A Qualitative Evaluation of the Missouri State University S-STEM Program Highlighting the Importance of Taking an Intersectional Approach in Program Evaluations

Abby I. Templer Rodrigues and Matthew C. Pierson
Missouri State University

Abstract

In 2016, Missouri State University (MSU) received a National Science Foundation (NSF) grant to provide scholarships in science, technology, engineering, and mathematics (S-STEM) for academically talented students with financial need. The MSU S-STEM program provided two years of financial and academic assistance, supporting students who began their studies at MSU during their sophomore and junior year and supporting transfer students in their first two years at MSU. The goal of the program was to increase the quality and number of undergraduate students with unmet financial need completing a Bachelor of Science (BS) within the fields of computer science, engineering, mathematics, and physics. Running from the fall of 2016 to the spring of 2021, the MSU S-STEM program served 5 cohorts, supporting 93 students total. In addition to two years of scholarship, the MSU S-STEM program provided academic support through requiring participation in a 1-credit hour seminar each fall and by making 12 hours of peer-to-peer academic tutoring available per week. This article describes the program and presents the findings from a qualitative, summative program evaluation. The data presented highlight the way intersectional inequalities differently shape student experience within STEM majors, affecting how they were supported in the MSU S-STEM program. This article makes a case for taking an intersectional approach when evaluating programs to support students in STEM and ends by discussing the benefits and challenges of taking an intersectional approach in program evaluations.

Introduction

The primary goal of the NSF S-STEM program is to support the success of academically talented students with financial need in STEM fields to diversify and increase the number of graduates participating in the American innovation economy (National Science Foundation, 2021). The grant recognizes that students from socioeconomically disadvantaged (SED) groups are a growing proportion of students enrolled at undergraduate institutions in the United States, yet often have lower retention rates (Longwell-Grice & Longwell-Grice, 2021). In this paper, we take an intersectional approach to explore how social class interacts with other aspects of a student's identity to shape the obstacles they face in pursuit of their STEM degree. Intersectionality is a framework developed out the scholarship and activism of Black feminists to analyze the interaction of multiple forms of social inequality (Collins, 1990). The purpose of an intersectional framework is to understand variations in how social inequality manifests to better enact equality. An intersectional approach is required for other NSF programs, such as the NSF ADVANCE program, which aims to increase equity and inclusion of women in STEM fields (National Science Foundation, 2020). Requiring an intersectional approach recognizes that gender equality cannot be reached without attending to how gender inequalities manifest differently based on the intersections of race, ethnicity, disability, sexuality, social class, age, etc. However, the use of an intersectional approach to evaluate the S-STEM program is novel. We argue that an intersectional approach is equally important for realizing the class-based equity fostered in the S-STEM program.

Women and students of color have historically been underrepresented in STEM majors, leading to a lack of diversity among STEM professionals (Laursen &Austin, 2020). This underrepresentation is the result of systemic inequalities that narrow access to the STEM pipeline for women and students of color and lead to a "leaky" pipeline for those who enter. Women often leave STEM majors as a direct result of gender bias (Ganley et al., 2018). Black and Latinx students enter STEM majors at the same rates as their white counterparts yet leave STEM fields at twice the rate of white students (Riegle-Crumb et al., 2019).

Several NSF funded programs to increase the number of students completing STEM majors supported women and/or underrepresented minority (URM) students (Gibson et al., 2020; Lisberg et al., 2018; Spaulding et al. 2020; Van Sickle et al., 2020). When program outcomes are tracked by demographic groups, differences emerge. Spaulding et al. (2020) found that women gained more in the areas of academic professionalism and building academic relationships when serving as peer mentors in STEM than their male counterparts. Additionally, supplemental peer teaching supports have been shown to increase pass rates in pre-calculus I and II for white students, but the same support was not sufficient to increase pass rates for URM students (Van Sickle et al. 2020.) While tracking differences in program outcomes across demographics groups is crucial, an intersectional approach takes the analysis as step further, illuminating how program outcomes vary based on the intersection of multiple aspects of identity. Indeed, there is a budding literature highlighting intersectional experiences of first-generation students (Jehangir et al., 2015; Longwell-Grice & Longwell-Grice, 2021). Through our program evaluation, we were keen to learn if students' experiences of supports provided by the MSU S-STEM program varied based on the intersections of race, ethnicity, gender, first-generation status, or nontraditional student status. We also wanted to know if participating in the program alleviated any challenges students may have faced in their majors based on their intersectional identities.

