Exploring Students' Attitudes and Intentions in a Student-Staff Led Research Initiative

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Abstract

The purpose of this work is to explore how the experiences of two Hispanic-Latino graduate students acting as members of a Directorship Team (DT) that led an extracurricular, undergraduate research program called the Holistic Foundry Undergraduate Engaged Learners (FUEL) program influenced their attitudes and intentions with respect to this student-staff partnership. The Holistic FUEL program and the experiences of the DT were guided by the Renaissance Foundry Model (herein the Foundry) an innovation-driven learning platform. This provided a unique opportunity to evaluate how this Foundry-guided program shaped the attitudes and intentions of the two graduate student coordinators working with faculty within a student-staff partnership. As part of this case study, an inductive analysis of secondary data —including graduate coordinators' post-program reflections, recruitment announcements prepared by the coordinators, and meeting notes— provide preliminary themes and insight into the ways in which their experiences influenced attitudes and intentions regarding partnerships with staff. Lessons learned offer insight into the internal personal transformations and type of relationships that support student-staff partnerships for implementing similar undergraduate programs.

Introduction

According to the literature, student-staff partnerships can enhance learning through, for example, increased content interest, metacognitive awareness, and self-regulation for students and greater confidence, engagement, and transformational thinking for staff (Bovill 2013; Cook-Sather et al. 2014; Healey et al. 2020). However, the attitudes and intentions behind such transformations and growth as experienced in student-staff partnerships are less developed in associated scholarship. The Holistic Foundry Undergraduate Engaged Learners (FUEL) program and the experiences of the Directorship Team, both guided by the Renaissance Foundry Model (hereafter the Foundry), provide a unique opportunity for co-learning between and among the student and staff leaders (Arce et al. 2015). Exploring this relationship via the Foundry can further advance understanding of the how the dynamics of the model aid the development of student-staff partnerships that support access for students of all backgrounds.

The Holistic FUEL program was conceived as an extracurricular research program centered on immersing traditionally underrepresented undergraduate students in STEM and STEM-related majors in student-team research projects, intentionally supported with professional training, community relevance, and multi-level mentoring (Oyanader et al. 2021). Through providing comprehensive, Foundry-guided training, this program offered opportunities for undergraduate students to engage in meaningful research activities and share significant

personal postsecondary experiences as underrepresented students in STEM (Oyanader et al. 2021). The Directorship Team, an interdisciplinary group of mentors familiar with the Foundry—the driving pedagogical platform for the program—designed the original outline for the training curriculum associated with the program (Arce et al. 2015).

In this study, an inductive analysis of secondary data reflective of two graduate student coordinators' experiences—including their post-program reflections, recruitment announcements prepared by the coordinators, and meeting notes—is presented (Thomas 2006). Through this analysis, the co-authors, including the graduate students who acted as co-mentors of the Directorship Team, explore how their experiences in the program influenced their attitudes and intentions with respect to this student-staff partnership. The resulting themes from this analysis provide insight into the ways in which staff attitudes toward student autonomy, authentic engagement with learning, and reinforcements towards commitment of lived experiences and knowledge-based skills in turn influence student-mentor attitudes regarding partnerships with staff. Lessons learned offer recommendations regarding using Foundry-guided practices for developing student-staff partnerships, as well as guidance into the internal personal transformations and type of relationships that support student-staff partnerships for implementing similar undergraduate programs.

Literature Review and Background

Benefits of Student-Staff Partnership

Student-staff partnerships have been utilized at many institutions for innovative and unique opportunities to address challenges within the Science, Technology, Engineering, and Mathematics (STEM) disciplines. Bunnell and colleagues (2021) contend that student-staff partnerships have positive effects on student learning and include enhanced trust, agency, and commitment to meaningful contributions. In addition, Bunnell et al. (2021) posit that within a partnership framework, staff intentionality rests in developing environments that promote authentic engagement with learning, which is also connected to a better understanding of bias and communicative misunderstandings. Further, in recent years, the discussion of student engagement concerning underserved undergraduate populations has focused on the creation of an inclusive environment for student engagement and retention through authentic engagement with learning (Healey et al. 2020).

