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GENERAL ESSAYS AND ARTICLES

EDITORIAL

Hello, Goodbye: Closing Thoughts on Ten Years as Editor-in-Chief

Erin L. Dolan

APPROACHES TO BIOLOGY TEACHING AND LEARNING

Reconsidering the Share of a Think–Pair–Share: Emerging Limitations, Alternatives, and Opportunities for Research

Katelyn M. Cooper, Jeffrey N. Schinske, and Kimberly D. Tanner

The think–pair–share is a common teaching tool, but how critical is the “share” step in helping students achieve learning goals? This feature examines assumptions that instructors may make about the share, explores unanticipated impacts of the share, and provides alternatives to having students share their thoughts in front of the class.

CURRENT INSIGHTS

Antiracism and the Problems with “Achievement Gaps” in STEM Education

Julia Svoboda Gouvea

This *Current Insights* draws together recent scholarship to motivate critical reflection on the problem of “achievement gaps” in STEM education.

ESSAYS

Success for All? A Call to Reexamine how Student Success is Defined in Higher Education

Maryrose Weatherton and Elisabeth E. Schussler

This essay explores how “student success” is defined in the education literature broadly, using specific examples from *CBE-Life Sciences Education* from 2015 to 2020. This essay posits that success is most often implicitly defined by researchers in terms of quantitative outcomes. Recommendations for centering student voice within policy, practice, and research are provided.

Reassess–Realign–Reimagine: A Guide for Mentors Pivoting to Remote Research Mentoring

Christine Pfund, Janet L. Branchaw, Melissa McDaniels, Angela Byars-Winston, Steven P. Lee, and Bruce Birren

An unprecedented situation requiring remote research mentorship from faculty and research group leaders has emerged from the COVID-19 health crisis. The ability of mentors to pivot and adopt new ways to lead their research teams during this time will be a critical factor in maintaining research productivity and fostering talent development.

Instructor Strategies to Alleviate Student Stress and Anxiety Among College and University STEM Students

Jeremy L. Hsu and Gregory R. Goldsmith

Student stress and anxiety often negatively impact students' academic performance. This *Essay* provides summaries of different evidence-based strategies, ranging from changes in instructional strategies to specific classroom interventions, that instructors can employ to address and ameliorate student stress and anxiety.

ARTICLES

Making a First Impression: Exploring what Instructors Do and Say on the First Day of Introductory STEM Courses

A. Kelly Lane, Clara L. Meaders, J. Kenny Shuman, MacKenzie R. Stetzer, Erin L. Vinson, Brian A. Couch, Michelle K. Smith, and Marilynne Stains

Observations of the first day of class are reported for 23 introductory STEM courses at three different institutions. The topics instructors discuss and the noncontent Instructor Talk they use on the first day are described. These results uncovered variation in instructor actions on the first day and can help instructors plan this day.

A Unique and Scalable Model for Increasing Research Engagement, STEM Persistence and Entry into Doctoral Programs

Nadia Sellami, Brit Toven-Lindsey, Marc Levis-Fitzgerald, Paul H. Barber, and Tama Hasson

Participation in the University of California, Los Angeles Program for Excellence in Education and Research in the Sciences (PEERS) program has a positive effect on closing gaps in research participation, graduation in science, technology, engineering, and mathematics majors, and enrollment into graduate and professional doctoral degree programs for underrepresented minority (URM) students. Hence, PEERS could serve as a model for other institutions looking for cost-effective ways to promote URM student success.

Is this Science? Students' Experiences of Failure Make a Research-Based Course Feel Authentic

Emma C. Goodwin, Vladimir Anokhin, MacKenzie J. Gray, Daniel E. Zajic, Jason E. Podrabsky, and Erin E. Shortlidge

In a mixed-methods study with students in course-based undergraduate research experience (CURE) and inquiry courses, student perceptions of authentic research elements in their courses were measured and compared. It was found that experiencing failure enhanced perceived research authenticity, and this seems to be especially powerful for CURE students in the context of relevant discovery.

The Relationship Between Perceptions of Instructional Practices and Student Self-Efficacy In Guided-Inquiry Laboratory Courses

Christopher W. Beck and Lawrence S. Blumer

Variation in individual student perceptions of instructional practices within a course were significantly related to differences in student self-efficacy at the end of the semester. Self-efficacy was unrelated to average student perceptions and faculty perceptions of their own practices across courses.

Developing a Model of Graduate Teaching Assistant Teacher Efficacy: How Do High and Low Teacher Efficacy Teaching Assistants Compare?

