

Benefiting Historically Excluded Student Populations Through Targeted Undergraduate Research Programming

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Undergraduate research experiences (UREs) have become increasingly common because of their positive impact on student learning and career readiness (Kuh 2008). Students engaged in faculty-mentored research are better able to analyze data and problem-solve (Cooper et al 2019) and show increased retention and graduation rates (Daniels et al. 2016, 2019 Estrada et al. 2018). However, not all students have equal access to research opportunities. Historically-excluded populations, including minority and first-generation students, experience financial and systemic barriers that limit participation in UREs (Davidson 2018).

To reduce the equity gap, systemic barriers that exclude potential students from benefiting from UREs must be addressed (Intemann 2009). URE participation is often voluntary and time-intensive, typically favoring more privileged students who have the resources to invest in additional work, and the generational knowledge to recognize URE benefits (Bangera & Brownell 2014; Davidson 2018). UREs are often out of reach for those with financial needs or other nonnegotiable responsibilities. Historically-excluded student populations may not have the confidence to navigate social and academic cultural practices (Bhattacharyya & Chan 2021; Corrigan 2003). Yet, participation in UREs can benefit these students more than privileged students (Jones, Barlow, & Villarejo 2010; Lopatto 2004 2007; Nagda et al. 1998; Russell, Hancock, & McCullough 2007), demonstrating increased graduation rates and applications to graduate programs (Barlow & Villarejo 2004).

Institutions have attempted to address this equity gap through course-based undergraduate research experiences (CUREs), which embed authentic research into course curriculum (Auchincloss et al. 2014). While CUREs promote inclusivity by allowing students to gain research experience through classroom settings (Linn et al. 2015), they might not provide the same high-quality experience of individualized, faculty-mentored research. Equitable access that addresses the issues of finances, time, and self-efficacy is critical to ensure that historically-excluded students can realize the greatest possible benefits from UREs.

Florida Gulf Coast University (FGCU) made efforts to address the gaps of equity, inclusion, and access by developing the WiSER (Work in Scholarly Experiences & Research) program. WiSER utilizes Federal Work-Study (FWS) to support students to ensure that individuals with financial limitations can participate in UREs by compensating their work. Eligible students typically belong to underserved populations who may otherwise work non-academic jobs to make ends meet. The scope of the program soon expanded as additional participation barriers were identified. For example, students whose cumulative GPAs dropped below 2.0 lost access to FWS and, therefore, could not participate in the program. Similarly, international or undocumented students cannot receive FWS. To offset these barriers, eligibility requirements were expanded to make the program accessible to a greater diversity of individuals, with departmental funds used to support non-FWS students.

Because historically-excluded students are less likely to utilize university student support services (Stebbleton &

TABLE 1. Participating WiSER students per discipline (N = 152)

Discipline	Participating WiSER Students	
	N	Percent
Business	14	9.2
Education	2	1.3
Engineering	28	18.4
Health & Human Services	12	7.9
Humanities	14	9.2
Natural & Physical Sciences	44	28.9
Social Sciences	34	22.4
Visual & Performing Arts	4	2.6

Diamond 2018), we supplemented WiSER with a curriculum of professional development and community-building activities led by program administrators. Activities were designed to teach students professional topics, including how to write CVs/resumes and cover letters; prepare a research/career philosophy; and do elevator pitches of their research. By working with like-minded peers from different backgrounds, students were exposed to a greater diversity of perspectives and developed a professional network that extended beyond their majors. Students were paid for these meetings, which incentivized attendance for the student and helped ensure equitable participation for the program. Participating students spent 90 percent of their time working with their faculty mentor and 10 percent engaging professional development curriculum. By employing students in UREs, we aimed to establish a program that maximized participants' academic goals while making ends meet.

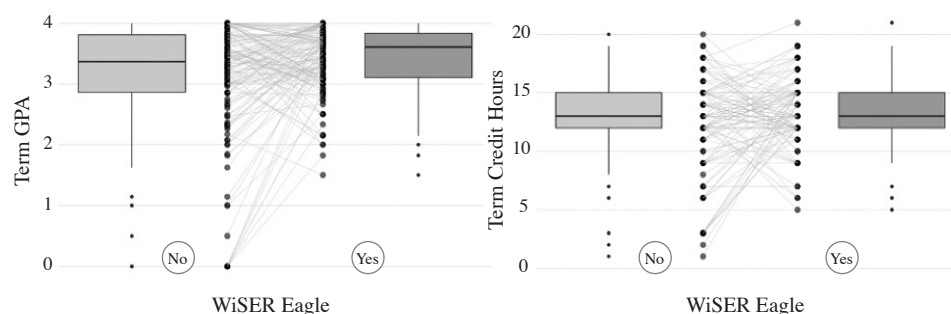
FGCU is a public, regional state university in southwest Florida with a Carnegie Classification of Doctoral/Professional University (ACE 2022). The school is both a predominantly undergraduate institution (87 percent) and a predominantly White institution (60.9 percent). Over 15,000 students are enrolled at FGCU with 37 percent being first-generation students (FGCU 2022). Undergraduates typically enroll full-time, with a high influx of transfer students (26.4 percent for AY22). With a growing population of Hispanic students (23.2 percent), FGCU is an emerging Hispanic-Serving Institution.

