BOARD # 245: Impact of the COVID-19 Pandemic on Online Student Interest and Engagement in Undergraduate Research: Sponsored through NSF IUSE

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Prior to joining Monash, Dr. Faulconer held various positions at Embry-Riddle Aeronautical University, where she was recognized internally and externally for her innovative approach to teaching and learning. Her work has been supported by external grants, including from the National Science Foundation.

Connecting her educational research with her teaching practice and aligning service to the profession accordingly, Emily Faulconer demonstrates dedication to enhancing learning experiences in higher education.

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Introduction

Undergraduate research is widely regarded as a high-impact practice. Students who engage in undergraduate research benefit through improvements to disciplinary knowledge and skills, gaining practical experience, refinement of key transferable skills (e.g., critical thinking skills), improved degree persistence, the formation and nurturing of long-term mentoring relationships, resume-building, and networking and dissemination opportunities [1], [2], [3], [4], [5]. Previous work from the authors has shown that online students have a strong interest in participating in research [6] and online faculty have comparable levels of interest in mentoring undergraduate research as residential faculty [7].

Funded through two successive National Science Foundation (NSF) Improving Undergraduate STEM Education (IUSE) grants, the Research Scholars Program was developed and expanded at the Worldwide campus of Embry-Riddle Aeronautical University. The purpose of the Research Scholars Program is to create a framework of support and reduce barriers for online undergraduate students to participate in research. The launch of the Research Scholars Program coincided with the COVID-19 pandemic in 2020.

In the first two years of the Research Scholars Program, the number of active online undergraduate researchers was lower than expected. A survey was issued in 2022 to investigate whether the pandemic had an effect on online student interest in research. Analysis of the survey results were used to answer the following research questions: 1) in a post-pandemic climate in higher education, are fully online students interested in undergraduate research opportunities? and 2) has student interest in undergraduate research changed since the onset of the COVID-19 pandemic? The purpose of this study was to compare pre- and post- student perspectives rather than to directly inquire about perceptions of how the pandemic impacted fully online students to avoid acquiescence (response) and recall bias. This paper provides a summary of the results.

Methods

This study was conducted at a medium-sized private university with two residential campuses and one distance campus. Online student participants were recruited from an upper-division undergraduate ethics course, that is required in nearly all online degree programs, ensuring a

broad representation. The survey included questions on demographics, awareness, interest, and engagement in research. The survey was reviewed by an institutional review board prior to administration and deemed exempt.

The 11-question instrument used in this study was previously reported by the authors [6]. As previously reported, the internal validity of the survey was established through multiple reviews by external experts. The survey also included 10 demographic questions. The pre-COVID survey was distributed between March and May 2018 with 40 responses [6]. The post-COVID survey was distributed between January and March 2020 with 54 responses. Chi-Squared tests were conducted to measure any statistical differences to the pre- and post-COVID responses.

Results and Discussion

Demographic data from respondents were collected through questions related to their gender, age, ethnicity, and military status. The majority of respondents (71% pre-Covid and 85% post-COVID) were male, the average age was in the 30s, and the majority identified as White (about 60%). Approximately 40% never served in the military, 30% were active duty, and 30% were veterans. In addition to standard demographic data, this study also collected characteristic data to explore potential additional variables for interest, participation, and perspectives of undergraduate research by online students. Chi-squared statistical testing indicated the distribution of gender (p-value = 0.0169), age distribution (p-value = .0172), (p-value = 0.0218), and military status (p-value = 0.6787) are not statistically different across surveys, at the 99% significance level. The demographic data from the survey participants are very similar to the demographics of all students who took the ethics course except for military status. For all students in the ethics course during the post-COVID survey, 23% never served, 46% were active duty, and 31% were veterans.

To address the first research question on whether online undergraduate students are interested in research post-COVID, results from the 2022 survey were used. Nearly half of the respondents were aware of research opportunities, though most respondents (72%) had not participated in undergraduate research or were unsure. As nearly half of the participants were in the last half of their degree progress, many participants will likely complete their degree without engaging in this high-impact practice. Interestingly, most students (74%) expressed an interest to engage in undergraduate research. While the concept of “interest” was not discretely defined within the survey, the intent was to determine the number of students with a desire to learn more about or participate in research.

Respondents reported they recognized the benefits of engaging in undergraduate research opportunities, with the most importance noted for resume-building, developing new skills, obtaining expert feedback, gaining practical experience, determining if the field is a good fit, networking, and building critical thinking skills. The potential benefits least identified by respondents include expanding disciplinary knowledge, refining existing skills, practicing for graduate school, publishing, and presenting at conferences. Interestingly, these last two seem in contradiction of the highly valued perceived benefit of resume-building.

In terms of preferences in research activities, respondents reported that their interest in undergraduate research would be highest if it was available in the form of a course-based

undergraduate research experience. Students did not express interest in undergraduate research presented as a volunteer position or as part of a student club, unless it directly aligned to a personal topical connection (i.e., “the right project”). Results of the survey indicated that of the four types of engagement formats, those that were credit-bearing (independent study or embedded within a course) were of the most interest to students.

