PKAL FACULTY FOR THE 21ST CENTURY STATEMENT

Ben B. Whitlock
Assistant Professor of Biology
West Virginia Wesleyan College
PKAL Faculty for the 21st Century '04

As an undergraduate, one of the most horrifying assignments that I faced was the unknown identification in microbiology. There was a tube filled with bacteria and the task of determining which bacterium you possessed among hundreds of possible species. What a daunting task!

Of course, it wasn't all that bad. I was a junior at this point and had some confidence in my abilities. Plus, it was later in the semester, and I had already mastered many of the techniques that I needed to answer this question. But, what if it had been my freshmen year and the first day of class. Now we are talking horror!

A challenge that faces STEM education is how to bridge the gap between the fledgling student at the beginning of his undergraduate career and the experienced student at the end of his. Far too many students cannot make this jump and are left with a bad taste for science which I believe breeds the mistrust and misconceptions that many have about scientific research and science in general. One of the odd conundrums of teaching STEM is that all of us that teach it, like it. But, of course, our students may not have that inherent interest, and faced with classes that seem to them to lack meaning or significance, they tune out.

I strongly feel that investigative laboratory work is at least a partial answer to this, but we need to go beyond the single, solitary, independent project in a single lab course. While I cheer - and constantly strive - to create labs such as these, the long term benefits of enticing and retaining students in STEM are questionable.

A potential answer to this may be to establish a cohesive, research-based curriculum that would begin with a scenario similar to one mentioned earlier. Freshman STEM majors would be introduced to a research scenario that they would work on in introductory courses and then continue to expand upon in later courses.

Students in non-major courses could be involved in other aspects of the project as well. For example, a biomedical project could involve non-majors in health surveys, education, and research design. This would establish research as a culture within STEM courses that could easily result in interdisciplinary interaction between departments, faculty and students.

I've recently become involved in the Genome Consortium for Active Teaching (GCAT), a program by Malcolm Campbell to establish genomics teaching at the undergraduate level. This group has impressed me with the possibilities for using genomics as a way of involving numerous courses and disciplines. The introductory courses could examine biological response in organisms such as yeast or bacteria, advanced courses could examine gene expression differences, computer science courses could work on data analysis tools and database construction, and math courses could examine the incredible need for good statistical analysis. This approach could help establish a continuum between the non-major course, the introductory course, the advanced course, and other STEM

courses. It may also help retain students since they are all part of a cohesive focused group. Every student could graduate with a wealth of experience and some type of research thesis or portfolio.

There are many obstacles to a curriculum such as this. Obviously, time, space, and money are issues, but I think there are bigger issues that need to be addressed first:

- Faculty communication and vision have to be open, shared and productive. There must be the willingness to dedicate college-wide STEM to a shared vision.
- There has to be a willingness to make changes. A few reticent faculty members can severely retard change, but significant change would have to happen in most cases.

We are really looking at a type of problem-based learning model in which students are developing their own course of study within a framework. This means that many traditional teaching courses/labs may need to be put to the side or re-designed and the amount of content reassessed. While these are major obstacles, the reward for this type of curriculum is huge. Students would gain a real understanding of science and how it is done. ■