At this phase of the program, we evaluated two hypotheses that were considered critical to the program's success. First, whether the WiSER program supported the target population of historically-excluded students using demographic data that compared WiSER participants with the rest of the university. Second, to determine how the program affected student performance in terms of GPA and credit hours,

which are both associated with the university's graduation goals. To determine whether WiSER affected student success, the GPA and credit hours earned during the term of participation in WiSER was compared to non-participating students. Students were randomly paired based on major, academic year, and incoming student status of the WiSER participants (e.g., a third-year, Biology, non-transfer WiSER student was compared to a third-year, Biology, non-transfer, non-WiSER student). Students from the general population were assigned a random number, and then sorted from smallest to largest value. WiSER students were paired with the student from the general population with the lowest number. Time-to-graduation for WiSER students who graduated was compared to the university average.

Students who participated in WiSER since 2018 (Cohorts = 11, WiSER students = 152) varied vastly in their demographics and scholarly pursuits. Overall, 74.4 percent of participating students were FWS eligible, and 25.6 percent did not meet FWS criteria (e.g., international or poor-academic standing). The program supported historically-excluded student populations relative to university-wide demographics ($X^2 = 10.52$, $df = 2$, $p = 0.03$). For example, 32 percent of participating students identified as Hispanic compared to the 23.2 percent of students university-wide. Participating students were also primarily female, although this was similar to the overall female population ($X^2 = 1.79$, $df = 1$, $p = 0.18$, WiSER = 67.1 percent versus FGCU = 59 percent). Most students participated for two consecutive semesters (Fall-Spring), with the longest participation spanning six semesters. Table 1 shows the range of disciplines of all WiSER participants. STEM fields account for almost half of participants (47.3 percent), followed by Social Sciences (22.4 percent). Additionally, 87 faculty have participated in WiSER since its inception.

When comparing a randomized sample of students enrolled at FGCU who were paired with participating WiSER

FIGURE 1. WiSER students showed small-to-moderate academic gains compared to paired-students

Note: WiSER students earned higher GPAs and more credit hours during the semester they participated ($p < 0.001$ & $p = 0.006$; Cohen's $d = 0.32$ & 0.23 , respectively). These figures show results of a permuted paired t-test in *lmPerm* package in R (Wheeler & Torchiano 2016), pairing a WiSER student ($N = 145$) with a comparable non-WiSER student ($N = 145$) at FGCU; seven students were excluded from the analysis because of incomplete data. Effect size was determined with Cohen's- d test in the *lsr* package in R (Navarro 2015). Students paired based on their major, academic year, and incoming status. For example, a fourth-year, transfer, philosophy student in WiSER was paired with a fourth-year, philosophy, transfer student not in the program.

students (Figure 1), WiSER students performed better academically, earning term GPAs that were 0.33 higher than their randomly sampled peers on average (WiSER = 3.44; sample students = 3.11). Additionally, WiSER students earned 1.1 more credit hours on average (WiSER = 13.4 credits; sample students = 12.3 credits). WiSER students graduated in 4.05 years ($N = 105$) compared to a university-wide average of 4.53 years (FGCU 2021). This is impactful at FGCU, as Florida public universities are subject to performance-based funding metrics, such as 4-year graduation rates (FLBOG, n.d.). Through multiple changes to reduce barriers that prevent participation, the WiSER program has been successful in providing paid research opportunities to diverse student populations, while seeing the impactful results of engaging in UREs.

The WiSER program ensures equitable access to the benefits UREs provide while also supporting institutional expectations for graduation. WiSER addresses financial and self-efficacy barriers associated with historically-excluded student participation in UREs through mechanisms such as FWS and professional development opportunities that pay students and contextualize their scholarly work to reach future career goals. Initial assessment of the program demonstrates that it supports historically-excluded student involvement in UREs, as underserved populations were disproportionately represented in WiSER relative to university-wide populations. The program also demonstrates how faculty-mentored research can increase academic performance and student success. WiSER students earned higher GPAs and graduated faster than the average FGCU student. Ultimately, a fundamental principle of higher education is to contribute to both a student's education and their development as a person; such opportunities shape their future and contribute to the greater good. The key to achieving these educational goals is removing participation barriers so anyone can

engage in these experiences, which the WiSER program appears to accomplish.

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Data Availability Statement

Raw data are not publicly available. Results came from institutional data and are subject to FERPA guidelines. Analyzed data were made anonymous prior to analysis and can be made available from corresponding author upon reasonable request.

IRB Statement

S2021-51 was deemed exempt, category C.F.R. 45 Part 46.104(d)(3)(i)(A).

COI Statement

No conflict of interest to declare.

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Dr. Charles Gunnels serves as Director, Office of Scholarly Innovation & Student Research and a Professor of Biology. He discovered the benefits of student research when he had the opportunity to study the parental care behavior of the Jamaican Brown Tree Snake Jamaica. He came to Florida Gulf Coast University in 2007 because of its focus on student learning, the integration of conservation areas into the campus, and the ability to engage students in research.