

# Perspectives

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## High School Biology: Making It Exciting and Meaningful

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Several months ago a teacher in my science department showed me a student's biology test paper. Instead of responding with the expected answers, the student had written: "Teach me something important," "Who cares," and "It means nothing to me." Of course, the student received an "F" for the examination, but he deserved an "E" for his effort to try to communicate the hopes, desires, and frustrations of numerous students studying biology across the nation.

"You can successfully teach students about a tin can because you get them excited about the tin can, and they want to know all about that can," my former biology chairman once told me. Not surprisingly, after sixteen years of teaching biology on the secondary level, I still believe that the key to teaching biology successfully is the teacher's ability to make the subject exciting for his students. "Ay, there's the rub," to quote Shakespeare. Biology is the study of life. Why do we have to worry about "turning on" students? Why isn't excitement inherent? Why indeed!

My experience indicates that the ability to excite an individual about an idea, or object, or place, is often predicated on the importance and familiarity of the idea, object, or place to that individual. Webster tells us that to excite involves arousing emotions. For example, how would you begin to excite a student about

baseball if the student had never seen the game? The first step would, of course, be to involve the student in the game (either as a spectator or as a participant) to give him or her some familiarity with what you are describing. Otherwise your ability to transfer your excitement to the student will be thwarted by his or her lack of a frame of reference and experience. Similarly, as biology teachers we cannot expect to excite students about earthworms, grasshoppers, or frogs by simply discussing them. The organisms—wriggling, hopping, and jumping—must be brought into class to allow our students to "experience" life. Thus, the subject becomes experientially based.

That students no longer seem to have the interest in or the desire to elect science courses is often ascribed to the view that this generation of students "no longer cares." I neither subscribe to this view nor to the view that "only teachers know what is best" for students. Such thinking only leads to the development of curricula that will continue to "turn students off." Witness that, as a result of our anxieties during the Sputnik era, we evicted meaningful and descriptive biology syllabi and substituted syllabi filled with abstract concepts and abstruse vocabulary. Many of today's biology students having been nourished on the "kernel" of biochemical genetics, are starved for a basic understanding of the concepts

associated with their immediate environment. For example, although students can often describe DNA replication, how many of your students can distinguish an oak tree from a maple tree, or a robin from a starling? The excitement of biology can be found outside of our classroom windows, but we ask our students to find it in the vacuum of the electron microscope. Our students cry out, "teach us what's important," but we are deaf.

I have no revolutionary earth-shattering revelations to offer because I believe biology can be made exciting, meaningful, and alluring if we use methods and techniques that have proven successful in the past and that have, for whatever reason, been abandoned.

"Meaningful" and "exciting" go hand-in-hand. Five years ago when I became chairman of the science department of our high school, I started a program that would provide positive experiences for our students. Although the traditional New York State Regents Biology course was mandated, this was not the situation for our non-college, general biology course. (The Regent's Biology course is, incidentally, being reviewed with an eye toward revision.) By working with students and teachers, we created a syllabus that provides flexibility, relevancy, and motivation for biology students. Our general biology syllabus includes:

1. What We Should Eat and Why
2. Normal Life Functions
3. Man Against Disease
4. A Biological Explanation of Behavior
5. Reproduction Among Living Things
6. Why We Are What We Are (Heredity and Environment)
7. Man's Place in Evolution
8. Ecology and Our Natural Resources

The relevancy of this course for students can be appreciated when the following topics are included within the general scope of the syllabus: The Vitamin C Controversy, Kidney and Heart Transplants, Mental Retardation, The Menstrual Cycle, Birth Control, Human Genetics (e.g., Sickle Cell Anemia, PKU), Evolution as the Thread of Life, and The Effects of Pollution On Our Environment. Students taking this course can identify with and better understand the life around them. They are given an opportunity to develop the basic competencies needed for survival in today's society. Might I also suggest that in settings not ensnared in traditional, bureaucratic "red tape," field trips can be built into the course I have described to provide additional meaningful life experiences.

Biology can be made exciting if students experience biology through "hands-on" laboratory experiences. The laboratory provides the source and site of excitement for many of our students. I have insisted that laboratory experiences be an integral part of every biology curriculum that we have developed in our school. Even though this is the audiovisual age and laboratory lessons require more time and effort from the teacher than the traditional lecture-chalkboard lesson, it is the inquiry approach that makes biology exciting and meaningful to students.

If we want students to enroll in our biology courses in the 70's, then we must provide first-hand experiences within these courses wherever and whenever possible. I, along with

some of the teachers in our department, ask first-year biology students (individually or in groups) to:

1. Purchase fertilized chick eggs and incubate them. Open the eggs periodically, observe, take notes, and study embryology.
2. Plant lima bean seeds and begin to understand the process of differentiation.
3. Perform regeneration experiments with planaria in order to understand the process of asexual reproduction.
4. Grow bacteria cultures in the presence of antibiotic disks to improve understanding of the role of drugs and the spread of disease.

Admittedly, none of these activities, or the numerous others that we ask our students to do, are earth shattering to YOU AND ME, but they are exciting and meaningful for the students. I believe that to excite students about biology, we must let them "taste" it; then they will enjoy it and want more of it. Have we been 100% successful in this approach? No. But considering that at any given time, two-thirds of the students in my school are enrolled in science, I consider our approach an effective one.

Our high school biology program also provides a bridge between the world of education and world of employment. I am not referring to first-year biology, for the high school biology program should include a number of electives in addition to the first-year program. Career-oriented biology courses must be offered to students to demonstrate possible job opportunities using skills and knowledge obtained in these courses. With this philosophy in mind, I introduced a marine biology program in my school in 1973. This program enables students not only to study the biology of the ocean, but also to become involved in a myriad of job-related opportunities. Since then I have added a medical laboratory program and a horticulture program to our elective sequence in biology. To be sure, a marine biology pro-

gram is a regional one, but certainly medical laboratory and horticulture programs can be instituted at any place in the country. I believe so strongly that we must develop meaningful biology programs for students that I advocate initiating career-focused programs similar to those in our school in other schools and cities. It is encouraging that animal care programs (pet shop management, dog grooming, tank management) have been popping up in the New York City, Chicago, and Cleveland school systems. High school programs can logically be extended into marinas, hospitals, florist shops, pet shops, research institutions, and ever so many other places. This prospect adds yet another dimension of excitement and meaningfulness for the secondary school student.

Providing successful high school biology programs in the 70's requires that you review your present curriculum. A curriculum that will provide for excitement and relevancy might include:

- Universal biological concepts with application to daily living.
- Regional biological concepts, such as the biology associated with the immediate environment of the student.
- Career opportunities, such as brief modules exploring areas of biology that lend themselves to work experience that could be included in a first year biology curriculum.
- A variety of laboratory experiences.
- Opportunities for independent study and/or projects.
- Provisions for periodic evaluation

Biology has always been a source of excitement and meaning for me. I want it to hold similar excitement and meaning for my students. It will be a fantastic day when all students exclaim, "Wow, so that's how it happens!" or "Gee—I never realized. . .!" I can't wait for that day. Can you?