

# EDITORIAL Why Is Biology so “Tough”?

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This billboard was seen recently in Upstate South Carolina. I could not resist taking an image of it. The Web site referenced is designed for students considering applying for college. It has an “Are You Ready?” quiz, a tour of a virtual campus, and many suggestions for preparing for college study and life. It is a clever Web site and potentially very useful. But the billboard raises the question of why biology was selected as the “tough” subject. I think it comes from the myths about high school biology. Here are some of these myths as actual quotes from current and former biology students followed by my responses.

- **Biology is hard.**

Yes, it certainly can be if it has a boring curriculum and is not taught properly. But I think that biology is the easiest subject in which to interest students and to teach. This is because biology is so fascinating and relevant to students’ lives today and there are numerous opportunities to engage students in active learning. The functioning of the human body, ecosystem principles that relate to our environment, and the mechanisms of inheritance are all of high interest to adolescents. Some of biology, such as molecular biology, statistical applications, and evolution can seem hard to understand because many of these concepts are abstract and difficult to comprehend, especially for students who are not formal thinkers. That is why successful biology teachers engage students in lab and field activities that allow them to progress in their learning from the concrete to the abstract.

- **Biology is boring.**

It sure can be if it is taught mostly by lecture. I will always remember the research-based comment by Robert Yager (University of Iowa Emeritus), “If one visits a high school biology classroom one will see the teacher lecturing 90% of the time.” I hope this is not still true today but one does wonder. The ratio I tried to maintain was 60% engaging activity and the remainder for lecture, discussion, assessment, and other. I agree that biology can be boring, particularly if students never have the



opportunity to raise questions and explore answers as young scientists. Another boredom problem is learning dead biology. Some biology students do not get to interact enough with living organisms, especially if the classroom experience is mostly worksheets from books and lecture. A biology classroom should be alive with living organisms year around.

- **Biology is yucky.**

Some of biology is gross but that is a reality. Life, food, metabolism, waste, death, competition, evolution, and extinction can be both cruel and gross but these processes also make biology utterly fascinating. It is interesting that students do seem to remember the “yucky” parts of their biology class. Maybe that is okay.

- **All I remember from biology is that awful frog dissection.**

There is an entire literature on the learning value of dissection and it is mixed at best. For many teachers and students, dissection is a rite of passage without any particular justification for its use in an introductory biology class. But dissections can be interesting to students and productive if they use inquiry. My high school biology students of the 60s and 70s dissected the earthworm, crayfish, and frog, as well as flowers, fruits, and seeds. There were always lots of questions. My pre-health aspiring physiology

students dissected either a fetal pig or ranch mink and found that experience incredibly interesting.

- **I don't remember anything from my biology class.**

This is not an uncommon statement and is probably related to biology class being uneventful. But that is shameful because of the many opportunities to excite students about living things, including having multiple live organisms in the classroom, doing observations and experiments with live organisms and, of course, field trips. Some of my favorite field trips very near school were the meter-by-meter analysis of four centimeters of a field or lawn, observing animal behavior, insect collecting, and a school trash audit. Students do remember these activities and they are neither tough nor boring.

I feel that anyone can and everyone should become a biologist, at least to some extent. One could say that everyone is a biologist, they just don't know it. Sometimes the formal study of something can make it seem tough and distant but biology is all around us and is us! If every biology teacher practiced that perspective, biology would not seem nearly as tough. I invite your reactions to the billboard and to this editorial as a Letter to the Editor.

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