Many of the programs that address student engagement in these populations focus on aligning staff intentions with student success. For example, Cook-Sather and colleagues (2021) propose that student-staff partnerships offer an opportunity to *"develop the cultural capital and language of the academic culture of power in order to successfully navigate the institution as it is"* as well as to transform the institution into what it needs to be, further affirming personal experiences that challenge reified norms and contribute to more welcoming experiences (p. 223).

This emphasis on the relationship between staff intentions and student success underscores the value of institutional knowledge exchanged between students and staff within an authentic learning-based partnership that is essential to the success of underserved student populations (Bovill 2013; Cook-Sather et al. 2021; Latin 2022). Student partner Angelina Latin (2022) emphasizes this necessity by reinforcing the importance of empowering

students in higher education with confidence to create welcoming spaces as part of their own professional development and learning.

Co-learning in Mentoring

Among the many examples of innovative schemes of student-staff partnerships, there is extensive reporting of outcomes relevant to co-learning environments with mentoring as a supporting function (Healey et al. 2020; Mathrani & Cook-Sather 2020). Narayanan and Abbot (2020) suggest that building inclusion in STEM can be reinforced through engagement in the classroom community conceptualized as a co-learning environment, resulting in a symbiotic relationship that fosters innovation. Learning is mutual and dependent on authentic experiences with and through mentors (Bovill 2013; Bunnell et al. 2021). As Bunnell and Bernstein (2014) argue about including undergraduates, graduate students, and faculty in co-creating courses, *"having all those perspectives in a single conversation gives a fuller picture of how learning is or is not taking place"* (p. 5).

The challenges of creating co-learning environments as described by Goff and Knorr (2018) include faculty resistance from established traditional educational methods and curriculum building to include a diversity of voices in co-curriculum building. Charkoudian and her student colleagues (2015) noted similar struggles in their work; yet they found that these challenges can be overcome with openminded students and faculty members willing to discuss and engage in thought-provoking conversations regarding each of their positions in the partnership. In this sense, a shared reverence of student and staff voices is needed.

Holistic FUEL: Design and Implementation

The curriculum of the Holistic FUEL program was formalized upon receiving funding by a state grant that supported curricula or educational programming designed to impact the engagement, retention, and success of underrepresented student populations at the postsecondary level in its inaugural year. The design and implementation of this program are discussed below.

Pedagogy/Practice of the Holistic FUEL Program

The Foundry guided the experiences and trainings offered as part of the program. As an innovation-driven learning platform, the Foundry centers on six major elements —learning challenge, organizational tools, legacy cycle, resources, linear engineering sequence, and prototype of innovative technology— that guide cognitive processes related to knowledge acquisition and transfer paradigms (Arce et al. 2015). Figure 1 offers an overview of the Foundry as applied to the components of the Directorship Team experience. By leveraging the Foundry as a guiding framework for student-staff partnership, the program was designed to facilitate meaningful opportunities for co-learning between the members of the Directorship Team as they navigated the implementation of the program.