Program background and Details

Context

Missouri State University is the second largest public university in Missouri. The MSU-STEM program took place at the university's main campus in Springfield, MO, which enrolled 24,163 students in the fall of 2020, the last year of the program. MSU is a predominantly white institution (PWI) with 79.7% of students in 2020 identifying as white alone. In the same year, the gender ratio was 60% female to 40% male and 27% of freshman were first generation. Table 1 provides the 2020 demographic characteristics of the majors from which S-STEM scholars were drawn.

Only computer science had a more racially and ethnically diverse student body than the university as a whole. Engineering, math, and physics were slightly whiter than the university body. Compared to the entire university, women were slightly underrepresented in math and dramatically underrepresented in computer science, engineering, and physics majors. In all majors there were more first-generation students than the university average. However, first-generation students were still a minority of students in all majors. Taken together, students in S-STEM majors were navigating social class differences in largely white, male, and non-first-generation spaces. This highlights the need to understand how student experiences of the MSU S-STEM program may have varied based on race/ethnicity, gender, and first-generation status.

Program Specifics

The goal of the MSU S-STEM program was to increase the quality and number of undergraduate students completing a BS within the fields of computer science, engineering, mathematics, and physics. These disciplines were chosen due to low graduation numbers, low retention rates, and a regional need for graduates in each field (Johnson, 2013). Majors within these disciplines also require the same gateway courses, allowing for cohort cohesion and efficient use of tutoring. Across S-STEM majors at MSU, the lowest retention rates occur within the first two years of undergraduate study. Therefore, the MSU S-STEM program provided two years of financial and academic support to students who began their studies at MSU during their sophomore and junior year and supporting transfer students in their first two years at MSU. The aim was to support students with a strong commitment to their major.

The MSU-STEM program had three primary components: a scholarship, a required 1-credit hour seminar, and optional tutoring. Across the life of the program, $500,000 was awarded to 93 students, with participants receiving $3,100 per year for two years. The number of semesters required for the 1-credit hour seminar changed as the MSU S-STEM program unfolded to cut redundancy. The first cohort had the seminar all four semesters of the program. The second cohort had the seminar 3 of the 4 semesters of the program while the remaining cohorts had the seminar twice, once each fall. The seminar brought industry experts into the classroom to provide career-related information while creating the opportunity to network for internships, mentoring, or post-graduation employment opportunities. Over the course of the program, 60 industry experts presented. Finally, the MSU S-STEM program paid for 12 hours of weekly tutoring carried out by the MSU Center for Learning and Writing. Tutors were provided for lower and upper division math and physics courses. Tutoring for electrical engineering or computer science courses was also available but not specifically advertised. Partnering with an existing university program streamlined tutoring while making the expertise of the S-STEM tutors available to all MSU students.

Program Evaluation Goals and Methods

The key objectives of this intersectional, summative program evaluation were to understand the effects of the MSU S-STEM program on participating students and to understand how, if at all, participating in the S-STEM program may have alleviated challenges that students faced in their major based on their intersectional identities. Specifically, we analyzed how students' experiences in their major and the impacts of the program varied based on race/ethnicity, gender, first-generation status, and nontraditional student status.

Characteristics		Computer Science	Engineering	Math	Physics
Race & Ethnicity	Caucasian	66	82	81	81
	Other	7	4	5	2
	Black	3	2	6	4
	Hispanic	2	2	1	2
	Asian/Pacific Islander	8	2	3	4
	American Indian/Alaskan Native	1	0	1	0
	Unknown	14	8	3	6
Gender	Male	84	89	56	64
	Female	16	11	44	36
SED	First Generation	32	33	27	30
	Pell Eligible	35	33	28	40

Table 1. 2020 Demographic Characteristics by % for participating S-STEM Majors

There is no one way to conduct intersectional research. Griffin & Museus (2011) argue for the use of mixed methods in intersectional research conducted in higher education. In mixed methods studies, quantitative data make trends visible and qualitative data illuminate why trends exist. While mixed methods are beneficial, conducting quantitative intersectional data analysis is challenging without large data sets, particularly when the data is collected at a PWI. In their review of intersectional research conducted about Black women in higher education, Haynes et al. (2020) found that most studies utilized qualitative methods. Qualitative methods, such as interviews, focus groups, or personal narrative, highlight the complexity of lived experience (Haynes et al., 2020) while providing data that can help understand and explain experiences and processes (Griffin & Museus, 2011).

