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### FEATURE

#### WWW. Life Sciences Education

## Online Resources for Understanding Outbreaks and Infectious Diseases

Nicola C. Barber and Louisa A. Stark

Disease outbreaks can be a powerful topic for teaching about science and health. This *Feature* reviews resources for bringing up-to to-date information on this hot topic into the classroom.

#### ESSAYS

#### Drawing-to-Learn: A Framework for Using Drawings to Promote Model-Based Reasoning in Biology Kim Quillin and Stephen Thomas

The authors offer a framework for drawing-to-learn that defines drawing, categorizes the reasons for using drawing in the biology classroom, and outlines a number of teaching interventions to promote visual model-based reasoning in biology. A Blooming tool for drawing exercises and other suggestions for assessment are also provided.

## Modeling Course-Based Undergraduate Research Experiences: An Agenda for Future Research and Evaluation

Lisa A. Corwin, Mark J. Graham, and Erin L. Dolan

The authors review relevant literature to determine established and predicted outcomes of course-based undergraduate research experiences (CUREs) and then use this information and social learning theory to model how students may realize desired short-, medium-, and long-term outcomes. This work has implications for future research and evaluation of CUREs.

#### Research-Based Implementation of Peer Instruction: A Literature Review

Trisha Vickrey, Kaitlyn Rosploch, Reihaneh Rahmanian, Matthew Pilarz, and Marilyne Stains

Peer instruction is an evidence-based pedagogy that has been extensively studied in various science, technology, engineering, and mathematics disciplines. In this essay, the authors review and summarize the research literature on the effectiveness and intricacies of implementation of peer instruction. A research-based how-to guide and suggestions for future research investigations are provided.

### ARTICLES

## Relations between Intuitive Biological Thinking and Biological Misconceptions in Biology Majors and Nonmajors

John D. Coley and Kimberly Tanner

The authors present evidence that seemingly unrelated biological misconceptions may share common conceptual origins arising from underlying systems of intuitive biological reasoning, or "cognitive construals." The findings presented raise the intriguing possibility that university-level biology education may reify construal-based thinking and related misconceptions.

## The Molecular Biology Capstone Assessment: A Concept Assessment for Upper-Division Molecular Biology Students

Brian A. Couch, William B. Wood, and Jennifer K. Knight

This article describes the development of the Molecular Biology Capstone Assessment, a multiple-true/ false concept assessment targeted to upper-division students. This assessment is intended to help pinpoint areas of conceptual difficulty among graduating majors in order to facilitate curricular change at the departmental level.

#### Implementation of the Peer-Led Team-Learning Instructional Model as a Stopgap Measure Improves Student Achievement for Students Opting Out of Laboratory

Julia J. Snyder, B. Elijah Carter, and Jason R. Wiles

This article discusses the efficacy of the peer-led team-learning, or PLTL, instructional model as a potential method for narrowing the achievement gap among undergraduate students electing not to enroll in an optional laboratory component of an introductory biology course.

## Bridging the Undergraduate Curriculum Using an Integrated Course-Embedded Undergraduate Research Experience (ICURE)

James E. Russell, Allison R. D'Costa, Clay Runck, David W. Barnes, Alessandra L. Barrera, Jennifer Hurst-Kennedy, Elizabeth B. Sudduth, Erin L. Quinlan, and Mark Schlueter

The results of a novel approach to integrating undergraduate biology curricula through the study of biodiversity, the use of and DNA bar coding, and the creation of a biodiversity database are presented with analysis of content and attitudinal gains.

## A Tale of Two Sections: An Experiment to Compare the Effectiveness of a Hybrid versus a Traditional Lecture Format in Introductory Microbiology

Alison E. M. Adams, Shelby Randall, and Tinna Traustadóttir

Learning outcomes of students in two large sections of an introductory microbiology course (one hybrid, one traditional) were compared. The two sections were identical except for the way in which lecture material was presented (online or in class). The hybrid class did slightly less well than the traditional class, possibly due to less interaction with the material.

## Improvements from a Flipped Classroom May Simply Be the Fruits of Active Learning

Jamie L. Jensen, Tyler A. Kummer, and Patricia D. d. M. Godoy

Researchers show that students perform equally well in flipped and nonflipped classrooms if activelearning activities are held constant, suggesting that active learning is the key moderator of success.

#### Alumni Perspectives on Career Preparation during a Postdoctoral Training Program: A Qualitative Study Jessica M. Faupel-Badger, Kimberley Raue, David E. Nelson, and Sophia Tsakraklides

This article features qualitative data from in-depth interviews of alumni from a long-standing, structured, postdoctoral research training program. Alumni from diverse scientific disciplines and representing 25 years of the program's history reflected on the training curriculum and career preparation as it relates to their current career path.

### The Faculty Costs to Educate a Biomedical Sciences Graduate Student

Adam J. Smolka, Perry V. Halushka, and Elizabeth Garrett-Mayer

Given the demands of a responsibility centers management fiscal model at the Medical University of South Carolina, a survey was designed to estimate the faculty costs of educating a biomedical sciences graduate student. The survey offers a readily applicable model for empirical estimation of faculty salary costs when developing budgets that will sustain a graduate school's commitment to its teaching, research, and service mission goals.

### Scientific Teaching: Defining a Taxonomy of Observable Practices

Brian A. Couch, Tanya L. Brown, Tyler J. Schelpat, Mark J. Graham, and Jennifer K. Knight

The authors describe the development of a taxonomy detailing core goals and practices of Scientific Teaching (ST). This taxonomy will support future educational efforts by providing an empirical framework for researchers studying the processes and outcomes of ST-based course transformations as well as a concise guide for faculty developing classes.

### It's Personal: Biology Instructors Prioritize Personal Evidence over Empirical Evidence

### in Teaching Decisions

Tessa Č. Andrews and Paula P. Lemons

This study investigates the conditions and factors that influence college biology instructors as they make decisions about adopting, sustaining, and improving the effectiveness of case study teaching.

### **CORRECTIONS**

Students Who Demonstrate Strong Talent and Interest in STEM Are Initially Attracted to STEM through Extracurricular Experiences

Amy VanMeter-Adams, Cara L. Frankenfeld, Jessica Bases, Virginia Espina, and Lance A. Liotta

# The Teaching Practices Inventory: A New Tool for Characterizing College and University Teaching in Mathematics and Science

Carl Wieman and Sarah Gilbert

On the Cover

Ebola is a rare and deadly disease caused by the filamentous Ebola virus. This colorized electron micrograph shows the Ebola virus (blue) budding from an infected Vero E6 monkey cell (yellow). There is currently no vaccine against the Ebola virus, and disease transmission occurs through direct contact with blood and body fluids. The latest outbreak of Ebola in West Africa began in March 2014 and is the largest outbreak of the disease in history. Media coverage of the outbreak has been extensive. Scientists and educators play important roles in sharing accurate information with students and the public. In this issue's *WWW.Life Sciences Education* feature, Barber and Stark review online content that explores public health and the science of infectious disease. (Image credit: National Institute of Allergy and Infectious Diseases)