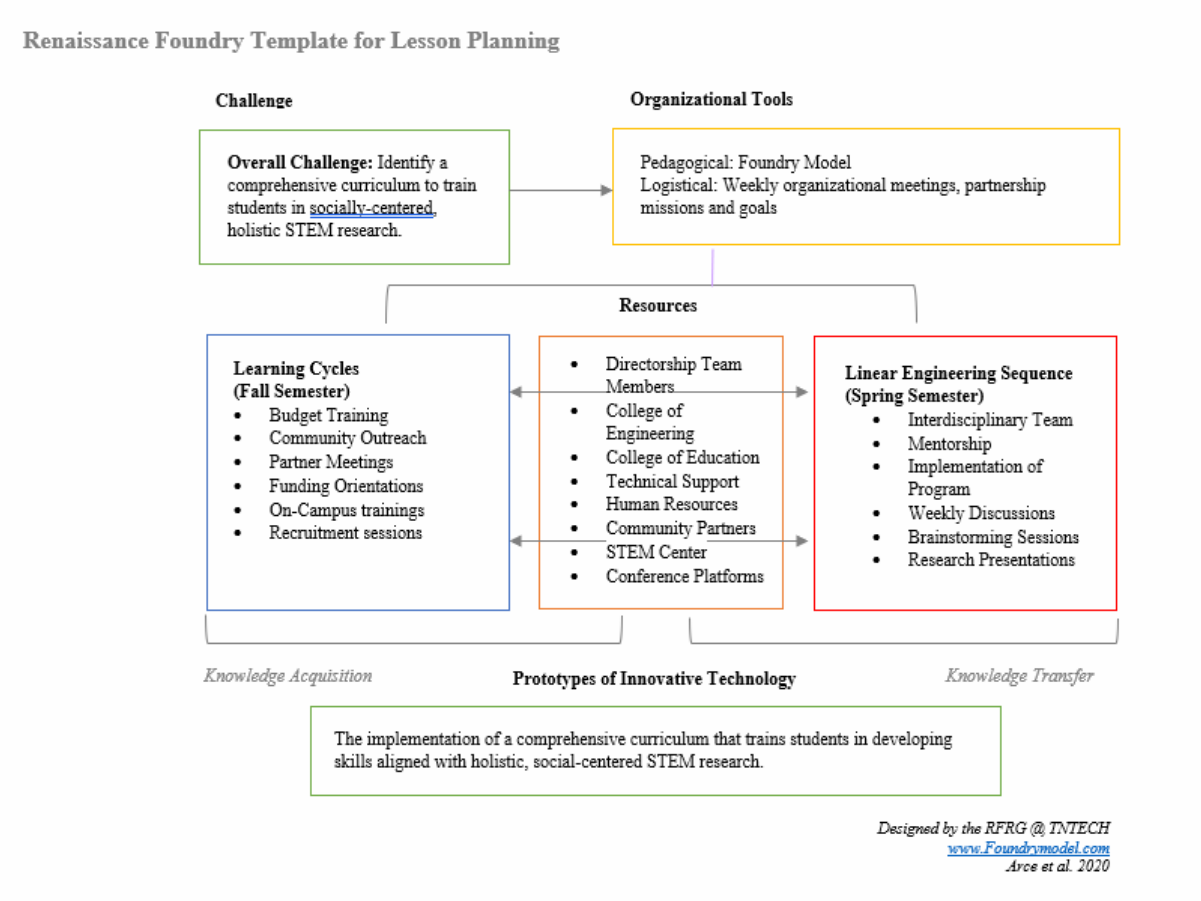

Figure 1: Design for Directorship Activities in Terms of the Foundry Model

In following the elements outlined in Figure 1, we align the pedagogical components of the Foundry with the implementation of the program. First, the challenge for the Directorship Team was creating a training experience that would train students in socially-centered, holistic STEM research (Oyanader et al. 2021). The organizational tools in this schematic featured the Foundry, weekly organizational meetings, and pedagogical tools related to learning cycles and Linear Engineering Sequence of the process. In the Fall semester, the Directorship Team focused on knowledge acquisition processes to learn more about the budget, community partnerships, funding requirements, and recruitment options for the program. In the spring semester, for implementation, the Directorship Team engaged in knowledge transfer, wherein collaborative efforts between the interdisciplinary teams, mentorship opportunities, weekly discussion, research brainstorming sessions and presentations became part of the implementation of the program for the undergraduate cohort. The culmination of this experience was the creation of the comprehensive curriculum that undergraduate students experienced as part of the first cohort of the program, ultimately the Prototype of Innovative Technology for the initial challenge presented (Arce et al. 2015).

Implementation

Table 1 lists the two stages of implementation: Knowledge Acquisition in the Fall semester and Knowledge Transfer in the Spring semester.