Our program evaluation utilized qualitative data collection to uncover processes of exclusion and inclusion not visible through quantitative data. Specifically, we used focus groups supplemented by interviews. Focus groups produce interactional, participant-driven data that is not possible in interviews (Hennink, 2014). When participants are pre-selected to have shared characteristics, focus groups can provide a protected environment for sharing experiences, which is key in intersectional research (Hennink, 2014). Intersectional research in higher education requires being attentive to power dynamics among students with different identities. Women or URM students may not feel comfortable talking about gender or racial discrimination in mixed-gender or mixed-race settings. To increase the likelihood that participants would share experiences of race/ethnicity- or gender-based discrimination, we organized focus groups as follows: women of color, white women, men of color, and white men. To understand the effects of social class, we utilized the marker of first-generation status. While all students who participated in the program had unmet financial need, we expected that the program may have been more impactful for first-generation students who tend to have lower levels of cultural and social capital than non-first-generation students (Bourdieu, 1997). First-generation status cut across all the race/ethnicity- and gender-based groups we proposed.

Recruiting evaluation participants was difficult. We conducted the evaluation at the completion of the MSU S-STEM program in the summer of 2021. All MSU S-STEM students (n=93) were contacted by email to participate. The number of students who agreed to participate was low even after amplifying recruitment strategies to include phone calls and texting. The low response rate made the planned focus groups impossible. We ultimately held two, 90-minute focus groups over Zoom: one for white women (2 participants) and one for white men (2 participants). These focus groups were supplemented by 13, 1-hour interviews, bringing the total number of evaluation participants to 17. Table 2 summarizes demographic information for the evaluation participants and all MSU S-STEM recipients. Demographic information for the evaluation participants is provided in aggregate to decrease the likelihood participants can be identified. All focus groups and interviews were recorded and transcribed. Transcripts were coded for emergent themes utilizing the qualitative data analysis software NVivo version 11.4.3 (QSR International Pty Ltd, 2017).

This research design provided rich qualitative data that allowed for understanding which aspects of the MSU S-STEM program were beneficial to students and why. The intersectional approach to data collection and analysis revealed patterns in how gender, race/ethnicity, nontraditional student status, and first-generation status interact to differently shape student's educational experiences and the role of the MSU S-STEM program in their success. However, without a quantitative analysis of GPA, graduation rates, and time to graduation, it is impossible to compare the outcomes of the MSU S-STEM participants to the outcomes of S-STEM majors who did not participate in the MSU S-STEM program. Additionally, the small number of evaluation participants means that findings are not generalizable. Rather, findings point to possible trends for further investigation.

Category	Aggregate Participant Information (N=17)	All MSU S-STEM Recipients (N=93)
Gender Identity	11 male 5 female 1 transgender [a]	70 male 23 female
Racial/Ethnic Identity	11 identifying as white alone 6 identifying as being from racially or ethnically minoritized groups [b]	59 White 21 not reported 8 Other 3 Hispanic 1 Black 1 Asian/Pacific Islander
First-Generation Status	11 not first-generation students 6 first generation students	45 not first-generation students 41 first-generation students 7 unknown
Pell Eligible	9 not Pell Grant eligible 8 Pell Grant eligible	50 not Pell Grant eligible 43 Pell Grant eligible
Transfer Student Status	9 not transfer students 5 transfers students 3 unknown	N/A
Nontraditional Student Status [c]	9 nontraditional students 8 traditional students	N/A
Major	8 computer science 5 civil engineering 2 electrical engineering 1 dual STEM major 1 other major	36 computer science 17 civil engineering 17 electrical engineering 7 physics 6 dual STEM major 5 mechanical engineering 4 mathematics 1 other
Cohort	3 cohort 1 3 cohort 2 5 cohort 3 5 cohort 4 1 cohort 5	21 cohort 1 21 cohort 2 26 cohort 3 20 cohort 4 5 cohort 5
Semesters in the Program	15 participated 4 semesters. 2 participated 2 semesters.	N/A

a The transgender evaluation participant was not openly transgender while participating in the MSU S-STEM program and is not reflected in the gender data for all MSU S-STEM participants. b Minoritized ethnic and racial groups were collapsed to decrease the likelihood that the identity of evaluation participants could be recognized. c Nontraditional student in this case refers to students who (1) delayed college enrolment and/or (2) were over the age of 24 when starting college (National Center for Education Statistics, n.d.).

