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GENERAL ESSAYS AND ARTICLES

CURRENT INSIGHTS

Recent Research in Science Teaching and Learning

Sarah L. Eddy

The *Current Insights* feature introduces readers to current articles of interest in other journals. In this installment we explore articles on the relationship between belonging and participation, instructor-student relationship and implementation of high impact teaching practices, and which leads to better student feedback: rubrics or exemplars.

ESSAYS

Preparing Teaching Assistants to Facilitate Course-based Undergraduate Research Experiences (CUREs) in the Biological Sciences: A Call to Action

Erin E. Shortlidge, Amie M. Kern, Emma C. Goodwin, and Jeffrey T. Olimpo

Teaching assistants (TA) have increasingly been tasked with facilitating course-based undergraduate research experiences (CUREs). Yet, there is little discussion in the literature regarding the need for or approaches to providing professional development (PD) for this population. This essay is a “call to action” for promoting intentional CURE TA PD.

Re-Envisioning the Culture of Undergraduate Biology Education to Foster Black Student Success: A Clarion Call

Terrell R. Morton, Wesley Agee, Kilan C. Ashad-Bishop, Lori D. Banks, Zanethia Choice Barnett, Imari D. Bramlett, Briana Brown, Walter Gassmann, Korie Grayson, Gail P. Hollowell, Ruth Kaggwa, Gaurav S. Kandlikar, Marshaun Love, Whitney N. McCoy, Mark A. Melton, Monica L. Miles, Catherine L. Quinlan, ReAnna S. Roby, Checo J. Rorie, Tatiane Russo-Tait, Ashlyn M. Wardin, Michele R. Williams, and Ashley N. Woodson

The Re-Envisioning Culture Network is a space dedicated to transforming the culture of undergraduate biology education to bolster Black student experiences and outcomes. This paper provides the REC Networks call to action for the field to engage in cultural transformation processes.

ARTICLES

Students explain evolution by natural selection differently for humans versus nonhuman animals

Joelyn de Lima and Tammy M. Long

Evolution is foundational to understanding biology, yet learners at all levels struggle to reason about and explain core evolution concepts. This study examines the influence of prompt context in shaping students’ explanations of natural selection by comparing responses about human versus nonhuman animals.

Missed connections: Exploring features of undergraduate biology students' knowledge networks relating gene regulation, cell–cell communication, and phenotypic expression

Sharleen Flowers, Kal H. Holder, Gabrielle K. Rump, and Stephanie M. Gardner

Think-aloud interviews with undergraduate biology majors were conducted to characterize the definitions of gene regulation, cell-cell communication, and phenotypic expression as well as the features of the student knowledge networks connecting them. Implications for developing students' systems thinking are discussed.

Gender Identity and Student Perceptions of Peer Research Aptitude in CUREs and Traditional Laboratory Courses in the Biological Sciences

David Esparza, Aimeé A. Hernández-Gaytan, and Jeffrey T. Olimpo

Few studies have explored potential gender inequities in STEM laboratory contexts, particularly those posited to be inclusive in nature (e.g., CUREs). Herein, we employ social network analysis and qualitative approaches to examine perceptions of peer research aptitude in CURE and traditional laboratories in biology as a function of one's gender.

Relevance of Science, Conceptualization of Scientists, and Contextualized “Failure” as Mediators in the Development of Student Science Identity

Christine M. Ambrosino and Malia Ana J. Rivera

Data collected during the Research Experiences in Marine Science (REMS) program suggest place-based elements and an authentic research experience may shift students' conceptualization of scientists to a “humanized” construct. A course-based undergraduate research experience (CURE) that emphasizes culturally relevant science may contribute to historically marginalized students better recognizing themselves as scientists.

“Your Family is Always With You”: Perceptions of Parental Relationships Among Hispanic/Latinx Young Adults Pursuing STEM Careers

Angela Frederick, Angelica Monarrez, Danielle X. Morales, Heather A. Daniels, Sara E. Grineski, and Timothy W. Collins

While participants reported benefiting from immense support from their parents, this emotional support was simultaneously coupled with tensions between the demands of school and their families, as well as what the authors term “conversational constraints” with their parents.