To further explore potential student desire to engage in undergraduate research, the survey featured a query designed to capture interest by types of research deliverables (i.e., artifacts). Participants reported the highest interest in preparing grant proposals, technical reports, and manuals. Interestingly, each of the potential artifacts had approximately a quarter of students interested “for the right project.” This suggests that while designing opportunities for the highest interest artifacts may help drive engagement, that is less important than the nature of the project itself. The artifact students were least interested in was editorials, with 33% of respondents clearly stating that an editorial does not fit in their plan. This is interesting because this type of artifact could be completed over a much shorter time span, with publication meeting the “resume-boosting” benefit that drives interest in undergraduate research. It is possible that respondents may not have adequately understood each type of research artifact. An interview over a survey could allow for further clarification. This is supported by the large percentage of participants indicating “unsure” for various artifacts, which could reflect their lack of understanding of the artifact, the time investment, the impact, or more.

The survey gauged interest in the roles undergraduate researchers could engage in, assuming the student could contribute regardless of any geographical locations. Interestingly, despite inherent limitations, the fully online students largely preferred roles with hands-on components, highly ranking field research and laboratory research. Several roles that are easier to navigate in a distributed research team that students also expressed interest include project management, data analysis, safety management, and consulting. The roles that were reported to have the least fit for students were computer coding, manuscript preparation, and survey development, with approximately 30–40% of respondents indicating that this type of role in an undergraduate research project did not fit with their plan. However, each potential role garnered a level of interest “for the right project” ranging between 17–41%. This means that students may be flexible in how they are willing to participate when joining a research team if they are drawn to a particular research project.

For motivation to participate in research, possible incentives were queried. Monetary compensation, independent study course credit, and earning a grade within a course all show support, with a majority reporting these would strongly to moderately encourage participation. Institutional recognition was the least likely incentive.

Numerous factors were identified that hindered students’ participation in undergraduate research opportunities. Time commitment was the overwhelming largest obstacle for students to engage in undergraduate research, with over three quarters of respondents identifying this factor interfering with engaging in undergraduate research. Other prominent barriers reported included costs of research, knowing who to reach out to, knowing where to start, and access to physical resources. To a lesser degree were access to human resources, access to research opportunities, and a lack of confidence.

To address the second research question on whether student interest in undergraduate research changed since the onset of the COVID-19 pandemic, the 2022 survey results were compared with the results conducted in 2018. In most areas of comparison, student awareness of opportunities, engagement of research, interest in types of opportunities, influencing decisions and factors that hinder participation, there were only a few instances of statistically significant differences between the samples (Table 1). Overall, the analysis suggests that despite the challenges posed by the COVID-19 pandemic, student interest in undergraduate research has remained remarkably stable, with only a few noteworthy variations in specific aspects of research engagement and awareness.

Table 1: Testing the Differences between Pre- and Post-COVID

		Chi-Squared-test Statistic	**P Value**	**Significant ($p<.01$)**
Demographics	Gender	5.71	0.02	No
	Age Distribution	13.77	0.02	No
	Ethnicity Distribution	16.38	0.02	No
	Military Status	0.78	0.68	No
Barriers	Knowing Where to Start	10.49	0.03	No
	Knowing Who to Reach out to	14.22	0.01	Yes
	Time Commitment	7.91	0.09	No
	Cost of Research	17.47	0.002	Yes
Type of Research Opportunity	Embedded in Course	15.31	0.004	Yes
	Independent Study	6.63	0.16	No
	Volunteer with a Research Team	1.43	0.84	No
	Volunteer with a Club	4.27	0.37	No
Type of Research Product	Grant Proposal	6.02	0.20	No
	White Paper	4.39	0.36	No
	Meta Analysis	9.03	0.06	No
	Review Article	2.60	0.63	No
	Research Article	3.63	0.46	No
	Editorial	6.26	0.18	No
	Manuals or SOP	8.62	0.07	No
	Tech Report	7.81	0.10	No
	Trade Journal	19.71	0.001	Yes
	Conference Paper	8.18	0.09	No

Conclusion

Results from the 2022 survey show that the COVID-19 pandemic did not significantly alter online students' interest in undergraduate research. Though beyond the scope of this study, the high interest in undergraduate research combined with lack of awareness of opportunities, makes it reasonable to hypothesize that increased marketing of research opportunities may drive engagement. Some of the perceived barriers for participation in research can be addressed in how an undergraduate research program is implemented. The time commitment barrier can be lessened by implementing research into the student's degree program either within a course or

through an independent study course that fulfills an elective. Providing research within a course or providing an independent study course were both ranked highly in the survey as possible incentives for research participation. Other perceived barriers (such as knowing who to reach out to; knowing where to start; and access to physical resources) can be addressed by a centralized resource providing all necessary information. This centralized resource needs to be easy to find and maintained for accuracy. Upkeep of this centralized resource will need institutional support. Finally, the barrier of student confidence in being able to perform research can be addressed in how research is presented to the student. Many of the skills required, such as working independently, critical thinking, and writing, are already practiced by students within their courses. Students need to be aware that these skills can be transferred to working on a research project. The Research Scholars Program was designed and implemented to address many of these barriers for online undergraduate students.

Acknowledgments

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