

Undergraduate Research as an Ecosystem: Aligning Design, Access, and Support

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Undergraduate research continues to evolve as a defining feature of high-impact educational practice, shaping not only how students learn, but also how they prepare for careers, develop confidence, and engage with scholarly communities. Once viewed primarily as an enrichment opportunity for a select group of students, undergraduate research is now increasingly recognized as a central component of undergraduate education. This is evidenced as institutions are expanding access, embedding research into curricula, and aligning experiences with broader educational goals. Yet, as undergraduate research grows in scale and visibility, there is the need to ensure that these experiences remain meaningful, equitable, and sustainable. The Spring 2026 issue of *Scholarship and Practice of Undergraduate Research* explores this transition, emphasizing that the value of undergraduate research lies not in its availability alone, but in how it is intentionally designed, supported, and experienced by students and faculty. The first three studies in this issue emerged from presentations at the 2025 ConnectUR conference at Grand Rapids, Michigan.

A central theme emerging from this issue is the connection between undergraduate research and career readiness. Authors Sarah Powell and Lance Barton, from the University of North Carolina at Charlotte, positioned undergraduate research as a structured pathway for developing the competencies valued by employers, including communication, teamwork, professionalism, and critical thinking. Their findings demonstrate measurable gains in students' confidence across these domains, reinforcing the idea that research experiences extend far beyond disciplinary knowledge. At the same time, their work highlights a persistent gap: Students do not always recognize or effectively articulate the skills they develop through research. This disconnect suggests that undergraduate research must be framed more intentionally rather than as a process of discovery and include space for skill development that prepares students for diverse career pathways. Helping students translate research experiences into professional language is therefore an essential component of maximizing the impact of undergraduate research.

Closely tied to outcomes is the question of design. Author Kelly Neiles, at St. Mary's College of Maryland, and colleagues bring attention to course-based undergraduate research experiences (CUREs) as a scalable approach to expanding participation in research. Their use of the original backward design (Wiggins and McTighe 2005) provides a framework for aligning learning outcomes, assessments, and instructional practices in a way that preserves both authenticity and rigor. This approach challenges the assumption that increasing access necessarily compromises quality. Instead, it demonstrates that thoughtfully designed curricula can engage large numbers of students in authentic scientific inquiry while maintaining appropriate scaffolding. Importantly, this work underscores that effective research experiences do not occur by chance. They require careful planning, clear articulation of goals, and continuous refinement. As institutions seek to broaden participation in undergraduate research, the principles of intentional design become increasingly critical.

Even with strong design, however, access remains uneven. Elizabeth Wimberly-Young and colleagues from Loyola Marymount University highlight the role of confidence and self-efficacy as key determinants of student participation in undergraduate research. Their findings show that targeted interventions, such as research learning communities, can significantly increase students' confidence in their ability to conduct research and their likelihood of continued engagement. This work reframes access from the traditional concept availability of opportunities to the presence of pathways that enable students to see themselves as capable participants. For many students, particularly those early in their academic careers or from historically marginalized backgrounds, barriers to participation are structural, psychological, and cultural. Addressing these barriers requires proactive strategies that build confidence, demystify research, and create inclusive entry points into the research enterprise, which this article brings forth.

Mentoring further shapes the quality and impact of undergraduate research experiences. Authors Jonathan Seymour and Maria Navarro, at the University of Georgia, emphasize that participation in research alone is insufficient; it is the nature of the mentoring relationship that determines the depth of student learning and development. Drawing on the cognitive apprenticeship framework (Collins et al. 1989), they highlight the importance of structured guidance, intentional sequencing of learning, and the social context in which research occurs. Effective mentoring fosters a sense of belonging within research communities,

which is particularly important for students who may not initially see themselves reflected in those spaces. This article reinforces that mentoring is not a secondary aspect of undergraduate research; it is central to its success and requires deliberate attention and support.

These student-centered perspectives inevitably lead to broader institutional considerations. Jeff Dusek, at Baldwin Wallace University, and colleagues examine how undergraduate research is valued from the faculty perspective. Their review reveals a persistent misalignment between the recognized importance of mentoring and the structures that reward faculty work. Dusek and colleagues show that undergraduate research mentorship is often undervalued in promotion and tenure processes, with limited recognition and inconsistent support across institutions. This misalignment has significant implications for the sustainability of undergraduate research programs. The authors highlight that when faculty contributions are not adequately acknowledged, participation may depend on individual commitment rather than institutional expectation. Addressing this challenge requires policy changes and a cultural shift in how institutions define and reward teaching, mentoring, and scholarly engagement.

The issue concludes with a review of the book, *Labwork to Leadership: A Concise Guide to Thriving in the Science Job You Weren't Trained For*, authored by Jen Heemstra and published by Harvard University Press. The book broadens the conversation to include leadership within the research environment, as reviewed by Zachary Murphy from St. John Fisher University. The book highlights a gap familiar to many in academia, bringing attention to that the

fact that academicians and scientists are rigorously trained in technical skills and often receive little preparation for leading teams, mentoring students, and managing the interpersonal dynamics of research groups. By offering practical strategies for developing leadership capacity, this book review underscores the importance of viewing leadership as a learned, essential component of scientific work, while also pointing to areas where deeper engagement is needed to deal with systemic challenges, such as burnout and institutional pressures. This perspective reinforces that effective leadership is integral to sustaining undergraduate research and fostering positive, inclusive research environments.

Across these article contributions, a consistent message emerges: Undergraduate research is not a singular intervention, but a complex and interconnected ecosystem. Its impact depends on the alignment of multiple elements, including curriculum design, student confidence, mentoring practices, faculty support, and institutional structures. Expanding access remains an important goal accompanied by intentional efforts to ensure quality, equity, and sustainability for meaningful and lasting outcomes for all participants.

References

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