Cody R. Smith and Cesar Delgado

This study identifies factors that influence the development of teacher efficacy in STEM graduate teaching assistants over the course of one semester. Those with high teacher efficacy draw upon mastery experience, vicarious experience, and verbal and social persuasions from reliable sources, such as professors and accomplished peers.

Christianity as a Concealable Stigmatized Identity (CSI) among Biology Graduate Students

M. Elizabeth Barnes, Samantha A. Maas, Julie A. Roberts, and Sara E. Brownell

In interviews with Christian graduate students in biology using the concealable stigmatized identities framework, it was found that Christian graduate students perceive, anticipate, and experience stigma against Christians in the biology community.

The Case for Biocalculus: Improving Student Understanding of the Utility Value of Mathematics to Biology and Affect toward Mathematics

Melissa L. Aikens, Carrie Diaz Eaton, and Hannah Callender Highlander

This study examines changes in life science students' understanding of the utility of mathematics to biology, their interest in mathematics, and their overall attitudes toward mathematics after taking courses that integrate calculus into biological problems. Factors that contribute to improved attitudes toward mathematics are identified.

Comparison of Cluster Analysis Methodologies for Characterization of Classroom Observation Protocol for Undergraduate STEM (COPUS) Data

Kameryn Denaro, Brian Sato, Ashley Harlow, Andrea Aebersold, and Mayank Verma

With the increased value of independently collected classroom observation data to biology education research, it is important that the field analyzes these data in the most appropriate manner. This work highlights considerations for cluster analysis of COPUS data and provides recommendations for researchers moving forward.

A Cocurricular Program That Encourages Specific Study Skills and Habits Improves Academic Performance and Retention of First-Year Undergraduates in Introductory Biology

Whitney Hawkins, Kate Goddard, and Carlita Favero

A short (8-week), low-cost intervention focused on study skills improved performance and persistence of first-year undergraduates in introductory biology. Wide-scale adoption of teaching study skills in STEM gateway courses is suggested to improve student outcomes, particularly for students who are commonly underrepresented.

To What Extent Do Study Habits Relate to Performance?

Elise M. Walck-Shannon, Shaina F. Rowell, and Regina F. Frey

Students' study habits during independent study sessions were examined. Controlling for preparation, total study time, and class absences, it was found that active study strategy use positively predicted exam score, study spacing potential did not predict exam score, and distraction during study sessions negatively predicted exam score.

Immersive 3D Experience of Osmosis Improves Learning Outcomes of First-Year Cell Biology Students

Nicole B. Reinke, Mary Kynn, and Ann L. Parkinson

An immersive 320° 3D experience of osmosis was perceived by cell biology students to be fun, useful, and educational. Performance of all students improved on a multiple-choice exam question, and those students with moderate to high base-level knowledge also performed better on short-answer questions.

Teaching Metabolism in Upper-Division Undergraduate Biochemistry Courses Using Online Computational Systems and Dynamical Models Improves Student Performance

Christine S. Booth, Changsoo Song, Michelle E. Howell, Achilles Rasquinha, Aleš Saska, Resa Helikar, Sharmin M. Sikich, Brian A. Couch, Karin van Dijk, Rebecca L. Roston, and Tomáš Helikar

This article reports the effectiveness of computer simulation modules to teach undergraduate students about familiar and unfamiliar metabolic systems. The modules were evaluated in large-enrollment biochemistry courses and show a medium effect size when compared with controls. The results also show that the modules did not create or reinforce gender bias.

SPECIAL SECTION ON CROSS-DISCIPLINARY RESEARCH IN BIOLOGY EDUCATION

ARTICLE

“I Like and Prefer to Work Alone”: Social Anxiety, Academic Self-Efficacy, and Students’ Perceptions of Active Learning

S. Hood, N. Barrickman, N. Djerdjian, M. Farr, S. Magner, H. Roychowdhury, R. Gerrits, H. Lawford, B. Ott, K. Ross, O. Paige, S. Stowe, M. Jensen, and K. Hull

Two psychological variables, social anxiety (psychological distress relating to the fear of negative evaluation by others) and academic self-efficacy (confidence in one’s ability to overcome academic challenges) are linked with student perceptions of active-learning practices and final grades in a course.

On the Cover

Through the Worm Hole

Aidan Fenix, University of Washington, Department of Laboratory Medicine and Pathology. 1st place winner (tie), Images, Cell Bio Virtual 2020 Image and Video Contest.

Human cancer cell (U2OS, osteosarcoma) treated with a drug (blebbistatin) to inhibit cellular force generation. Actin (magenta) forms wispy filaments and mitochondria (orange) become elongated. Structured illumination microscopy, 60x magnification.