Table 1: Overview of Holistic FUEL Directorship Team Activities

Semester	Objectives	Activities
Fall	Establish ongoing coordination and communication between Directorship Team	• Weekly Directorship team meetings with clear objectives, community partners, and campus leaders • Planning initiatives for the preparation of the curriculum
	Securing partner connections	• Secure partnership support in community • Establish partnership opportunities for research • Recruit new community partner members to research groups
	Establish Mechanisms for student payments	• Budget & Administrative Training • Orientation to Funding Responsibilities
	Implement recruitment Efforts	• Meet with Colleges of Engineering and Education to recruit at the college level • Internal recruitment strategies • Social Media strategies • Attendance at Recruitment Fairs • Work with on-campus Partners
	Implement enrolment efforts	• Establish venues of communication for Spring semester, protocol for communication, and leadership roles for communication • Establish application medium, review protocol, and selection process
	Finalize curriculum development	• Secure guest speakers • Establish and confirm schedule • Secure conference opportunities and support • Secure research group opportunities • Review COVID-19 protocols for interaction and secure valid virtual space for program interactions
Spring	Establish ongoing coordination and communication between Directorship Team	• Bi-weekly Directorship team meetings to review training sessions and coordinate for next training meeting
	Implement 10 training sessions related to the program	• Comprised of an orientation session, four mentoring/research sessions, four high-performance learning activities with community partners related to research, and a final research symposium • Plan each training introduction activity • Coordinate and practice virtual session formats prior to training

		• Follow-up with student questions and requested supports • Answer all student related inquiries or challenges in a timely manner
	Create viable mentorship opportunities	• Coordinate clear research mentorship opportunities with first cohort outside of training sessions • Meet as needed to discuss research projects and progress • Make connections to and with community partners as needed for support
	Engage in conference opportunities	• Support students in outside research-team meetings to apply to regional and national research conferences • Review abstracts, posters, provide feedback
	Establish funding mechanisms for students	• Work with HR office to ensure student stipend is sent as scheduled • Ensure grant funding is provided to students attending conferences and needing support for research efforts

In the Fall semester (Knowledge Acquisition), after their initial recruitment, the Directorship Team were tasked with attending ten planning meetings, which acted as professional development training. The first session became an orientation to the program, where all seven individuals were integrated as part of the Directorship Team. In four of the meetings, the student coordinators shadowed the communications lead to learn and implement strategies for effective recruitment. Similarly, they were tasked with their own knowledge acquisition (i.e., budget training, virtual training, etc.) to get everyone prepared for the implementation stage of the program.

As part of the student-staff partnership, student coordinators trained with the administrators to learn about budget implementation (e.g., charged with the administration and undergraduate student training in the fall), curriculum coordination (e.g., learned program planning with their mentors), recruitment and marketing production (e.g., immersion in video production and marketing campaigns), and communication coordination (e.g., students met with the communication director on campus, set up group accounts, created email templates for the undergraduate students, etc.). Four other meetings were centered on brainstorming activities, which led to the design and planning of the first FUEL cohort. In the last meeting, the graduate student coordinators took the communication lead for the program, with autonomy to design the correspondence campaign for the program.

In the Spring semester (Knowledge Transfer), the Directorship Team focused on successfully implementing the program as designed for the first undergraduate student cohort. As planned, ten training sessions were coordinated for the undergraduate cohort during the semester. Each session had its own learning objectives, itinerary, and lesson plan within the program. In the interim, the Directorship Team continued to meet biweekly to review the training sessions and coordinate the following sessions. Other transfer activities included the establishment of funding and conference opportunities, community outreach, and continued mentoring support. For the staff-student partnerships, this meant, for

example: delving into administrative meetings to coordinate conference logistics; reaching out to community leaders and following up on student progress, research objectives, and evaluation metrics; and meeting one-on-one with undergraduate students to answer questions, provide content knowledge, and offer research support. At all times, the student coordinators were represented as standing members of the Directorship Team and took on leadership roles that spoke to this type of teamwork.

