

The Evolving Landscape of Undergraduate Research

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The Winter 2023 issue of SPUR offers articles based on presentations made at the ConnectUR 2023 conference as studies and perspectives. Several studies cover a variety of model systems of engagement in undergraduate research at institutions that enhance a variety of success indicators such as retention rates, confidence in transfer from community college to university, and improvement in perceptions and confidence in research skills.

The issue opens with a commentary related to our recent series on different types of methods used in reporting undergraduate research, scholarship, and creative inquiry (URSCI) research. David Lopatto from Grinnell College discusses the methods in the assessment of URSCI and highlights the history and importance of the simplicity of descriptions and/ or quantitative assessment methods. The evolving nature of undergraduate research assessment with data visualization and machine learning underscore the need to re-assess the methods and the models.

Everything Undergraduate Research in One Place by Joseph Reczek from Denison University provides readers to the themes at the 2023 ConnectUR conference through the author's in-person experience. It provides a sampling of various conference features focused on developing and sustaining institutional undergraduate research programs. Two key variables in the undergraduate research equation, namely the student-related experience and their perception and the faculty-related experience, are provided in a snapshot style. The author believes that the conference offers yet unrealized potential to engage the broader URSCI community in discussion and growth. This commentary benefits not only the seasoned professional but also new SPUR readers.

Undergraduate research in the Humanities, Arts, and Social Sciences (HASS) focusing on a structured cohort-based program by Brit Toven-Lindsey and colleagues at the University of California Los Angeles present an empirical study that includes both qualitative and quantitative data to evaluate the effectiveness of undergraduate research in HASS fields. This study used the success of well-structured models from the STEM disciplines and customized

it to the HASS discipline's unique needs. They reported the ability of students to nurture a sense of ownership of their research projects and also a feeling of community with scholars on campus. They also found that offering needed support and resources to students broadened their participation in HASS undergraduate research.

Jackie Swanik and colleagues at Wake Technical Community College present the impact of a mentored STEM Academic Research & Training (START) program on the students' persistence in STEM and ability to transfer to 4-year institutions. This randomized controlled study engaged students from six campuses in faculty-mentored research in many disciplines, and seven different university and community partners. Positive impact in terms of community college students' comfort with STEM research, scientific literacy, and confidence in their ability to transfer successfully was a key finding when compared to those not enrolled in START.

Cynthia Pacheco and colleagues at West Virginia University describe an interesting study involving first-generation and low-income students in a multidisciplinary Research Apprenticeship Program model, followed over five years. The participants showed higher college retention rates than their institutional average. Additionally, the retention rates of participating Black students were higher than the institutional averages though not statistically significant. The study's strength mainly stems from its survey of 868 participants, which is an appreciably large sample size. Implementation strategies for other institutions to support historically marginalized student groups are provided.

In another study of students who identify as Black, Indigenous, or a person of color (BIPOC), Danica White and colleagues examined the barriers to getting started in the undergraduate research process at Penn State University. Using a mixed method approach leveraging interview and survey data, results suggested that more outreach, communication, and tailored support mechanisms could enhance the undergraduate research experience for BIPOC students.

Programmatic challenges are presented in a report based on a survey of participants who are principal investigators and program coordinators of the National Science Foundation (NSF) Geoscience (GEO) Research Experiences for Undergraduates (REU) programs. Jenna Lamphere and colleagues at Texas A&M University examined the

effects of the COVID-19 pandemic and subsequent challenges faced by the NSF GEO REU leaders. They found that the reduction of applications by students was the major challenge. However, program leaders demonstrated resilience and adaptability by implementation of innovative strategies such as increased communication with students, creative research, and social activities during that pandemic year.

Course-based undergraduate research experiences (CUREs) have been appreciated as important for student success. In the field of behavioral and social sciences CURE outcomes are less understood as compared to that of traditional STEM fields. Sophia Mun at California Baptist University assessed a two-year-long research methods sequence in behavioral and social sciences research on the students' perception of the research process and skills. The Undergraduate Research Student Self-Assessment instrument measured the students' learning gains. At the same time, the Experiences with Research Activities Scale assessed broad out-of-course research experiences such as research in a lab. The study demonstrated that diverse out-of-course research activities and course-based research programs improved the students' proficiency

in research-related skills, and that faculty-mentee direct interactions were critical to this achievement.

Within the science disciplines such as biology, geology, and environmental engineering, the science of working productively with others, termed the Science of Team Science, has been recognized as deficient among students in CUREs. Joi Walker and colleagues at East Carolina University addressed whether the principles of team science communication, planning, and conflict resolution could be added to CUREs through specific course elements. Linking CUREs in these three different disciplines, the article provided a model for students to have meaningful interactions. The scores in the communication and research plans demonstrated an increase in students' understanding of the benefit of working with individuals within and across disciplines to solve complex problems.

Undergraduate research remains a high-impact practice in higher education that is evolving through its programs, participants, new pandemic-related situations, collaborative needs at single or multiple sites and campuses, and across many disciplines. This issue of SPUR reminds us to adapt and nurture the diversifying and evolving landscape.