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LETTERS TO THE EDITOR

The CourseSource Bioinformatics Learning Framework

Anne G. Rosenwald, Mark A. Pauley, Lonnie Welch, Sarah C. R. Elgin, Robin Wright, and Jessamina Blum

From Solo in the Silo to Strategic Training Programs

Marianne Koritzinsky, C. Anne Koch, Barbara Riley, Nicole Beauchemin, Gerry Johnston, Michael Johnston, James Koropatnick, Carmen G. Loiselle, Magdalena Maslowska, Craig McCormick, Wilson H. Miller, Jr., Lois Mulligan, and Ming-Sound Tsao

FEATURE

WWW.Life Sciences Education

Brains–Computers–Machines: Neural Engineering in Science Classrooms

Eric H. Chudler and Kristen Clapper Bergsman

Neural engineering is an emerging field of high relevance to students, teachers, and the general public. This *Feature* presents online resources that educators and scientists can use to introduce students to neural engineering and to integrate core ideas from the life sciences, physical sciences, social sciences, computer science, and engineering into the classroom.

RESEARCH METHODS

Contemporary Test Validity in Theory and Practice: A Primer for Discipline-Based Education Researchers

Todd D. Reeves and Gili Marbach-Ad

This essay offers a contemporary social science perspective on test validity and the validation process. The instructional piece explores the concepts of test validity, the validation process, validity evidence, and key threats to validity. The essay also includes an in-depth example of a validity argument and validation approach for a test of student argument analysis. In addition to discipline-based education researchers, this essay should benefit practitioners (e.g., lab directors, faculty members) in the development, evaluation, and/or selection of instruments for their work assessing students or evaluating pedagogical innovations.

ARTICLES

Features of Knowledge Building in Biology: Understanding Undergraduate Students' Ideas about Molecular Mechanisms

Katelyn Southard, Tyler Wince, Shanice Meddleton, and Molly S. Bolger

This article explores how undergraduate students integrate knowledge in molecular biology. Analysis of interviews with introductory-level and upper-division students revealed patterns in how students sorted and connected ideas about DNA transcription, translation, and replication. Findings include differences in the nature of how students connected ideas.

Beyond the Central Dogma: Model-Based Learning of How Genes Determine Phenotypes

Adam Reinagel and Elena Bray Speth

Introductory biology students' conceptual models of how genes determine phenotypes elicit and reveal specific systems-thinking abilities.

Development of the Statistical Reasoning in Biology Concept Inventory (SRBCI)

Thomas Deane, Kathy Nomme, Erica Jeffery, Carol Pollock, and Gülnur Birol

Statistical reasoning is a life skill that is integral to an undergraduate education in biology. The authors describe the development of the Statistical Reasoning in Biology Concept Inventory (SRBCI), which was specifically designed to evaluate student ability to interpret typical data from biology experiments.

Examining Gender Differences in Written Assessment Tasks in Biology: A Case Study of Evolutionary Explanations

Meghan Rector Federer, Ross H. Nehm, and Dennis K. Pearl

Using item-response theory, the authors evaluated differences in performance by gender on a constructed-response assessment about natural selection. The results identify relationships between item features and performance by gender and highlight the importance of examining gender effects on performance in written assessment tasks in biology.

A Campus-Wide Investigation of Clicker Implementation: The Status of Peer Discussion in STEM Classes

Justin D. Lewin, Erin L. Vinson, MacKenzie R. Stetzer, and Michelle K. Smith

The authors observed university STEM classes and documented clicker use. Comparisons of classes taught with and without clickers show that the use of clickers does not significantly impact lecture time. One explanation stems from the observation of three distinct modes of clicker use that differ in instructional behaviors and question difficulty.

Testing CREATE at Community Colleges: An Examination of Faculty Perspectives and Diverse Student Gains

Kristy L. Kenyon, Morgan E. Onorato, Alan J. Gottesman, Jamila Hoque, and Sally G. Hoskins

This study addressed whether 1) workshop-trained community college faculty teach effectively with CREATE in their first attempt and 2) two-year students in CREATE courses make cognitive and affective gains. The authors report that 2-yr faculty successfully applied CREATE pedagogy in their first CREATE course and that 2-yr students demonstrated diverse gains.

Increasing the Use of Student-Centered Pedagogies from Moderate to High Improves Student Learning and Attitudes about Biology

Georgianne L. Connell, Deborah A. Donovan, and Timothy G. Chambers

Students in an extensively student-centered biology class using multiple active-learning pedagogies and consistent formative assessment had greater content gains and more sophisticated views about learning biology compared with students in a moderately student-centered section using fewer active-learning pedagogies and less formative assessment.

Influence of a Dissection Video Clip on Anxiety, Affect, and Self-Efficacy in Educational Dissection: A Treatment Study

Christoph Randler, Eda Demirhan, Peter Wüst-Ackermann, and Inga H. Desch

A predissection video to instruct students about fish dissection was used in a treatment-control study. The dissection film group scored higher in positive affect, negative affect, anxiety, and self-efficacy after the dissection. The dissection film has clear benefits—increasing positive affect and self-efficacy—that come at the cost of higher negative affect and state anxiety.