Forming Groups in a Large-Enrollment Biology Class: Group Permanence Matters More than Group Size

Georgianne L. Connell, Deborah A. Donovan, and Elli J. Theobald

Students in permanent groups reported better attitudes towards working in groups and had higher group exam scores compared to students in nonpermanent groups. Students in larger groups had higher group exam scores but attitudes towards working in groups were not affected by group size.

Postsecondary biology students' ways of participating in the critique and discussion of primary scientific literature

G. B. Jablonski and A. S. Grinath

This multiple-case study describes varied forms of productive disciplinary engagement in the critique and discussion of primary scientific literature by postsecondary biology students. Such descriptions are necessary for biology educators to design for and recognize diverse repertoires of participation.

A Comparison of Study Behaviors and Metacognitive Evaluation Used by Biology Students

Sharday N. Ewell, Emily P. Driessen, William Grogan, Quinn Johnston, Shobnom Ferdous, Yohannes Mehari, Ashley Peart, Michael Seibenhener, and Cissy J. Ballen

Study behaviors and metacognitive-evaluation skills can promote positive-academic outcomes. This study investigates the contextual and metacognitive influences that drive the selection and use of specific-study behaviors.

A card-sorting tool to measure expert versus novice thinking in scientific research

Megan F. Cole, Clarke O. Britton, Denver Roberts, Peter Rubin, Hannah D. Shin, Yassin R. Watson, and Colin Harrison

Using a card-sorting task it was shown that expert and novice thinking is different when conceptualizing research. Experts sort more based on deep features of research approach than novices. This card-sorting task can be useful for analyzing student growth in research approach and design.

Exploring Black Undergraduate Students' Communication and Biology Education Experiences about COVID-19 and COVID-19 Vaccines During the Pandemic

Chloe D. Bowen, Alexa R. Summersill, Angela N. Google, Madeline G. Aadnes, and M. Elizabeth Barnes

In this study Black undergraduate biology students described their science communication about COVID-19 vaccines during the pandemic. Results indicate that students may have been using a deficit approach to communicating. Students recommended that science communication strategies be taught in biology classes to improve their science communication.

“I don't Know what I Would do Without it” How Life Science Graduate Students Describe Resource Value

Maryrose Weatherton, Bailey M. Von der Mehden, and Elisabeth E. Schussler

Utilizing expectancy-value theory for help sources, this national, qualitative study explored life science graduate students' choice of their highest-value resources, their explanations about why they chose those resources, and how students' perceptions of value differed among resources and across demographic characteristics.

Investigating the Influence of Assessment Question Framing on Undergraduate Biology Student Preference and Affect

Jeremy L. Hsu, Noelle Clark, Kate Hill, and Melissa Rowland-Goldsmith

Quizzes and exams are widespread in undergraduate biology courses, yet there has been no work examining how the framing of assessment questions impacts student-performance and affect. We examine how using authentic scientist names, the self-referential “you”, or classmate names in scenario-based questions may impact student-affect and performance.

Undergraduate Lay Theories of Abilities: Mindset, universality, and brilliance beliefs uniquely predict undergraduate educational outcomes

Lisa B. Limeri, Nathan T. Carter, Franchesca Lyra, Joel Martin, Halle Mastronardo, Jay Patel, and Erin L. Dolan

This article presents a new measure of Science and Math undergraduates' mindset beliefs: the Undergraduate Lay Theories of Abilities survey. The authors find that mindset, brilliance, and universality are distinct and empirically discriminable constructs. They also find that each of these lay theories contributes unique predictive value to relevant academic outcomes.

Intersecting Identities: A Look at How Ethnic Identity Interacts With Science Identity in Native Hawaiian and Pacific Islander Students

Rebeka F. Greenall, Jose Gaspar de Alba, Samara Nichols, G. E. Kawika Allen, and Elizabeth G. Bailey

This study investigates differences between Native Hawaiian and Other Pacific Islander (NHPI) and non-NHPI undergraduate Biology students in terms of Science identity, self-efficacy, alignment with science values, belonging, and environmental concern. NHPI experiences involving the influence of their ethnic-racial identities on their Science identities are discussed.