Table 2: Evaluation participant information compared with all MSU S-STEM recipients

Findings

To understand how the MSU S-STEM program supported students, we conducted a general program assessment, adapting questions from Kalevitch et al. (2012). We then explored the broader context in which the program was taking place, asking students about their experiences of race-, gender-, and class-based challenge within their majors. Asking questions about the broader context in which programs are embedded is not standard practice for program evaluations. Findings from the general assessment of the MSU S-STEM program were positive, however, the evaluation revealed troubling details regarding the broader context. Here we report the findings on this broader context to highlight the utility of collecting this type of data while also making the case for an intersectional approach to the evaluation of STEM interventions aimed at addressing class-based inequalities. In keeping with convention for feminist research, we have maintained the grammar structure and slang of respondents in extended quotes to preserve the voice of evaluation participants.

The Intersections of Race and Gender

No men, including men of color, reported being treated differently in their majors based on gender or race. However, disturbing trends emerged around the intersection of gender and race for female and transgender participants. Of the three white female participants, one reported negative behavior from peers and all three reported that they never experienced negative behaviors from faculty. In contrast, all three students of color from minoritized gender identities (2 women and 1 transgender participant) experienced negative behaviors from peers. Even more troubling, two of the three reported being sexually harassed by a professor. Sexual harassment was reported to the Title IX office and warrants further institutional research to understand the scope of the problem. However, sexual harassment is not a problem exclusive to MSU. It is endemic in higher education (Klein & Martin, 2019), highlighting the importance of data collection strategies that provide a safe space for students to share these experiences.

Negative behaviors from peers and faculty, including sexual harassment, contribute to a "chilly climate" in STEM majors such that women and other minoritized groups do not feel welcome (Laursen and Austin, 2020). Three of six participants from minoritized gender identities (2 women of color and 1 white woman) were uncomfortable asking questions in courses for their major. Here the intersection of gender and being a traditional student mattered most; traditional female students were not comfortable asking questions. In contrast, even those nontraditional students who had experienced negative behaviors from peers and/or faculty were comfortable asking questions in class, as illustrated by this nontraditional, non-first-generation, transgender student of color:

> I think if I were younger, I would have felt more pressure to succeed in a male dominated field to show you that I can, or as a minority to show you that I can. But not so much now. Now it's more like I'm just a person. I can be normal…[I]t's a matter of being older.

Age acted as a buffer because nontraditional students were not as worried about the opinions of their peers or as intimidated by professors. It is important to note, that while the transgender participant was comfortable speaking in class, gender was a barrier to forming connections with peers. As they articulated, "I'm trans. I never know how people are going to react to that information, so I have a very close circle of people that I trust." In contrast, the only male participant to report classroom discomfort said it was related to social anxiety not to race or gender. Participating in the S-STEM program allowed two female students (1 white woman and 1 woman of color) to feel more comfortable talking with their peers, as the woman of color articulates:

> [Participating in MSU S-STEM] didn't make me ask more questions for my professors, but it made me more comfortable to ask questions with my peers. It made me connect with them to the point where I didn't feel like I was always competing with them… And eating dinner with them and stuff, and hearing about their lives, it made me feel like "oh, they're stressed too."

While this student was still not comfortable with the professors in her major, participating in the MSU S-STEM program allowed her to see her male peers as people who struggle just like her. It gave her more confidence and facilitated forming friendships, like eating dinner together after seminar. The time together in seminar similarly humanized the male students for the white woman such that she, to use her language, no longer saw the men as "smarter" than her.

