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Minoritized Students in STEM Patchworking Forms of Support

Proposal for AERA 2024

College Student Access, Trajectories, and Transitions

Abstract

This general qualitative describes the ways that minoritized students majoring in STEM fields patchwork forms of support, specifically through National Science Foundation-funded programs. In interviews and observations, students described how they leveraged multiple NSF programs on their campuses to provide access to experiences, financial assistance, and broader mentoring networks.

Keywords: STEM, minoritized students, qualitative, broadening participation

Word count – 2,000

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Objectives

The purpose of this study is to describe how minoritized undergraduate students in science, technology, engineering, and mathematics (STEM) fields utilize programs funded by the National Science Foundation (NSF) to patchwork various forms of support. This study came about from a broader research project focused on an alliance of institutions in the Midwest funded by the Louis Stokes Alliances for Minority Participation (hereafter LSAMP). This alliance is “a Midwest STEM partnership for innovation in research and education. The alliance is committed to broadening the participation of underrepresented minorities in STEM education in the Midwest” (“Welcome,” 2019). A cornerstone of the alliance’s program is in promoting undergraduate research experiences to students who are STEM majors within the alliance’s 16 participating colleges. Utilizing a general qualitative study approach, this study addresses the question: How are minoritized undergraduate students majoring in STEM patchworking multiple forms of support?

Abbreviated Literature

There is a well-documented problem of recruiting and retaining minoritized students into STEM majors in postsecondary education (Museus et al., 2011). These spaces embody “oppressive and culturally biased meritocratic structures, campus cultures based on White European individualistic values, marginalizing predominantly White campus cultures, and racial prejudice and discrimination” (Museus et al., 2011, p. 25). While much of the extant literature on minoritized students in STEM focuses on the challenges students face, there is a body of literature on what factors promote their success. For example, Palmer and colleagues (2011) found that peer-group support, participation in STEM-related extracurricular activities, and participation in STEM summer programs boosted student outcomes. For Latinx students in STEM fields, Rincón et al. (2020) found that relationships and cultivating a sense of community matter, though how these relationships are formed and how students use them may differ between Latinx first-generation college students and Latinx continuing generational students. In programs like the LSAMP program in particular, Burt and colleagues (2023) wrote that students often come into these programs with self-defined strengths and when they receive validating experiences, students achieved a greater sense of their own science identity.

Theoretical Framework

This study employs Kolluri’s (2020) idea of patchwork capital as its theoretical framework. In their study on Latinx students transition from high school to college, Kolluri described the different theories that have been used to describe how Latinx students navigate these sectors and find success, even in the face of oppressive systems. In describing patchwork capital, Kolluri describes other theories of capital (Bourdieu’s cultural capital; Yosso’s community cultural wealth; Valenzuela’s subversive schooling) and argues that these existing theories are often pessimistic. Their framework, patchwork capital, is “a metaphor for the often-haphazard nature of capital acquisition for college success among marginalized students” (p. 6). Rather than aligning himself with one type of capital or another (e.g., cultural capital or community cultural wealth), Kolluri posits that students draw from multiple sources of capital and that these do not come together in a student’s lived experience in an intentional way. In this study, patchwork capital was useful in thinking about the intentional and unintentional sources of

support minoritized students in STEM drew from to build a meaningful and validating undergraduate experience.

Methods

This study utilized a general qualitative approach described by Merriam and Tisdell (2016) to answer the research questions. As previously mentioned, the LSAMP Alliance which unites the students of this study is located in three states in the Midwest. The institutions represent a diverse cross-section of postsecondary education institutions including a wealthy, private liberal arts college (Grinnell College); a land-grant university (Iowa State University); a tribal college (Little Priest College); an emerging Hispanic-Serving Institution (Marshalltown Community College) as well as other public and private institutions of various sizes. At least one time per year, the alliance holds a research conference for students that includes professional development opportunities and sessions where students present their findings from their respective research experiences. Data collection took place both during one alliance conference and virtually, described below.

Data Sources

There are two main data sources for this study: interviews with students and observations from the LSAMP conference. Students were identified by their badges and were asked to participate in the study through opportunistic sampling—that is, we tried to minimize my interference with their conference experience, so we deliberately tried to interview students during scheduled breaks or when they were not attending sessions. We also immersed ourselves in the programming of the conference by attending plenary sessions, sitting at tables with students during meal times, and in attending the conference poster session where students presented their research projects. Students who were not interviewed at the conference were recruited via email to participate in an interview about their experience in the LSAMP program. In total, nine students are included in this present study. Table 1 offers a brief summary of the participants who completed interviews.

A semi-structured interview protocol was used to guide the interviews, and the interviews were audio-recorded so they could be transcribed. The interview protocol covered topics such as how students chose to participate in the LSAMP program, their academic goals (both present and future), what undergraduate research experiences they completed, and their perceptions of how these experiences helped them develop as scientists. In all, we estimate that we completed about 20 hours of observation and observed both formal and informal interactions. An observation protocol was used to help provide some structure and consistency on the way field notes were taken. For each observation, I also wrote a reflective memo immediately after their observation was complete to provide more context or thoughts on what I observed.

Data Analysis

During the first round of coding, we used Charmaz's (2006) method of initial coding to analyze the transcripts and observations. As this proposal represents data drawn from a larger study, the focus of the first round of coding was in part theoretically driven by how the LSAMP program help builds students' science identity. However, in the second round of coding, it became clear that students described the ways in which their experiences (and ultimately, success) were attributed to multiple sources.

