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Is a Framework of Support Enough?

Undergraduate Research for Online STEM Students

By Emily Faulconer, Brent Terwilliger, Robert Deters, and Kelly George

While undergraduate research is known as a high-impact practice, little research has been conducted for the online educational setting. Early research suggests that online students and faculty have similar interest in undergraduate research as their residential (face-to-face) counterparts. This point of view presents the framework of support developed for fully online students distributed globally and shares some of the challenges faced in online undergraduate research, including the issue of low recruitment (despite stated interest) that could be exacerbated by the COVID-19 pandemic.

Undergraduate research is widely considered a high-impact practice, with many well-reported benefits to students, faculty, institutions, and disciplinary fields (Kuh, 2008; Lopatto, 2010), particularly minority students (Bangera & Brownell, 2014; Estrada et al., 2017; Jones et al., 2010; Simmons, 2018). Until recently, however, little research emphasis was placed on understanding the benefits of this practice for online and globally distributed students. Online students may be underrepresented in research for a variety of reasons, including institutional factors (e.g., the prevalence of research-engaged faculty or institutional support) and environmental factors, including students' professional responsibilities. Institutions must now wrestle with these barriers as more students seek high-impact experiences from a distance. Even prior to the pandemic, online students were no less interested than residential students in participating in undergraduate research (Faulconer, Griffith et al., 2020). Similarly, online and residential faculty had a comparable level of interest in mentoring undergraduate research (Faulconer, Dixon et al., 2020).

When we first began organizing structured undergraduate research opportunities for science, technology, engineering, and math (STEM) students who participated solely online, we were well positioned to do so because this was before the pandemic began, and we were operating from a

campus that was already fully online with globally distributed faculty and students. Our goal was to increase students' disciplinary learning and transferable skills and their persistence and degree retention, as well as improve STEM identity and positive attitudes and motivation toward learning and using STEM knowledge and skills. (*STEM identity* refers to individuals seeing themselves as a member of the STEM community and as someone who understands, uses, and contributes to STEM disciplines.) We established a comprehensive network of supports based on best practices, including a long-term research mentorship program, disciplinary communication assistance through the institution's virtual communication lab, research-focused synchronous workshops, an independent study-style course-based undergraduate research experience (CURE) that offers credit for research activities as an elective in their degree program, and virtual access to participate in the annual internal student research conference.

Administrative hurdles presented early challenges to the research. The first challenge involved securing approval to adapt an undergraduate research certificate program from the residential campus so it could be followed by students completing online degree programs. Next, there was some administrative resistance to offering a research-based independent study course when standard independent study courses were already available. Finally, there were admin-

istrative responsibility and workload allocation issues that arose when we expanded an existing career-focused mentoring program to include research mentoring. Launch challenges for the research-based mentoring were compounded by the fact that the mentoring program was housed in the College of Arts and Sciences, while the research mentoring would be available to students completing any online degree program at the institution.

An unexpected challenge we are facing is the recruitment of students for the program. We hoped that the idea of “If you build it, they will come” would apply. That has yet to be the case, however, despite the strong interest expressed by online students and faculty when they were surveyed pre-pandemic. Currently, the reasons for the lack of interest are unknown, but we can make some educated guesses from the most recent research on the pandemic’s impact on students. Some concerns STEM students reported about learning from home during the pandemic include difficulty focusing, lack of hands-on experience, and loss of social interactions (Palmer et al., 2021). Students have reported a decline in positive attitudes toward science and a reduced perceived value of science learning (Wester et al., 2021). “If you build it, they will come” appears to be an inadequate strategy for program recruitment in the modern climate of higher education. Educators who wish to offer these types of high-impact experiences may want to consider how they can address complex internal personal and psychological factors.

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