Female students viewing male students as "smarter" is a manifestation of imposter phenomena, feeling like a fraud or imposter. Imposter phenomena is linked to internalized oppression and is well documented among college students related to gender, first-generation status, race, and ethnicity (Canning et al., 2020). Four of the five female participants (3 white women, 1 woman of color) discussed imposter feelings. For these women, imposter phenomena were rooted in the interaction of gender with multiple forms of identity: being first generation, being a nontraditional student, being a transfer student, being neuroatypical, or being a student of color. All four women discussed participating in the MSU S-STEM program as key to combating those feelings, as this first-generation, nontraditional, white female student illustrates:

> For me, [imposter phenomena] was a combination of gender and economic background, as well as being neuroatypical… I've been treated like I'm stupid pretty much my whole life…I had several people, say, "why are you going to college? I don't think that that's meant for you." And people would say, like, "oh it's a good thing you're pretty." …[Getting] the degree, and being a part of the S-STEM program, all of that was proving to myself, and, accessorily proving to other people, that I was smart enough…to handle this, and handle it well, and end up somewhere successfully and be fulfilled.

Her imposter feelings were rooted in a lifetime of experiencing discrimination based on the intersections of gender, class, and being neuroatypical. Participating in the MSU S-STEM program was about proving her ability to be in STEM to herself even more than to her naysayers.

While participating in the MSU S-STEM program did not erase the negative gender-based experiences students faced in their majors, five out of the six found that participating did help alleviate gender-based inequality. As discussed above, it helped some feel more comfortable participating in class and helped address imposter feelings. For others, seeing more women in the MSU S-STEM seminar than in the courses for their majors helped provide a sense of belonging. As one first-generation, nontraditional, white, female student articulated, "seeing that there are other women [in STEM] reinforced that it's okay that I'm here." The same participant noted that having industry professionals come to seminar gave her access to the "good ol' boy" network from which she would have otherwise been excluded. Finally, the transgender participant of color viewed the intimacy of the S-STEM seminar as a way to build empathy, pushing back against negative stereotypes based on gender and race.

Social Class as More Than Unmet Financial Need

Twelve evaluation participants (5 white men, 3 white women, 2 women of color, and 2 men of color) discussed one or more challenges based on social class within their majors. Four participants (2 men of color, 1 transgender person of color, and 1 white male) said they did not face class-based challenges, highlighting that students with 'unmet financial need' do not all face the same circumstances. While all evaluation participants worked for some or all of their college career, only the first-generation and nontraditional students fully financially supported themselves. Only one first-generation student was a traditional student. For the rest of the first-generation students, social class acted as a barrier to taking the traditional path to school. As this white, male, first-generation, nontraditional student highlights, the scholarship was crucial in facilitating a work-life-school balance for nontraditional students:

> I tried to do the whole work full-time, go to college at the same time [and] that wasn't working out. I had a lot of three-hour nights of sleep for a long, long time until I finally quit work completely so I could just finish my degree. And, you know, it still took me four good years to finish the degree even without working. So, any kind of help I could get financially was just a huge relief. You know, I got a few other scholarships, but of course, [the MSU S-STEM] definitely helped big time. And I was able to not stress as much about finances, which, of course, improved family life and college life.

Paying for school on his own led him to first try to balance full-time work and school to the detriment of his physical and mental health. As a father, this balancing act also put strain on his family life. Receiving the MSU S-STEM scholarship, among others, allowed him to quit work completely to focus on school. While his experience demonstrates the strain felt by most first-generation and nontraditional students, he was only 1 of 2 evaluation participants out of 17 who were able to quit work completely. For the remaining 15, participating in the MSU S-STEM program allowed for scaling back the number of work hours, improving their work-life-school balance.

Social class also shapes cultural capital, the cultural resources at one's disposal (Bourdieu, 1997). While all participants reported some form of economic need, it was only first-generation students who discussed lacking cultural capital. One first-generation, nontraditional, white, female student describes the effects of missing cultural capital:

> I didn't really have access to the tools I needed in my first year, like, I didn't really have access to a laptop or anything. And because of my very poor high school education, I didn't even know how to use Microsoft Word... I just didn't have any of that technical knowledge, and it was very hard for me to catch up and get to a collegiate level within one semester. And being first gen, my parents didn't understand a lot… In the beginning, when I had to have them signing things for FAFSA,…they didn't really understand what all that was about or the importance of it. So, it was very hard to drag them along and get them to participate in the ways that they had to.

