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Re: Misconceptions Are “So Yesterday!”

Gregory J. Crowther and Rebecca M. Price 3–5

FEATURES

Approaches to Biology Teaching and Learning

Considering the Role of Affect in Learning: Monitoring Students’ Self-Efficacy, Sense of Belonging, and Science Identity

Gloriana Trujillo and Kimberly D. Tanner 6–15

While emphasis is often placed on assessing students’ conceptual knowledge, less has been placed on investigating affective aspects of student biology learning. In this paper, we explore self-efficacy, sense of belonging, and science identity, as well as emerging assessment tools to monitor these dimensions of students’ learning.

From the National Science Foundation

Vision and Change in the Biology Community: Snapshots of Change

Helen L. Vasaly, Jason Feser, Matthew D. Lettrich, Kevin Correa, and Katherine J. Denniston 16–20

Six years after the initial Vision and Change conversations, it is important to try to determine the extent of dissemination and implementation of the initiative. There is good evidence of use by some segments of the biology community; however, there is less use of Vision and Change principles or even acknowledgment of its existence within other segments.

WWW.Life Sciences Education

Engaging with Molecular Form to Understand Function

Nicola C. Barber and Louisa A. Stark 21–24

Understanding the relationship between form and function is critical for appreciating biology at the molecular level. This feature explores online materials that connect molecular structures with their functional relevance.

Current Insights

Recent Research in Science Teaching and Learning

Deborah Allen 25–28

This feature is designed to point *CBE—Life Sciences Education* readers to current articles of interest in life sciences education as well as more general and noteworthy publications in education research.

Meeting Report

Assessment of Course-Based Undergraduate Research Experiences: A Meeting Report

Lisa Corwin Auchincloss, Sandra L. Laursen, Janet L. Branchaw, Kevin Eagan, Mark Graham, David I. Hanauer, Gwendolyn Lawrie, Colleen M. McLinn, Nancy Pelaez, Susan Rowland, Marcy Towns, Nancy M. Trautmann, Pratibha Varma-Nelson, Timothy J. Weston, and Erin L. Dolan 29–40

This report presents a summary of a meeting on assessment of course-based undergraduate research experiences (CUREs), including an operational definition of a CURE, a summary of research on CUREs, relevant findings from studies of undergraduate research internships, and recommendations for future research on and evaluation of CUREs.

RESEARCH METHODS

Is It the Intervention or the Students? Using Linear Regression to Control for Student Characteristics in Undergraduate STEM Education Research

Roddy Theobald and Scott Freeman 41–48

Existing methods for analyzing pre/posttest data can lead to incorrect conclusions, as they do not control for student academic ability and preparation. Using an example data set from an introductory biology course, this paper shows how regression models offer a solution to this problem.

ESSAY

Putting PhDs to Work: Career Planning for Today’s Scientist

Jennifer A. Hobin, Philip S. Clifford, Ben M. Dunn, Susan Rich, and Louis B. Justement 49–53

The authors examined individual development plan (IDP) awareness and use, the benefits of creating an IDP, and ways to facilitate IDP use by administering surveys to postdoctoral researchers, mentors, and administrators.

ARTICLES

Integrating Quantitative Thinking into an Introductory Biology Course Improves Students’ Mathematical Reasoning in Biological Contexts

Susan Hester, Sanlyn Buxner, Lisa Elfring, and Lisa Nagy 54–64

The authors designed and taught an introductory molecular and cell biology course integrating math and biology throughout the course, and designed a pre/postcourse assessment to measure student gains on biology and bio-math concepts. Students in the experimental section made greater gains on bio-math and comparable gains on biology assessment items than did students in other sections.

The Genetic Drift Inventory: A Tool for Measuring What Advanced Undergraduates Have Mastered about Genetic Drift

Rebecca M. Price, Tessa C. Andrews, Teresa L. McElhinny, Louise S. Mead, Joel K. Abraham, Anna Thanukos, and Kathryn E. Perez 65–75

The Genetic Drift Inventory is a multiple true–false format concept inventory consisting of 22 statements. It tests how well upper-division undergraduate biology students grasp four key concepts, while simultaneously testing for the presence of six misconceptions.

Development and Effectiveness of an Educational Card Game as Supplementary Material in Understanding Selected Topics in Biology

Arnel F. Gutierrez 76–82

To help students understand and apply basic biological concepts in a challenging and interactive format, this study focused on the development, effectiveness, and evaluation of an educational card game. The test supported that the use of this educational card game is more effective than the traditional method. The students perceived that the material is “very satisfactory.”

Online Plagiarism Training Falls Short in Biology Classrooms

Emily A. Holt, Britt Fagerheim, and Susan Durham 83–89

This study compared three plagiarism-avoidance training formats (i.e., no training, online tutorial, or homework assignment) in several undergraduate ecology courses. The authors found that students trained with the homework assignment more successfully identified plagiarism or the lack thereof than did untrained students or students trained with the online tutorial.

