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## EDITORIAL

### **Biology Education Research 2.0**

Erin L. Dolan

Biology education research (BER) 2.0 has arrived, and is moving the BER community beyond showing that active learning works to understanding the individual and contextual factors that explain and influence biology teaching and learning.

## LETTER TO THE EDITOR

### **NIBLSE: A Network for Integrating Bioinformatics into Life Sciences Education**

Elizabeth Dinsdale, Sarah C. R. Elgin, Neal Grandgenett, William Morgan, Anne Rosenwald, William Tappich, Eric W. Triplett, and Mark A. Pauley

## FEATURE

### *WWW.Life Sciences Education*

#### **Online Resources for Engaging Students in Bioethical Discussions**

Amy J. Hawkins and Louisa A. Stark

This review highlights free online resources for teaching bioethics that will be useful for educators working with high school and undergraduate students. These materials provide frameworks of ethical analysis, curricula and lesson plans, case studies, and resources that have a special focus on protection of human research participants.

## ARTICLES

### **Increased Preclass Preparation Underlies Student Outcome Improvement in the Flipped Classroom**

David Gross, Evava S. Pietri, Gordon Anderson, Karin Moyano-Camihort, and Mark J. Graham

A 5-yr study of an upper-division course explored changes in student learning outcomes when the course was changed from a standard lecture to a flipped format. Student exam scores, particularly for female and low-GPA students, improved significantly.

### **Concept Maps for Improved Science Reasoning and Writing: Complexity Isn't Everything**

Jason E. Dowd, Tanya Duncan, and Julie A. Reynolds

Despite the pervasiveness of the notion that complex concept maps reflect greater knowledge and/or more expert-like thinking, this study finds that concept maps used for scientific writing do not adhere to this notion.

### **Evidence-Based Medicine as a Tool for Undergraduate Probability and Statistics Education**

J. Masel, P. T. Humphrey, B. Blackburn, and J. A. Levine

The authors describe a context-rich approach to teaching both probability and statistics, with three pillars: randomized controlled trials, Bayes' theorem, and science and society. Postcourse versus precourse improvements with the Quantitative Reasoning Quotient and Attitudes Toward Statistics instruments are found.

### **A Pharmacology-Based Enrichment Program for Undergraduates Promotes Interest in Science**

Elizabeth A. Godin, Stephanie V. Wormington, Tony Perez, Michael M. Barger, Kate E. Snyder, Laura Smart Richman, Rochelle Schwartz-Bloom, and Lisa Linnenbrink-Garcia

The authors examined the effect of an intervention (a Summer minicourse and a Fall research course) that was designed to support students' science motivation. Undergraduates improved their knowledge of biology and chemistry concepts, reported high levels of science motivation, and were likely to major in a biological, chemical, or biomedical field.

### **Caution, Student Experience May Vary: Social Identities Impact a Student's Experience in Peer Discussions**

Sarah L. Eddy, Sara E. Brownell, Phonraphee Thummaphan, Ming-Chih Lan, and Mary Pat Wenderoth

This study found that self-reported preferred roles in peer discussions in introductory biology classrooms can be predicted by social identities and that barriers to participation in peer discussions may impact certain student groups more than others.

### **Cues Matter: Learning Assistants Influence Introductory Biology Student Interactions during Clicker-Question Discussions**

Jennifer K. Knight, Sarah B. Wise, Jeremy Rentsch, and Erin M. Furtak

Recordings of introductory biology student discussions of clicker questions demonstrate that students use reasoning and questioning in their discussions and that their use of these discussion characteristics is heavily influenced by the cues they hear from learning assistants during discussions.

### **Beyond the Biology: A Systematic Investigation of Noncontent Instructor Talk in an Introductory Biology Course**

Shannon B. Seidel, Amanda L. Reggi, Jeffrey N. Schinske, Laura W. Burrus, and Kimberly D. Tanner

We define a new construct termed *Instructor Talk* that may be a key mechanism for effectively implementing active learning and that may contribute to minimizing student resistance and stereotype threat, while building instructor immediacy. We used a mixed-methods approach and analyzed more than 600 instructor quotes. Presented here is a novel framework revealing the emergent categories and subcategories of the framework as well as examples of Instructor Talk.

### **Measuring Networking as an Outcome Variable in Undergraduate Research Experiences**

David I. Hanauer and Graham Hatfull

This paper proposes, presents, and validates a simple survey instrument to measure student conversational networking. The tool covers both personal and professional social networks and may be significant for exploring issues of retention and the development of scientific literacy.

### **The Laboratory Course Assessment Survey: A Tool to Measure Three Dimensions of Research-Course Design**

Lisa A. Corwin, Christopher Runyon, Aspen Robinson, and Erin L. Dolan

This paper presents the development and validation of the Laboratory Course Assessment Survey (LCAS), a measure of three laboratory course design features: collaboration, discovery and relevance, and iteration. Results from analysis of LCAS data indicate that it is useful for distinguishing between research courses and traditional lab courses.

### **Career Development among American Biomedical Postdocs**

Kenneth D. Gibbs, Jr., John McGready, and Kimberly Griffin

This study reports results from a national survey examining the career development of biomedical postdocs. Findings point to the need for enhanced career development programs earlier in the training process and interventions that are sensitive to distinctive patterns of interest development across social identity groups.

### **The Role of Scientific Communication Skills in Trainees' Intention to Pursue Biomedical Research Careers: A Social Cognitive Analysis**

Carrie Cameron, Hwa Young Lee, Cheryl Anderson, Angela Byars-Winston, Constance D. Baldwin, and Shine Chang

Scientific communication skills are indispensable for success in academic biomedical research careers, but the effort to acquire them can be formidable for trainees and their mentors. The authors investigated whether and how development of these skills affects the academic career intentions of trainees.

#### *On the Cover*

This image was captured from *The Ethics of Preimplantation Genetic Diagnosis*, an excerpt from the NOVA episode *Cracking Your Genetic Code*. The video clip explores ethical concerns raised by preimplantation genetic diagnosis, a genetic screening technique that allows for identification of disease-causing DNA mutations and other traits in embryos created via in vitro fertilization (IVF). The rapidly evolving nature of biotechnologies makes bioethics particularly amenable to the use of online resources as primary or supplemental teaching materials. In this issue's WWW.Life Sciences Education feature, Hawkins and Stark review online resources for teaching bioethics. The review includes sources for teaching ethical analysis, case studies, and content that focuses on protecting human research participants. The video excerpt and others are available online through PBS Learning Media's website. (Image credit: NOVA)