As a freshman, she was teaching herself basics such as how to use Word while "dragging" her parents through the FAFSA process all the while working full-time to support herself. The MSU S-STEM program helped students build cultural capital through sharing the knowledge of industry professionals and through building social capital, the social networks in which one is embedded (Bourdieu 1997). The seminar helped 5 students build connections with industry professionals (2 white women) or with their peers (1 woman of color, 1 man of color, and 1 white man) through which they gained access to jobs and new forms of cultural capital such as tips for navigating their academic and post-academic careers.

Self-efficacy and Intersectional Identities

All 10 participants (4 white men, 3 white women, 2 men of color, and 1 woman of color) who reported that participating in the MSU S-STEM program improved their confidence had one or more marginalized identities, as exemplified by this first-generation, traditional, female, student of color:

> Before I was in the program, I was always anxious. I was always, like, anxious about where I'm going to work, what I'm going to do, where I'm going to end up. Everyone has those anxieties, but like, me being a woman in STEM, a person of color, it was like even more terrifying. And I feel like not until I got into [the S-STEM] program…being given all of those resources, I felt more comfortable. I felt like everything was going to be okay. And then, me gaining a social group from that, like a support group from that, also made me feel a lot better, like, more comfortable. The program made me feel like I had a place at MSU because before I wasn't really in any clubs or anything, so I didn't really have a group. I didn't have my place really at MSU…[S-STEM] made me more comfortable. I feel like it helped me with my self-confidence. It helped me, like, with my social skills, and it helped me feel like I was more capable than I ever gave myself credit for…

This evaluation participant was very aware of her intersectional social marginalization, which was a source of heightened anxiety. The MSU S-STEM program reduced her anxiety through providing her social and cultural capital and a sense of belonging on campus. This helped improve her confidence, enabling her to see herself as capable.

Participating in the S-STEM program improved self-efficacy for many but not all S-STEM participants who had experienced being minoritized within STEM fields based on gender, race/ethnicity, being first generation, and/or being a nontraditional student. The scholarship provided validation that each participant was smart enough to receive this honor, and it provided economic support to bring students closer to parity with students who did not have the same level of financial burden. Bringing participants together in the seminar, reinforced that sense of validation while also providing cultural capital. Students who connected with their peers also expanded their social capital, creating friendships that further strengthened their confidence and a sense of belonging while extending the exchange of cultural capital beyond the seminar.

Discussion

Scholarships and academic supports do not happen in a vacuum. Social inequalities shape student experiences before and during college (Canning et al., 2020; Longwell-Grice & Longwell-Grice, 2021). Our intersectional analysis revealed distinct patterns in how gender, race/ethnicity, nontraditional student status, and first-generation status intersect to differently shape students' educational experiences and the role of the MSU S-STEM program in their success. While participating in the MSU S-STEM program provided economic support to all participants, it had the deepest effects on students who had the greatest financial need: first-generation and nontraditional students. It also had the largest effects on the self-efficacy of students whose intersectional identities created compounded inequalities and imposter feelings. Class-based interventions in STEM, like the NSF S-STEM program, exist in racialized and gendered spaces. Recognizing those dynamics can help ensure that class-based supports also increase racial, ethnic, and gender equity within STEM fields. Our findings also indicate that there is wide variation among students with 'unmet financial need' such that effectively addressing class-based challenges requires attending to the experiences of first-generation and nontraditional students.

Recommendations

Program evaluations are an important element of STEM interventions, allowing programs to understand what works and what could be improved. They can also be utilized as a tool for monitoring and amplifying program inclusion. To facilitate broader inclusion in class-based STEM interventions, we make three suggestions for data collection and analysis in program evaluations. First, explore demographic differences in how students experience programmatic supports. Women experience STEM interventions differently than men (Spaulding et al., 2020) just as UMR students experience them differently from whites (Van Sickle et al., 2020). Second, program evaluations would ideally take an intersectional approach. An intersectional approach in program evaluations allows for a more nuanced understanding of the phenomena being evaluated. Pinkston (2015) found intersectional differences in the perception of campus climate. When looking at race alone, Blacks perceived campus as less welcoming than Asians or whites. However, looking at the intersection of race and gender revealed that the racial gap was largely driven by Black women's perceptions of the campus as unwelcoming.