Methodology

Overview

This study was conducted using analytic induction, which focuses on the method by which a case-based inquiry is utilized to examine a social phenomenon through qualitative approaches (Patton 2002; Thomas 2006). This type of approach requires that those analyzing the data are immersed in the details and specifics to be able to "discover important patterns, themes, and interrelationships" by first exploring, then confirming, the patterns through the analysis (Patton 2002: 41). As analytic induction necessitates that categories or dimensions of analysis emerge from observations within the data, it is often associated with emergent design and paired with various forms of qualitative data that offer a holistic perspective of the phenomena being explored (Patton 2022; Thomas 2006). In accordance, the inductive analysis presented in this study is data-driven in that the "…analysis is built on a solid foundation of specific, concrete, and detailed observations, quotations, documents, and cases" (Patton 2002: 58).

Ethical considerations & trustworthiness

Institutional Research Board (IRB) approval was sought and given for the purpose of this study (Reference number: APP#2539). As part of the original parameters for compliance, the data were intentionally disaggregated and deidentified. Thus, even though the graduate students of the Holistic FUEL program are co-authors of this contribution, to comply with the IRB parameters, the quotes and reflections herein must remain anonymous. However, as co-authors of this work, student voices provided additional interpretations and perspective to the resulting themes. In this sense, the design of this study incorporated several elements of trustworthiness including prolonged engagement, persistent observations, member checks, and peer debriefing (Ary et al. 2010; Patton 2002). The approach and analysis presented offer insight into the experiences of the student-staff partnership from the graduate student coordinators' perspective through a deep understanding of the data, a thorough incorporation of observations within the data, and an emergent design that is anchored in the patterns, themes, and categories found from an inductive analysis of these data.

Setting

Aligned with its core mission, the Holistic FUEL program was implemented in a rural, mid-sized, four-year university in the Southeastern United States. The university serves a primarily rural student population, with growing first-generation, Hispanic/Latinx, and African-American groups. The university is situated in the middle of group of counties categorized by state authorities as economically depressed or distressed. The implementation of this program occurred during the pandemic and lasted two semesters (see Table 1). Most

activities for the Directorship Team were hybrid, using both virtual and in-person activities as feasible and in compliance with the university policies.

Sample Participants

The design of the program envisioned the incorporation of two graduate students as co-Directors to help bridge student and faculty and to promote the importance of undergraduate research experiences. The experiences and backgrounds of the graduate student coordinators supported several components of the initiative, and thus both coordinators served as the sample population for this study. Each graduate student represented the Hispanic/Latinx student community—a population that was targeted as a goal of the program's training—had research and international experience and had previous immersion opportunities that acted as identity markers which influenced the way in which the Directorship Team initially approached and navigated the student-staff partnership. The graduate students' voices are incorporated within the reflective experiences highlighted in the data, as well as within the interpretations of the data analysis as co-authors of this work.

Data Sources

Secondary data from the program were used for this study. Babble (2008) describes secondary data as data collected and processed originally for a specific research question, reanalyzed for the purpose of answering another research focus. These data included post-program reflections, recruitment announcements prepared by the coordinators, and meeting notes representative of the duration of the program, collected originally for evaluation purposes (Thomas 2006). The artifacts feature the experiences of the two graduate student coordinators offering insight into how this program shaped the attitudes and intentions they brought to working within a student-staff partnership. Data were deidentified and disaggregated to comply with the ethical considerations outlined by the IRB.

Data Analysis

An inductive analysis of secondary data from the program that reflected the two graduate student coordinators and co-authors' experiences was conducted for the purpose of this study (Thomas, 2006). This inductive analysis required researchers to be true to the data sources, referencing observations, notes, and rereading the material to become ever more familiar with the emergent patterns that result from the analysis (Patton 2002; Thomas 2006). As part of this process, the researchers, already familiar with the data through the data collection process, reread the artifacts and conducted several iterations of open coding that resulted in 205 refined codes (Patton 2002; Thomas 2006). From these codes, fifteen categories emerged from an axial coding process that further refined the initial codes (Saldaña 2015). These were then further refined to form eight major themes, with subsequent categories based on the axial coding, and later to the final four themes, with subsequent categories based on the axial coding (Saldaña 2015). Table 2 provides an overview of the results of this analysis.

