INTEGRATING CORE COMPETENCIES INTO GENERAL BIOLOGY
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Several problems are apparent in curriculum development at a small commuter campus. The lack of sufficient numbers of students prevents offering separate sections of introductory courses for both majors and nonmajors. Students are often part-time students, who work full or part-time and have families. Their educational goals are extremely pragmatic and job-oriented. Thus they tend to avoid basic skills courses such as writing and mathematics or put them off until after taking several other courses. This puts them at a disadvantage in many of their courses. Finally, some professional programs require sophomore-level science courses for their students, but do not mandate any introductory or prerequisite course-work in the area.

Because of these characteristics and problems, students often were not successful in the science courses in which they were enrolled.

The biology department at Indiana University East addressed the above concerns in several ways.

The first was to formally require a prerequisite course of general biology and/or chemistry for almost all other courses in the biology department.

Secondly, it was decided to redesign the introductory course in biology so that it met the needs of both majors and nonmajors.

The final step was to incorporate certain desirable basic skills or core competencies into the structure of the course. L107, Biological Concepts in a one-semester, five credit hour lecture-laboratory course.

The relatively easy part of this project was the identification of content areas to be included. The faculty in the department designed a course which was basically divided into four sections: (1) basic chemical processes necessary for an understanding of biology; (2) cell structure and physiology, including cell reproduction; (3) concepts of inheritance; and genetic principles, and (4) ecological principles and mechanisms of change (evolution).

It was felt that the above four areas would provide majors and non-majors alike with the fundamental concepts to move successfully into more advanced courses. In addition, the topics included are central to an understanding of biology, and students who take no other science course would have been exposed to the major biological concepts that impact their lives and the world in which they live.

The most difficult part of the course development was the identification and inclusion of basic skills and competencies into the course. We fought the battles of traditional labs and lab techniques (because it has always been done that way) vs. inquiry technique, vs. almost no lab content at all.

After hours of debate, the following skills (competencies) were identified for inclusion in the General Biology Course. (This list is not all inclusive, but no single course can provide every aspect of education to a group of students.)

1. The ability to identify, analyze, and solve problems.
2. The ability to find and retrieve information.
3. The ability to communicate, through a variety of modes, information to other individuals.

4. The ability to perform basic laboratory skills at an acceptable level and to understand the principles behind them.

5. The ability to use mathematics and simple statistics as tools for interpretation of data.

6. The ability to utilize computers as a learning aid and as a means of collecting and manipulating data.

7. The awareness and appreciation of living things and the world around us.

8. The realization that science can be enjoyable and is not something to be feared.

The final step in the procedure was to incorporate the above competencies into the course and integrate them into the curriculum.

The following are some of the ways in which this was accomplished:

1. Problem solving skills – Here we are talking about scientific method. The skills of observing, predicting, collecting and interpreting data, drawing conclusions, and forming hypotheses. A series of labs are used which require the collection and sharing of large amounts of raw data. Students must then interpret the data and form valid conclusions from these. Often students will be required to transfer the knowledge to some other situation or set of conditions. Labs are designed to coordinate with all the content areas of the course. Two labs deal with observation and inference specifically.

Students are required to write and turn in formal lab reports for 3-5 of the labs done during the semester. Other labs are evaluated by use of laboratory quizzes. All labs and the conclusions drawn are discussed in class.

2. Information retrieval skills: To accomplish this goal, students are required to abstract 10 articles from current, reputable journals. These are divided evenly over the topics covered in the course. Students are given a library orientation by the public services librarian and provided with a list of appropriate available journals. This accomplishes two things. It gets students into the library and the literature, and improves their information gathering and critical analysis skills.

3. Communications Skills: The journal abstracts mentioned before play an important part in teaching students methods of clear, concise written communication. In addition, lab reports require students to organize their thoughts so as to effectively communicate results. Several of the labs require groups of students to work together and then to share data (often with the entire class.) This involves clear oral communication skills. They learn very readily that there is much to be gained through spending five or 10 minutes discussing and organizing lab work before beginning. We also do a mystery bag lab, designed to teach students how to communicate clearly with others.

4. Basic Laboratory Skills: Here students are exposed to various techniques such as microscopy, measuring, sketching, preparation of materials needed, measuring, making slides, etc. through a series of labs. For example, the chemistry labs stress accurate measurements, while the cell labs require students to develop good microscope habits, make slides, and sketch what they see.

5. Mathematical Skills: Students carry out lab experiments relating to chemistry which require accurate measurement, computation of amounts and
percentages of solutions, and simple mathematical evaluations of data. Graphing is stressed as a means of mathematically presenting data in all lab reports. A population lab requires students to use simple statistics to determine goodness of fit of sets of data collected.

6. Computer Literacy: Students are introduced to computer management of large pieces of data through a coin-flip lab which simulates flipping 1, 2, or 3 coins up to 5000 times. This semester we have added some C.A.I. modules dealing with genetics to give students more experience using microcomputers and manipulating data as well as using them to practice genetic problems and to review concepts.

7&8. Awareness and appreciation of Life, The Enjoyment of Science, and the Lessening of Science Anxiety. These are somewhat intangible goals that the faculty strive to achieve in a variety of ways. Interesting applications are used liberally as examples during lecture. Films over various habitats and biomes introduce students to areas of the world which may be new to them. Encouragement and timely feed-back play important roles in alleviating anxiety. Students are allowed to do some work over (i.e., abstracts) if they do not do well the first time through. Faculty strive to help students "discover" biology and its basic concepts by being enthusiastic, encouraging and questioning.

The General Biology course at Indiana University East offers students a solid grounding in both biological concepts and important basic skills which will serve them through out their college careers and their lives.