Researcher Positionality

As qualitative researchers, we acknowledge that we serve as a tool of the research process and am not without our own lived experiences that may influence the interpretations of

the study. The first author identifies as a multi-ethnic (Mexican American and white) cis-gender woman. I did not major in STEM nor did I attend a Predominantly White Institution, so I acknowledge that I can never understand the oppressive experiences (e.g., misogyny, racial microaggressions) that many minoritized students in STEM fields experience. The second author is a White, cis-gender gay man who acknowledges the advantages of different parts of his identity, specifically being a white man, especially in STEM fields. Throughout the research process, both in the questions we asked and in the data analysis process, we continually grounded ourselves in Harper's (2010) anti-deficit framework in order to better understand how minoritized students exercise agency in patchworking resources to get out of their undergraduate education what they need to achieve their academic and professional goals.

Results

Students within the Midwest LSAMP Alliance described several ways the LSAMP program enabled them to patchwork multiple forms of support. The Alliance itself facilitated access to laboratory spaces to carry out their undergraduate research experiences; participation in LSAMP enabled students to learn about other NSF-funded opportunities that could benefit them; and finally, students patchworked their own mentoring spaces that included other LSAMP participants.

Patchworking Resources

During the poster presentation at one LSAMP conference, three community colleges described their individual research projects. All three completed their laboratory portions of their undergraduate research experiences at a nearby university. The LSAMP Alliance itself provides institutions with relationships that enable the smaller, less resourced institutions the ability to partner with the universities with more laboratory equipment and spaces. Through these cooperative efforts, students had access to richer undergraduate research experiences. When asked what he appreciated about his time in LSAMP most, Pablo responded, "The fact that you can make it your own because there are opportunities to do structured UREs [undergraduate research experiences]. I was able to do research during the semester, and LSAMP was able to fund me over the summer to do the same research. If they hadn't done that, my professor wouldn't have had enough money to do that. I would have had to do research part-time and work somewhere else part-time."

Patchworking Finances

Multiple campuses within the LSAMP network are active NSF funding applicants and often have different NSF-funded programs available to students. Among four participants in the sample, involvement in one program led to awareness and eventual involvement of others. What was helpful to these students is in opening up opportunities for them to patchwork financial resources. For example, two community college women were recipients of S-STEM scholarships. Their participation in the activities related to that grant made them aware of the LSAMP program and the ability of funds for a summer research experience at the nearby university. Two students at a private liberal arts college shared a similar journey in that participation in one NSF program facilitated their experience in another and enabled them to patchwork finances for building out their resumes.

Patchworking a Mentoring Network

In thinking about her experience at a large, four-year campus, Keeley remarked, “I feel like I am underrepresented at [my university], both at the cultural level and the traditional family sense. I have never met anyone like me...I feel like LSAMP does a good job of incorporating underrepresented populations whether it be from familial ties to culture and race, et cetera. I’m happy to be here.” Due to their participation in LSAMP and what they felt was a rewarding experience, a group of students formed their own grassroots LSAMP alumni network. This group, outside of the formal oversight of the Alliance itself (but with its total support), fundraises for its own events, provides mentoring and professional development activities throughout the year, and serves as an informal way for students to remain in touch with others outside of their respective campuses. In observing formal and informal conversations at the LSAMP conference and the activities of the alumni network, it is clear that students are sharing information about school-related topics (e.g., applying for graduate and/or professional school) and non-academic topics (e.g., their experiences as underrepresented students at Predominantly White Institutions).

Brief Discussion

The LSAMP Alliance in which students in this study participated in provides a number of opportunities for experiences like undergraduate research, conference presentations, and preparation for graduate school. However, the LSAMP program experience was not the only program students participated in or leveraged. Instead, participation in the LSAMP program facilitated access to other experiences, financial assistance, and networks to help them prepare for graduate school or to enter the workforce post-graduation. This study reaffirms previous research on the importance of peer support for minoritized undergraduates pursuing STEM degrees (e.g., Palmer et al., 2011; Rincon et al., 2020). It adds context to how students’ patchworking on NSF programs may work in tandem to enhance their experiences, particularly as they prepare for graduate school (see Rodriguez et al., 2021, for a discussion of the SSTEM program in which some students in this study also participated in, and Burt et al, 2023, for more information on LSAMP student experiences).

Significance

One important implication for practice of this study is reinforcing the importance of researchers, advisors, and others to know the breadth of resources available to students—especially those who help provide direct (e.g., scholarships) or indirect funds (e.g., summer tuition) to minoritized students. We argue that it also reinforces the need for NSF programs that directly provide resources to students. This year’s AERA theme asks attendees to think about the educational possibilities, and in this this work, I focus not on how minoritized students in STEM are surviving in these fields but how they are thriving—and more importantly, how they patchwork resources and mentors to build a meaningful set of experiences for themselves in their undergraduate education.

Table 1 Summary of Participants

Pseudonym	Gender	Major at the time of interview	Current Student or Alumnus
Alejandra	Woman	Biology/Psychology	Current Student
Abel	Man	MBA	Alumnus
Pablo	Man	Chemical Engineering	Alumnus
Miriam	Woman	Mechanical Engineering	Alumnus
Gina	Woman	Global Health	Alumnus
Chayla	Woman	Biochemistry	Alumnus
Stella	Woman	Biochemistry	Current Student
Felisha	Woman	Chemistry and Biology	Current Student
Keeley	Woman	Environmental Science and Horticulture	Current Student

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