Table 2: Descriptive Overview of the Themes from the Inductive Analysis

Theme	Description	Axial Codes	Total Codes
Impactful Role of Staff for Student-Leader Growth	The type of learning environment or space that is conducive to building intentional attitudes associated with students' sense of validation and support.	• Validation • Support • Results • Valuable • Positive Experience	40 codes
Intentional Gate-opening demands a Guiding Protocol	How guiding frameworks anchor co-learning between staff and students as central to the role of both in leadership.	• Student-Led • Leadership • Mentorship • Framework • Research	50 codes
Knowledge Construction Mechanisms in Student-Staff Partnerships	The type of collaborative interactions that help to build specific cognitive attitudes and intentions.	• Teamwork • Collaboration • New Ideas • Learning Process • Decision-Making	44 codes
Student-Centered Transformation in Student-Staff Partnerships	The importance of elevating student growth as part of the partnership experience.	• Teamwork • Collaboration • New Ideas • Learning Process • Decision-Making	44 codes

Findings

Four major themes were identified as part of the inductive analysis conducted on secondary data for this study: Impactful Role of Staff for Student-Leader Growth, Intentional Gate-opening Demands a Guiding Protocol, Knowledge Construction Mechanisms in Student-Staff Partnerships, and Student-Centered Transformation in Student-Staff Partnerships. Due to the focus of this work, the comprehensive analysis of all four themes is beyond the scope of this contribution. The following thus offers a brief overview of these themes, featuring theme one with data that highlights the major patterns found within Impactful Role of Staff for Student-Leader Growth. For the other three themes, our graduate student co-authors' interpretations of the importance of these themes are offered. This type of reflective analysis provides an opportunity to underscore nuances within the themes that provide insight into the connections between these themes and graduate student coordinators' experiences in the program.

Impactful Role of Staff for Student-Leader Growth

The theme *Impactful Role of Staff for Student-Leader Growth* encompasses aspects of the type of relationship needed to be fostered by staff and students working as partners in order to facilitate student growth as leaders. With respect to student-staff partnerships, this theme reveals the type of learning environment or space that is conducive to building intentional attitudes associated with students' sense of validation and support, which in turn are associated with positive experiences and results. An example of this theme comes from one of the graduate student coordinator's experiences collaborating with faculty during the FUEL program's planning meetings, wherein he reflected:

> *Yo personalmente me sentía cohibido en las primeras reuniones y se me dificultaba un poco dar mis opiniones, sin embargo, los facultativos y miembros del board siempre me apoyaron y animaron a expresar mis opiniones e ideas.*
>
> *I, personally, felt shy in the first meetings and it was somewhat difficult for me to share my opinion, however, the faculty and members of the board always supported and encouraged me to voice my opinions and ideas. [translated by authors]*

This example illustrates the importance of staff attitudes of support and encouragement as those can support students' developing expressive abilities associated with self-confidence and leadership.

Another example draws on a graduate student coordinator's description of the staff-student relationship:

> *I felt trusted in my actions during our scheduled follow up meetings which I felt proud to lead, only ever so often hoping for some sort of validation. In times when I felt as though I needed further direction, I was working horizontally with my faculty members rather than as their subordinate.*

This excerpt points to the staff attitudes of a collegial partnership, wherein the student felt they were at the same level, working as colleagues, instead of feeling "subordinate." Both examples illustrate the impact of staff attitudes within a staff-student relationship as those foster the growth of students as leaders and, in turn, students' attitudes with respect to their identity as leaders.

