

Hybrid Format Allows Application, Integration and Promotes Active Learning

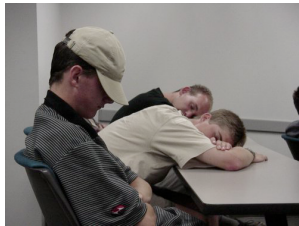
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Introduction

Freshman biology is currently taught in a standard lecture-based format in classrooms of ~200 students. Such an environment does not encourage a deep understanding of concepts and does not fit the learning style of most 21st century students. Lecture-based teaching in concert with "recognition" multiple-choice exams encourages students to memorize and regurgitate. They then lack a real understanding of the material, cannot apply knowledge to problem solving, and retain little of what was taught.



Upon reflection, we realize that the introductory experience with regard to its ability to provide structure and time for skill building has been severely compromised over the last two decades. Many of us experienced biology courses that included problem sessions and two laboratories per week. Today, the time for hands on activity and problem solving has decreased by more than half. Financial constraints as enrollments rise have caused the shrinking laboratory experience to default to activities that ensure consistent, but often simply illustrative demonstrative examples of basic concepts. Yet we are asked to prepare students for positions that will continue to require more technical expertise. Students begin to question why they should even be spending three hours a week in laboratories that are weak renditions of concepts treated in more depth in lecture.

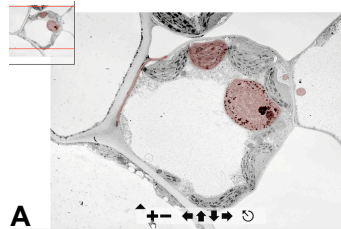
The bottom line

Solutions must be sought that are fiscally responsible yet provide more application, practice and extension of basic concepts than can be treated in typical "lectures". All components of the course, such as group exercises and laboratory, must be carefully and successfully integrated so that retentive learning is the objective and duplication that does not enhance understanding is avoided. If each faculty member in the course handles several small sections, the hybrid course approach can be used even if budgets continue to spiral downward and enrollments upward.

The experiment: Internet explorations of concepts and active-learning small classroom experiences

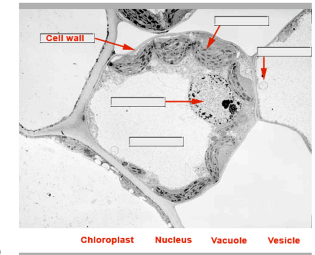
We plan over a period of several years, to convert the current lecture style of teaching Bio 181 and 183 to a hybrid format (also called "blended" learning). The new format would combine Internet technology with small-group interactions between instructor and student, thus merging the best features of a large University with a "small college" atmosphere. The result will provide students with a higher quality learning environment than currently exists, while reducing the resources required to teach large numbers of freshmen.

Students acquire the basic material from a rich, highly interactive, course web site in concert with readings from their textbook. Each weekly topic is accompanied by a web-based quiz that tests student mastery of the week's material. Most of the quiz is graded automatically and provides feedback for questions answered incorrectly.

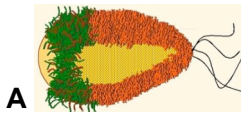


A. Self exploration from the section on cell structure and function. Students can zoom, just as if they were changing magnification to view organelles in more detail. As they do so, they will also learn function.

B. Self help quizzes reinforce learning.

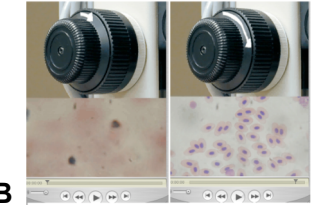


The web site contains a mix of text, audio, interactive video, and animations to illustrate concepts and add interesting details.



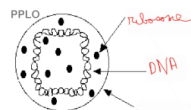
A. A scene from our quicktime movie exploration of symbiosis showing the different bacteria that "move" *Mixotricha paradoxa*

B. As students turn the knob, the image focuses



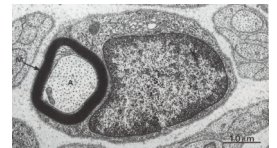
Students meet in small sections (30-35 students) once per week in a 75 min class period during which the instructor conducts group exercises, problem solving and/or discussions relevant to the material covered during the previous week. Students will be required to apply their knowledge and demonstrate an in-depth understanding of concepts, including those covered in the previous week's laboratory. These activities are designed to provide structure, extending and integrating the laboratory and website explorations.

Students are required in round robin style to draw or label an organelle drawn by another student.



Groups of students build relative size analogies from a table providing common sizes of animals, plants and common objects. If a ribosome was the size of a toaster, an nucleus would be..... If a small bacterial cell such as PPLO was the size of a mouse, E. coli would be the size of and a cheek cell would be the size of Three-dimensional sizes will also be considered.

Groups of students view micrographs of various cells and defend their assessment of the specific role played by these cells based on which organelles the cells contain. Other groups of students will design specialized cells. Designs, light and electron micrographs will be matched and critiqued during class discussion.



The second 75 min period of the week will be used to administer the three major exams for the course. Thus most of these meetings are optional, but encourage one-on-one interactions between instructor and student and provide the opportunity for individual and/or group tutoring.

