Utilizing Case-Based Learning in a Summer Pre-Freshman Bridge Program to Impact STEM Retention Rates

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Numerous reports call for universities and colleges to engage with local, regional and national school systems to improve the success rate of students transitioning to college especially in STEM disciplines. Programs vary widely depending upon the nature of the institution and the kinds of funding available. A recent 5-year NSF STEP grant has allowed us to develop a unique summer bridge program incorporating both residential and online instructional models using case-based learning; student-tailored tutoring in mathematics and science writing, course advising workshops and guided self-assessment activities. Our case-based learning focuses on using interrupted cased focusing on a wide variety of STEM topics including biology, chemistry and physics giving participants with diverse interested multiple means of interacting with each case allowing us to introduce core skills STEM students require.

Included in these case studies are cases dealing specifically with Microbiology and Epidemiology. This case delves into the evolution of epidemiology and the detection of pathogens via the history of Cholera and its transmission. This activity utilizes a capstone project in which student groups develop and play board games based on individual microbes and disease they have researched. While in our second year, our data indicates our diverse student population (n=80) confidence, analytical and communication skills increased during participation in either our three-week residential or six-week online bridge program. Utilizing grounded theory analysis of student reflection journals indicates program participants felt the program prepared them for their upcoming college experience in both academic and social means, gave participants the opportunity to consider a variety of career options and further development of scientific and life skills necessary for college.

Adaptation of Case Studies from the New England Journal of Medicine for Use in Immunology and Molecular Biology Courses

Ann Buchmann
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The scientific literature can be used to develop complex case studies that help students learn to analyze data, interpret scientific language, and explore connections between molecular biology, immunology, genetics, and physiology. Because of their strong narrative structure, short case reports and articles from The England Journal of Medicine are easily adapted for use in undergraduate classes. These articles provide real patient data for analysis and interpretation and allow students to connect between obscure scientific facts and the complexities of human physiology. Here I present a synopsis of four case studies that have been used in my Molecular Biology and Immunology classes.
**A Lethal Combination: Superbugs, Sick Patients and Dirty Sinks**
*A case study in progress...*

Angela Hartsock
University of Akron-Wayne College

This poster describes a case study in development for a non-majors microbiology course. The case study is based on the 2011 outbreak of drug resistant Klebsiella pneumoniae at the NIH Clinical Center.

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**Online Active Learning Tools: iBiology’s Scientific Teaching Video Series**

(1) The American Society for Cell Biology, Bethesda, MD; (2) Davidson College, Davidson, NC; (3) San Francisco State University, San Francisco, CA; (4) University of Colorado Boulder, Boulder, CO; (5) University of California, San Francisco, CA.

We are developing free, online videos to address the needs of instructors who are just getting started with active learning. The “Active Learning module is the first of several modules in the new Scientific Teaching Series on the iBiology.org website.

These short videos include interviews with instructors from a range of backgrounds and levels of experience in active learning. Viewers will be able to observe different types of classrooms, receive advice from science education researchers, and be introduced to the science education literature.

The videos were designed to address the problems with traditional science education models, allow viewers to reflect on their own practices, and help them get started with active learning by introducing simple changes to their pedagogical approach.

We would like to hear from educators about the important messages they would like to see addressed in future Scientific Teaching Series videos.

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**A multi-part case study using a bacterial two hybrid to link lecture and lab**

Amanda Simons, Ph.D. Department of Biology
Framingham State University

This problem-based learning unit uses the paper “Activation of prokaryotic transcription through arbitrary protein-protein contacts” [Dove et al, Nature, 386:627-30 (1997)] as a starting point for discussing gene regulation. Students are guided by a series of targeted questions intended to encourage critical thinking and link back to lecture material. Students then explore how the information used in this paper is applied in the two-hybrid screen for protein-protein interactions. Later in the semester, students apply this information when they discuss cancer biology: In lab, they use a bacterial two-hybrid system to search for proteins that interact with the tumor suppressor p53. Through both the lecture and the laboratory components of the project, students explore the topics of the gene regulation, the lac operon, cooperative binding, reporter genes, and cancer biology. They gain practice in common molecular biology techniques, simple sequence analysis, and literature search and review.

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Case It! Molecular Biology Computer Simulations for Case-Based Learning in Biology

Mark Bergland and Karen Klyczek, University of Wisconsin-River Falls

Case It is used by students to analyze cases involving the use of molecular biology techniques. The software will perform a variety of laboratory procedures on any DNA or protein sequence including electrophoresis, PCR, blotting, ELISA, and SNP and expression microarray, and can be integrated with MEGA software for bioinformatics analyses. There are a variety of cases available at www.caseitproject.org, including genetic and infectious diseases, cancer, and honey bee health.

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The Science Case Network: An Historical Perspective

The Science Case Network Steering Committee, Pat Marsteller, Emory University, PI

The Science Case Network (SCN) is a community of faculty using, developing and assessing the effectiveness of case studies and problem based learning, facilitating collaborations and other opportunities. The SCN is funded by an NSF RCN-UBE grant and led by a team of national projects on cases, including the National Center for Case Study Teaching in Science, Case It!, BioQUEST/Investigative Case Based Learning, Cases Online at Emory Center for Science Education, and University of Delaware Problem Based Learning. SCN is based on more than 20 years of history and data, including many collaborations with ASM/ASMCUE. Join the network at http://sciencecasenet.org.