Graduate Student Co-Authors' Reflections on Importance of other Themes

The theme *Intentional Gate-opening Demands a Guiding Protocol* underscores the pedagogical nature of the staff-student partnership that was developed as part of the program, where learning and growth were driven by intentional gate-opening moments. In reflecting on this theme, we wanted to start with its antithesis: gatekeeping. The selection and advocacy of students by staff and administrators within students' academic learning can constitute gatekeeping moments, presenting barriers or challenges in access that often lead to systemically overlooking minority students (Gonzalez et al., 2021). Thus, defining who can, and who cannot, access professional opportunities related to academic and career success often define gatekeeping—and in turn gate-opening—moments. Although gatekeeping has been identified as a construct in extant literature (Gonzalez et al., 2021; Sommer et al., 2020), specifically as it relates to academia, sometimes these barriers are

hard to define or identify for students within their experiences in a learning environment. Moreover, students may not know gatekeeping is happening until it has happened.

Drawing on our own experiences of gate-opening moments in partnership with the Directorship Team, we focus on the identification of access and opportunities for minorities within a learning environment based on the use of a guided framework that helps identify complex challenges as led by the Foundry. In relation to the attitudes and intentions needed to develop strong staff-student partnerships, this theme highlights the need for a guiding framework, like the Foundry, that anchors co-learning between staff and students as central to the role of both in leadership. In the Holistic FUEL program, the constant focus on the application of the Foundry helped students to be intentional in voicing what they needed, as well as staff to be partners in helping to advocate for students. For example, identifying the opportunity to train undergraduate students as content experts alongside staff was essential in building in students an attitude of confidence and familiarity with this type of leadership in academia; such opportunities are necessary to address disciplinary barriers related to graduate student success. In contrast, experiences in other courses which did not use the Foundry framework, made it challenging to voice concern, advocate—and have advocacy—for these types of opportunities.

The theme *Knowledge Construction Mechanisms in Student-Staff Partnerships* embodies the type of collaborative interactions that help to build specific attitudes and intentions that support co-learning within the partnership between graduate coordinators and staff. As a learning environment, the program embedded unique opportunities for teamwork and collaboration across the research activities and mentoring in the program that allowed graduate student coordinators to take a leading role in supporting the involvement of undergraduate mentees. As part the experience in the Holistic FUEL program, an open attitude to students' contributions was paramount to coordinate helpful, collaborative moments in learning. Every meeting was another opportunity to explore ideas that might not have otherwise been expressed in traditional learning environments, influenced by learned conventional methods of research in STEM. In such an innovative environment, being constantly encouraged by staff partners to think outside of the box was key to being intentionally open to new ideas and to actually co-constructing rather than simply receiving knowledge.

In this sense the Holistic FUEL program was deeply collaborative: it allowed students to collaborate both with other students and with staff in a way that helped to close gaps in content knowledge while also making connections in new ways. As graduate coordinators also training undergraduate researchers, we were not only exposed to how staff understood STEM content knowledge but also to how undergraduate students were learning it for the first time. This intersection was a powerful avenue to seeing content in different perspectives. In one graduate coordinator's experience, for example, the undergraduate researcher working on the same project explored the application and analysis of data on different platforms, opening the door both to learning new software and to validating the data through distinct lenses. Maintaining this type of collaborative effort, wherein valuing and integrating all perspectives was important, defined the type of attitudes and intentions needed to facilitate learning that was co-created.

The theme of *Student-Centered Transformation in Student-Staff Partnerships* centers on the attitude and intention of elevating student growth as part of the partnership experience. In

this environment, what students said mattered and staff focused on how student contributions could catalyze other ideas, all with the larger goal of student transformation. This environment opened opportunities for student reflection where the opinions shared, ideas explored, and connections made were steppingstones for larger transformations in terms of gaining confidence, acknowledging value, and leadership identity formation.

This theme highlights students' transformational learning processes and decision-making opportunities as intentional goals of incorporating different opinions and perspectives. One graduate coordinator and co-author reflected that they felt validated as an individual and as a minority with many expressive outlets within the partnership work that focused on their transformation. This reflection underscores how the development of students' interpersonal abilities and sense of belonging as leaders and colleagues within the partnership were influenced by the program's focus on student transformation. Further, in reflecting on the experience, another graduate coordinator and co-author affirmed that his experience as a member of the Holistic FUEL Program helped to develop and better interpersonal abilities, moving him along the path to becoming a better leader and colleague. The student-centered transformation theme underscores how the development of students' interpersonal abilities and sense of belonging as leaders and colleagues within the partnership were central to the program.