Finally, collecting data on the broader context in which STEM interventions take place provides a better understanding of programmatic effects and facilitates addressing systemic inequalities. As illustrated by our data, zooming out from the MSU S-STEM program to explore students' experiences in their majors made it clear that the program was not being implemented in a level playing field. Students' academic experiences and needs varied by gender, race/ethnicity, nontraditional student status, and first-generation status. Learning that variation allowed for understanding variation in how participating in the program affected self-efficacy and addressed financial need. Taking an intersectional approach to look at the broader context also revealed sexual harassment, which likely would not have emerged utilizing a conventional methodological approach to program evaluations. Knowing about harassment is a crucial first step in addressing the underlying inequality.

An intersectional approach to program evaluations could be implemented a number of ways. Our study utilized focus groups and interviews while Jehangir et al. (2015) utilized focus groups alone in their intersectional analysis of the experiences of first-generation, low-income college students. For programs that already have evaluation tools such as surveys, adding an intersectional approach could happen through analyzing variation in program outcomes based on intersecting social identities, as illustrated by Pinkston's (2015) campus climate survey. Evaluators could also add new questions to existing survey instruments.

Conclusion

We have discussed the benefits of conducting intersectional program evaluations. However, intersectional research is challenging, adding complexity to both data collection and analysis (Griffin & Museus, 2011). Conducting an intersectional analysis at a PWI, where most program participants were white men, required methodological flexibility in our program evaluation. The numbers of URM students were so low in our population that we were not able to find a common meeting time to conduct focus groups. All URM students participated via interview as did the white men and women who could not attend their respective focus groups. On one hand this created an intimate setting in which participants share deeply personal experiences, like sexual harassment. On the other hand, switching to interviews extended the time devoted to data collection by a month.

We argue the benefits of an intersectional approach outweigh the challenges. When data is collected at PWIs without attention to intersectional identities, data largely reflect the experiences and opinions of the majority. At MSU, most S-STEM participants were white men who were traditional, non-first-generation students. These demographic groups are the most likely to persist in STEM fields. While students from these demographic groups had real economic need, they were not facing the same disadvantages as their counterparts: a chilly climate, including sexual harassment, based on the intersection of race and gender, imposter feelings based on the intersection of multiple marginalized identities, the financial burden of paying for school without familial support, and the lack of cultural and social capital experience by first-generation and nontraditional students. For scholarships and academic supports in STEM to be truly inclusive, programs must understand the range of obstacles experienced by all program participants, not just those in the majority. An intersectional approach in program evaluation is one way to uncover the complexity of student experiences and to craft more inclusive STEM interventions.

Acknowledgments

This work was supported by the National Science Foundation (Proposal 1458699). We want to thank all the MSU S-STEM participants who shared their experiences with us. We thank our undergraduate research assistants Janis Whalen and Sophie Arnold, whose meticulous work was crucial to the program evaluation. Finally, thank you to Kayla Curry for sharing resources on first-generation students and imposer phenomena.

References

Bourdieu, P. (1997). Forms of Capital. In A. H. Halsey, H. Lauder, P. Brown, & A. S. Wells (Eds), *Education: Culture, Economy, and Society* (Pp. 46–58). Oxford University Press.

Canning, E. A., LaCrosse, J., Kroeper, K. M., & Murphy, M. C. (2020). Feeling Like an Imposter: The Effect of Perceived Classroom Competition on the Daily Psychological Experiences of First-Generation College Students. *Social Psychological and Personality Science.* 11(5), 647-657. https://doi.org/10.1177/1948550619882032

Collins, P. H. (1990). *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment.* Routledge.

Ganley, C. M., Casey, G. E. , Cimpian J. R., & Makowski, M. B. (2018). Gender Equity in College Majors: Looking Beyond the STEM/Non-STEM Dichotomy for Answers Regarding Female Participation. *American Educational Research Journal* 55(3), 453–487. https://doi.org/10.3102/0002831217740221

Gibson, A. D., Siopsis, M. & Beale, K. (2020). Improving Persistence of STEM Majors at a Liberal Arts College: Evaluation of the Scots Science Scholars Program. *Journal of STEM Education: Innovations & Research* 20(2), 6–13.