“It's More Of A Me-Thing Than An Evolution Thing”: Exploring The Validity Of Evolution Acceptance Measures Using Student Interviews

Taya Misheva, Sara E. Brownell, and M. Elizabeth Barnes

In this study, the authors have examined the response-process validity of two recent measures of student evolution acceptance, the Inventory of Student Evolution Acceptance (I-SEA) and the Generalized Acceptance of Evolution Evaluation (GAENE), using student interviews. They found several validity issues which can inform future study design and survey improvement.

Gendered Performance Gaps in an Upper-Division Biology Course: Academic, Demographic, Environmental, and Affective Factors

Victoria S. Farrar, Bianca-Yesenia Cruz Aguayo, and Natalia Caporale

We studied gender equity gaps in an upper-division biology course (10-years of offerings). We found significant gender disparities that were comparable to those of lower division courses. In 46% of offerings, women had incoming GPAs higher than men, yet still had lower grades. Course anxiety correlated with course grades for women but not men.

Building Authentic Science Experiences: Students' Perceptions of Sequential Course-Based Undergraduate Research

Bailey M. Von der Mehden, Eric M. Pennino, Heather L. Fajardo, Catherine Ishikawa, and Kelly. K. McDonald

The SIRIUS project integrated scaffolded Course-based Undergraduate Research Experiences (CUREs) across a biology department to provide students with multiple opportunities to engage in authentic research at a primarily undergraduate-serving institution.

How Do Instructors Explain The Mechanism by which ATP Drives Unfavorable Processes?

Clare G.-C. Franovic, Nicholas R. Williams, Keenan Noyes, Michael W. Klymkowsky, and Melanie M. Cooper

We uncover themes characterizing how instructors in chemistry, biology, and biochemistry explain the mechanism by which ATP drives unfavorable processes. Content themes include explanations for energy release and transfer; affective themes include negative teaching experiences and questions about the role of chemical ideas in introductory biology.

Puerto Rican Students Rising in STEM: Findings from a Multicampus Collaborative CURE Program to Promote Student Success

Merlis P. Alvarez-Berrios and Gabriele Haynes

In this work the impact of the Research for Improved Student Experiences (RISE) in STEM program on low-income, Hispanic student performance and perceptions (sense of belonging, self-efficacy and science identity) was investigated. This program aimed to promote student success in STEM at two primarily undergraduate Hispanic Serving Institutions.

SPECIAL ISSUE ON COMMUNITY COLLEGE BIOLOGY EDUCATION RESEARCH

“So, We Found a Way:” How Changing Modalities Affected a Year-Long Mentored Research Experience for Associate’s Degree Students

Ron Nerio, Veer Shetty, and Effie MacLachlan

The CUNY Research Scholars Program (CRSP) offers mentored research experiences for associate degree students at an urban minority-serving public university system. This study reports our assessment of the program’s impact during the COVID-19 pandemic.

Assessing Community College Biology Student Perceptions of Being Called on in Class

Stacy M. Alvares, J. Gwen Shlichta, Jenny L. McFarland, and Elli J. Theobald

In a large ($n = 383$) mixed methods study in a community college, students in classes that use warm random call report benefits (e.g., engagement, eustress) and drawbacks of being called on (e.g., distress, anxiety), and perceive more peer interaction. This urges continued investigation of warm random call and possible context-dependent effects.

On the Cover

An embryonic mouse embryonic submandibular salivary gland was grown out of the animal in a culture dish for 24 hours and was exposed to fluorescently labeled antibody probes to detect specific cellular proteins. An image was acquired that represents a single section through the center of the gland using a confocal microscope. The basement membrane protein heparin sulfate proteoglycan, or perlecan, (green) outlines the developing secretory epithelial cells; the neural-specific β III tubulin (red) is associated with the developing nerves; and the extracellular matrix protein, fibronectin (cyan) is associated with the mesenchymal cells that surround the epithelium.

Image courtesy of Shayoni Ray and Melinda Larsen at University at Albany, State University of New York.