Guiding Students to Develop an Understanding of Scientific Inquiry: A Science Skills Approach to Instruction and Assessment

Elisa M. Stone 90–101

Teacher-driven action research in the high school biology classroom reveals effective instructional and assessment strategies for guiding students to integrate their ideas about the skills and practices necessary for scientific inquiry. Implications for inquiry-based teaching and research in undergraduate life sciences courses are discussed.

Redefining Authentic Research Experiences in Introductory Biology Laboratories and Barriers to Their Implementation

Rachelle M. Spell, Judith A. Guinan, Kristen R. Miller, and Christopher W. Beck 102–110

A national survey of faculty teaching introductory biology laboratory courses uncovered different conceptions of course-based authentic research and identified barriers that prevent the expansion of undergraduate research in courses.

A Course-Based Research Experience: How Benefits Change with Increased Investment in Instructional Time

Christopher D. Shaffer, Consuelo J. Alvarez, April E. Bednarski, David Dunbar, Anya L. Goodman, Catherine Reinke, Anne G. Rosenwald, Michael J. Wolyniak, Cheryl Bailey, Daron Barnard, Christopher Bazinet, Dale L. Beach, James E. J. Bedard, Satish Bhalla, John Braverman, Martin Burg, Vidya Chandrasekaran, Hui-Min Chung, Kari Clase, Randall J. DeJong, Justin R. DiAngelo, Chunguang Du, Todd T. Eckdahl, Heather Eisler, Julia A. Emerson, Amy Frary, Donald Frohlich, Yuying Gosser, Shubha Govind, Adam Haberman, Amy T. Hark, Charles Hauser, Arlene Hoogewerf, Laura L. M. Hoopes, Carina E. Howell, Diana Johnson, Christopher J. Jones, Lisa Kadlec, Marian Kaehler, S. Catherine Silver Key, Adam Kleinschmit, Nighat P. Kokan, Olga Kopp, Gary Kuleck, Judith Leatherman, Jane Lopilato, Christy MacKinnon, Juan Carlos Martinez-Cruzado, Gerard McNeil, Stephanie Mel, Hemlata Mistry, Alexis Nagengast, Paul Overvoorde, Don W. Paetkau, Susan Parrish, Celeste N. Peterson, Mary Preuss, Laura K. Reed, Dennis Revie, Srebrenka Robic, Jennifer Roecklein-Canfield, Michael R. Rubin, Kenneth Saville, Stephanie Schroeder, Karim Sharif, Mary Shaw, Gary Skuse, Christopher D. Smith, Mary A. Smith, Sheryl T. Smith, Eric Spana, Mary Spratt, Aparna Sreenivasan, Joyce Stamm, Paul Szauter, Jeffrey S. Thompson, Matthew Wawersik, James Youngblom, Leming Zhou, Elaine R. Mardis, Jeremy Buhler, Wilson Leung, David Lopatto, and Sarah C. R. Elgin 111–130

While course-based research in genomics can generate both knowledge gains and a greater appreciation for how science is done, a significant investment of course time is required to enable students to show gains commensurate to a summer research experience. Nonetheless, this is a very cost-effective way to reach larger numbers of students.

Immediate Dissemination of Student Discoveries to a Model Organism Database Enhances Classroom-Based Research Experiences

Emily A. Wiley and Nicholas A. Stover 131–138

A model for integrating course-based research with community genome annotation efforts at model organism databases is presented. Disseminating gene function discoveries directly to an interested audience increased student motivation to more deeply engage all aspects of an authentic research experience.

Effect of Time on Perceived Gains from an Undergraduate Research Program

Omolola A. Adedokun, Loran C. Parker, Amy Childress, Wilella Burgess, Robin Adams, Christopher R. Agnew, James Leary, Deborah Knapp, Cleveland Shields, Sophie Lelievre, and Dorothy Teegarden 139–148

This study examines student perceived gains from an undergraduate research experience (URE) program, using data from pre-, mid-, and postparticipation surveys. Results suggest that students experienced different gains at developmentally different stages of their UREs and reported gains in fewer areas at the end of the Summer segment than at end of the yearlong experience.

The Project Ownership Survey: Measuring Differences in Scientific Inquiry Experiences

David I. Hanauer and Erin L. Dolan 149–158

This study evaluates the reliability and validity of an instrument for quantitatively assessing project ownership in undergraduate laboratory learning experiences.

On the Cover

This image is from an animation depicting the process of DNA replication. The animation takes advantage of resolved structural data to realistically portray the components of the DNA replication machinery and how they function together. The DNA helix on the bottom left enters the blue donut-shaped helicase, which spins around the DNA and unwinds it into two single template strands. The strand on the right is continuously copied as it feeds through the purple and green replication complex. The strand on the left feeds through the same complex, but the DNA is copied in segments because of its opposite orientation. Animations like this synthesize a wealth of molecular structure data to capture how complex biological processes are facilitated by molecular interactions and structure changes. On page 21, Barber and Stark review a set of online materials that emphasize the relationship between molecular form and function. This animation is available online through the Dolan DNA Learning Center’s 3D Animation Library and the Howard Hughes Medical Institute’s Biointeractive website. (Image credit: Howard Hughes Medical Institute)