Griffin, K. A. & Museus, S.D. (2011). Application of Mixed-Methods Approaches to Higher Education and Intersectional Analyses. *New Directions in Institutional Research 151*, 15-26. https://doi.org/10.1002/ir.396

Haynes, C. Joseph, N. M., Patton, L. D., Stewart, S. & Allen, E. L. (2020). Toward an Understanding of Intersectionality Methodology: A 30-Year Literature Syntheses of Black Women's Experiences in Higher Education. *Review of Educaal Research* 90(6), 751-787. https://doi.org/10.3102/0034654320946822

Hennink, M. M. (2014). *Focus Group Discussions: Understanding Qualitative Research*. Oxford University Press.

Jehangir, R. R., Stebleton, M. J., & Deenanath, V. (2016). *Exploration of Intersecting Identities of First-Generation, Low-Income Students.* The National Resource Center for The First-Year Experience and Students in Transition.

Johnson, T. G., & Rossi, J. D. (2013). *Engineer Missouri.* Report prepared for The Community Policy Analysis Center at The University of Missouri.

Kalevitch, M., Maurer, C., Badger, P., Holdan, G., Iannelli, J., Sirinterlikci, A., Semich, G., & Bernauer, J. (2012). "Building a Community of Scholars: One University's Story of Students Engaged in Learning Science, Mathematics, and Engineering Through a NSF S-STEM Grant." *Journal of STEM Education: Innovations & Research* 13(4), 34–42.

Klein, L.B, & Martin, S.L. (2019). Sexual Harassment of College and University Students: A Systematic Review. *Trauma, Violence, & Abuse*, 22(4), 777-792. https://doi.org/10.1177/1524838019881731

Laursen, S. & Austin, A. E. (2020). *Building Gender Equity in the Academy: Institutional Strategies for Change.* John Hopkins University Press.

Lisberg, A., & Woods, B. (2018). Mentorship, Mindset and Learning Strategies: An Integrative Approach to Increasing Underrepresented Minority Student Retention in a Stem Undergraduate Program. *Journal of STEM Education: Innovations & Research*19(3), 14–20.

Longwell-Grice, R. & Longwell-Grice, H. (2021). A*t the Intersection: Understanding and Supporting First-Generation Students.* Stylus Publishing.

Nation Center for Education Statistics. (n.d.). *Nontraditional Undergraduates/Definitions and Data.* Retrieved October 7, 2021, from https://nces.ed.gov/pubs/web/97578e.asp

National Science Foundation. (2021, November 24). *NSF Scholarships in Science, Technology, Engineering, and Mathematics Program (S-STEM)*. Retrieved October 6, 2021, from https://beta.nsf.gov/funding/opportunities/nsf-scholarships-science-technology-engineering-and-mathematics-program-s

National Science Foundation. (2020, March 6). ADVANCE: Organizational Change for Gender Equity in STEM Academic Professions (ADVANCE). Retrieved January 25, 2022, from https://beta.nsf.gov/funding/opportunities/advance-organizational-change-gender-equity-stem-academic-professions-advance

Pinkston, K. (2015) The Best of Both Worlds: One Account of Becoming a Program Evaluation Sociologist. *The American Sociologist* 46, 480-485. https://doi.org/10.1007/s12108-015-9284-7

QSR International Pty Ltd. (2017). *NVivo* (Version 11.4.3) [Computer Software]. https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home

Riegle-Crumb, C., King, B., & Irizarry, Y. (2019). Does STEM Stand Out? Examining Racial/Ethnic Gaps in persistence Across postsecondary Fields. *Educational Researcher* 48(3), 133–144. https://doi.org/10.3102/0013189X19831006

Spaulding, D. T., Kennedy, J. A., Rózsavölgyi, A., & Colón, W. (2020). Differences in Outcomes by Gender for Peer Mentors Participating in a STEM Persistence Program for First-Year Students. *Journal of STEM Education: Innovations & Research* 21(1), 5–10.

Van Sickle, J., Schuler, K. R., Quinn, C., Holcomb, J. P., Carver, S. D., Resnick,K., Duffy, S. F., & Sridhar, N. (2020). Closing the Achievement Gap for Underrepresented Minority Students in STEM: A Deep Look at a Comprehensive Intervention. *Journal of STEM Education: Innovations & Research 21* (2), 5–18.

Abby I. Templer Rodrigues, Ph.D. is an Assistant Professor in the Department of Sociology and Anthropology at Missouri State University.

Matthew C. Pierson, Ph.D. is the Mace/Turblex Engineering Professor in the Cooperative Engineering Program at Missouri State University.