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## FEATURES

### *From the National Science Foundation*

#### **News from the Funding Front: Upcoming Opportunities, Proposals Welcomed**

Helen L. Vasaly, Jose Herrera, Charles H. Sullivan, and Katherine J. Denniston . . . . . 1–4

Many life sciences faculty and administrators are unaware of existing funding programs and of the strategies needed for writing an educationally related proposal. We hope to remedy this problem by making the life sciences audience aware of two National Science Foundation programs underutilized by the biology community.

### *From the National Academy of Sciences*

#### **Glycoscience: Integrating a Key Macromolecule More Fully into the Curriculum**

Katherine Bowman and Douglas Friedman . . . . . 5–8

The recent report from the National Research Council, *Transforming Glycoscience: A Roadmap for the Future*, explores an important area of the life sciences. Glycoscience examples are suitable additions to many areas of the curriculum, and their inclusion will help ensure that students have an understanding of the diverse functions played by this key class of macromolecules.

### *Current Insights*

#### **Recent Research in Science Teaching and Learning**

Deborah Allen . . . . . 9–11

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.

## ESSAY

#### **The Teaching Demonstration: What Faculty Expect and How to Prepare for This Aspect of the Job Interview**

Michelle K. Smith, Mary Pat Wenderoth, and Mary Tyler . . . . . 12–18

To help job candidates understand faculty expectations of the teaching demonstration portion of an interview for a tenure-track faculty position, we canvassed biology faculty from a variety of institutions. We asked faculty to identify the elements of an effective teaching demonstration and to give advice on how candidates can best prepare for this aspect of the interview.

## ARTICLES

#### **Addressing the Challenge of Diversity in the Graduate Ranks: Good Practices Yield Good Outcomes**

Nancy L. Thompson and Andrew G. Campbell . . . . . 19–29

This paper describes practices designed to improve graduate student training outcomes in the sciences. It describes work to increase student diversity in the graduate ranks and documents the success of trainees. The practices designed to achieve these outcomes are broadly applicable to all graduate training programs and students.

#### **Stereotyped: Investigating Gender in Introductory Science Courses**

Shanda Lauer, Jennifer Momsen, Erika Offerdahl, Mila Kryjevskaja, Warren Christensen, and Lisa Montplaisir . . . 30–38

This study investigated the performance of women and men across introductory science courses, stereotype threat endorsement, and the utility of a values-affirmation writing task in reducing achievement gaps. Data analysis revealed no achievement gap, little stereotype threat endorsement, and no impact of the values-affirmation writing task on performance.

#### **Figure Facts: Encouraging Undergraduates to Take a Data-Centered Approach to Reading Primary Literature**

Jennifer E. Round and A. Malcolm Campbell . . . . . 39–46

Figure Facts is a versatile instructional tool designed to help college students tackle complex data figures in the primary literature.

- Questions for Assessing Higher-Order Cognitive Skills: It's Not Just Bloom's**  
 Paula P. Lemons and J. Derrick Lemons ..... 47–58
- Biologists' conceptions of higher-order questions include Bloom's, difficulty, time, and student experience. Biologists need more guidance to understand the difference between Bloom's and item difficulty. Biologists' conceptions about higher-order questioning can be used as a starting point for professional development to reform teaching.
- CREATE Cornerstone: Introduction to Scientific Thinking, a New Course for STEM-Interested Freshmen, Demystifies Scientific Thinking through Analysis of Scientific Literature**  
 Alan J. Gottesman and Sally G. Hoskins ..... 59–72
- This study shows that a one-semester course aimed at STEM-interested freshmen and focused on scientific literature analysis using the CREATE strategy can produce gains in thinking/design ability as well as epistemological maturation.
- Improvement in Generic Problem-Solving Abilities of Students by Use of Tutor-less Problem-Based Learning in a Large Classroom Setting**  
 Andis Klegeris, Manpreet Bahniwal, and Heather Hurren ..... 73–79
- Problem-based learning (PBL) was introduced in a large classroom setting. Two generic problem-solving tests were administered at the beginning and end of the term, and a statistically significant 13% increase in the test scores of students exposed to PBL was demonstrated; no change in test scores was observed in the control groups not using PBL.
- Developing the Inner Scientist: Book Club Participation and The Nature of Science**  
 Phyllis Baudoin Griffard, Tayseer Mosleh, and Saad Kubba ..... 80–91
- First-year premedical students' understanding of Nature of Science (NOS) improved over one academic year. Those who participated in a nonfiction book club as a curricular option showed better understanding of NOS than students who did not participate. Pre- and postcourse surveys and course documents suggest that book club may attract students with higher NOS status and further improve it.
- Evolving Impressions: Undergraduate Perceptions of Graduate Teaching Assistants and Faculty Members over a Semester**  
 K. Denise Kendall and Elisabeth E. Schussler ..... 92–105
- This study explored student ratings of instruction by GTAs and faculty members to see whether perceptions differed by instructor type, whether they changed over a semester, and whether certain instructor traits were associated with student perception of their instructor's teaching effectiveness or how much they learned from their instructor.
- Implementing Recommendations for Introductory Biology by Writing a New Textbook**  
 Mark J. Barsoum, Patrick J. Sellers, A. Malcolm Campbell, Laurie J. Heyer, and Christopher J. Paradise ..... 106–116
- A new introductory biology textbook responds to national calls for reform and promotes critical learning gains in scientific, quantitative, and metacognitive ability.

#### *On the Cover*

*Integrating Concepts in Biology (ICB)* is a new textbook and teaching approach developed by reverse engineering the undergraduate introductory biology course in response to many national calls for teaching reform. As depicted in the diagram, *ICB* divides biology into five big ideas that encompass the entire field: information, evolution, cells, emergent properties, and homeostasis. To emphasize the interconnectedness of all aspects of the biosphere, each of the five big ideas is explored at all levels of life's size scale: molecular, cellular, organismal, population, and ecological system. Students are guided in critical interpretation and quantitative analysis of primary data, often from classic publications. *ICB* stresses the importance of mathematics in biology and the ethical and social implications of biology, while deemphasizing content coverage, memorization, and passive acceptance of information. Barsoum and colleagues (see page 106) report that *ICB* students show significant improvement in critical thinking outcomes and metacognition over comparison group students, while recalling content knowledge at the same level.