course, 132 participated in this activity and came up with 95 distinct
eco-friendly actions that they took to earn extra credit. Table I presents
the 14 most frequently reported actions.

Beyond the enthusiastic involvement of so many of my students, I was
even more pleased about another interesting, and unintentional, result of
the project. The message I had hoped to convey through the activity had
spread beyond the classroom. Several students reported that individuals who
witnessed their actions would often ask them for more information about
the assignment and subsequently get on board by making some eco-
friendly changes in their own lives. This was particularly true of some
professors who were asked to be witnesses. Further testimony of the stu-
dents’ enthusiasm was demonstrated in the creativity of their submitted
work. Many students submitted their assignments in digital format
rather than hard copy, citing ease of submission as well as environmental
benefits (saving paper, ink, and energy). Several students who opted to
turn in hard copies of the assignment remained true to the eco-friendly
approach by using materials such as recycled grocery sacks and pieces of
cardboard boxes to create their final work product. Their creativity demon-
strated that they were actively trying to embrace the spirit of the assign-
ment above and beyond the initially established guidelines.

This experience supports Sobel’s claim that knowledge alone does
not lead to behavioral change. As environmental educators, we should
instead approach environmental education with the idea that “a sense
of agency and control leads to the knowledge of issues and action strate-
gies, which lead to an intention to act” (Sobel 2007, p. 16). It is highly likely
that many, if not all, of the students who participated in the activity did
so for the purpose of improving their

course grade and not because of any
intrinsic desire to tread more lightly
on the planet. However, by identi-

fying and implementing new behaviors,
they recognized that they actually do
have the ability to make a difference.

Their seemingly insignificant actions,
combined with those of their class-
mates, accumulated to an impressive
amount of positive change that could
contribute to correcting large-scale
environmental problems. This sense
of agency allowed their attitudes to
change as well, as demonstrated by
their creative methods for turning in
their assignments.

Lessons learned
My desired goal was for students
to learn about many biological is-

sues ranging from human diseases to
large-scale environmental problems.
I hoped that through these knowl-

dge gains, they would be able to ad-
just their behaviors to avoid negative

collections. What I discovered
was that my approach to teaching
had to change. I was not achieving
my goals by directly teaching the
knowledge to my students. Instead,
I was leaving them with all sorts of
phobias. What I actually wanted for
my students was for them to develop
scientific literacy. However, scientific
literacy requires more than basic
content knowledge about scientific
issues. For my students to become
literate in science, they needed the
mechanism to use their content
knowledge.

The Five Small Steps activity pro-
vided them an opportunity to use their
knowledge in a way that helped them
develop a sense of agency. With that
sense of agency, I was able to witness
the beginning of an empowerment
among my students to face challenges
far more imposing than diabetes or
heart disease; they were taking on cli-
mate change. Will this sense of agency
lead to lasting behavioral changes?
That is a valid question. In our pro-

fession, we oftentimes only get a few
short months to have an influence on

our students. Although it is difficult to
know what lasting impact we have on
them, I remain hopeful that the sense
of agency that I witnessed being born
among these students remains vital to-

day. I hope it continues to impact their
daily choices and that they continue to
leave a slightly less apparent footprint
on our environment.

References
American Association for the Advance-
ment of Science. 1993. Benchmarks
for science literacy. New York:
Oxford University Press.
Branford, J.D., A.L. Brown, and R.R.
Cocking. 2000. How people learn:
Brain, mind, experience, and school.
Washington, DC: National Academy of
Science.
Driver, R., J. Leach, R. Millar, and P.
Scott. 1996. Young people’s images
of science. Buckingham, England:
Open University Press.
Hazen, R.M., and J. Treffl. 1991. Sci-
cence matters: Achieving scientific
literacy. New York: Anchor Books,
Doubleday.
Changing behavior through environ-
mental education. Journal of Envi-
ronmental Education 21 (3): 8–21.
National Research Council (NRC).
1996. National science education
standards. Washington, DC: Na-
nional Academies Press.
Sobel, D. 1996. Beyond ecophobia:
Reclaiming the heart in nature edu-
cation (Nature Literacy Monograph
Series #10). Great Barrington, MA:
The Orion Society.
Sobel, D. 2007. Climate change meets
ecophobia. Connect (November/De-
Teachers College Press and Arling-
ton, VA: National Science Teachers
Association.

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