Implications

Themes from this analysis offer insight and lessons learned concerning how staff attitudes and intentions in the student-staff partnership supported through the Holistic FUEL program shaped the experiences of graduate student partners in the program and in turn developed those graduate student partners' attitudes. These lessons build on strategies highlighted within the extant literature on the topic while providing a unique perspective from the application of the Foundry. For example, intentional attitudes associated with students' sense of validation and support in the student-staff partnership, highlighted in scholarship (Bovill, 2013; Bovill et al. 2017; Bunnell, 2021), was important for student validation, freedom to develop creativity, making critical decisions, and realizing personal objectives as part of their overall growth through the Foundry-guided partnership. The second theme emphasizes how guiding frameworks anchor co-learning between staff and students as central to the role of both in leadership, particularly in identifying barriers and gate-opening opportunities (Cook-Sather et al. 2014; Gonzalez et al., 2021; Sommer et al., 2020; Healey et al. 2020).

Another lesson from the Holistic FUEL program includes the active participation of both students and staff in knowledge construction activities. As noted in the third theme, the type of collaborative interactions that help to build specific cognitive attitudes and intentions in the Holistic FUEL program were guided by the Foundry and connected to collaborative and student-centered learning pedagogies (Bunnell & Bernstein, 2014; Cook-Sather et al. 2014). Theme four presented lessons concerning students' transformation as part of the benefits of working in student-staff partnerships, emphasizing the importance of guidance, without micro-managing, from the staff in the partnership. These themes provide insight into the dynamics of how the Foundry that underscore how "engaging students actively in their learning is the most common form of partnership" (Healey et al. 2020, p. 2).

Further, the type of partnership fostered by the Foundry in this program supported graduate students in becoming active participants in their growth as leaders, an insight also

highlighted in literature (Cook-Sather et al. 2014). However, adopting and transferring these strategies highlights potential pitfalls or challenges related to the implementation of the Foundry as a guided practice. For example, the development of student autonomy as related to the learning environment fostered by the Foundry is also dependent on student expectations, prior experiences, and the presence of student voices in multiple conversations. Another challenge may stem from the commitment of the staff involved in the partnership to engage in continual training and the expectation to be a facilitator of learning—while also learning from and with the students— which is often is met with resistance, as noted in the literature (Goff and Knorr 2018). The implementation of the Foundry as a necessary framework for guiding student-staff partnership has the potential to shape the way participants view their role in the partnership, the type of ideas brought to the table, and their contributions to the success of the program, if and when the Foundry is implemented in a way that is aligned with the spirit of innovation and co-learning inherent to the framework.

Concluding Remarks

We offer the following conclusions within the context of existing scholarship. The Foundry enables the promotion of authentic engagement as part of the learning processes of the program, an outcome consistent with previous findings on partnership work (Bovill 2013, 2016; Bunnell et al. 2021; Cook-Sather et al. 2021). Within the program, students felt that staff attitudes and intentions led to a sense of ownership of their contributions as part of the student-staff partnership, also consistent with previous analyses (Bunnell et al. 2021; Cook-Sather et al. 2021; Latin 2022). Students affirmed that their involvement in the program strengthened their lived experiences, knowledge, skills, and intentions of continued leadership and mentoring, outcomes highlighted in previous analyses as well (Healey et al. 2020; Latin 2022).

These personal transformations and types of relationship suggest that student-staff partnerships have potential benefits for implementing similar programs across a wide variety of STEM disciplines. Participants' experiences indicate that having many perspectives as part of a single conversation can potentially lead to a better understanding of integrating co-learning approaches that create a beneficial environment for underrepresented students. Further assessment of the different characteristics that determine these outcomes is warranted to continue to advance the understanding of Foundry dynamics on these relationships.

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