Fostering Career Development through Leadership: The Experiences of Peer Mentors in STEM courses at a Community College

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Abstract

Undergraduate students who were successful in completing various introductory Science, Technology, Engineering, and Math courses applied for and were hired as peer mentors to support undergraduate students enrolled in the same courses. This program took place at a Hispanic-Serving community college in the Southwest United States, where there are low graduation rates. This has resulted in low rates of students transferring to four-year, bachelor's degree-granting institutions. Beginning with one peer mentor in one course, the peer mentoring program expanded to 18 peer mentors embedded in 30 courses. Peer mentors were required to attend each class, assist students with in-class assignments, and provide office hours that often included study strategies and group review sessions. In addition, peer mentors provided support and guidance for non-academic concerns by connecting students with campus resources, assisting students with course registration, and, in some instances, sharing their own experiences of transferring from the community college to a four-year institution. This multi-semester study explores the impact of the program on peer mentors' professional development. Framed by the Career Construction Theory, findings suggest that students applied meaning to their roles as peer mentors and used the experiences in thinking about their career goals. As peer mentors, students developed vocational personality, or career identity, by strengthening communication, leadership, and interpersonal skills. It is ascertained that the role of peer mentor fostered student confidence in being qualified for STEM careers. In some cases, the responsibilities and experiences in guiding and assisting students allowed peer mentors to consider career adaptability, in which they refined professional goals by exploring multiple career paths in STEM. This study demonstrates the importance of providing leadership opportunities for students, as these experiences supplement their educational and technical training and make them ideal candidates for highly competitive STEM fields.

Background

At Doña Ana Community College (DACC) in the Southwest United States (US), 72% of the students identify as Hispanic/Latinx, yet only 16% of this demographic graduate in normal time, compared to the national average of community college graduation rate of 35% [1]. This Hispanic-Serving Institution (HSI) enrolls many Pell-eligible and first-generation students. Community colleges are key to the higher education landscape, providing mostly minority students with degree programs, certificates, and continuing education opportunities [2]. To address the low graduation rate, the Science, Engineering, and Math (SEM) division of this institution piloted a peer mentoring program in the Spring of 2023 in which an experienced

student, or peer mentor, was embedded in an introductory science class. The program has evolved with the current count of 18 peer mentors embedded in 30 courses.

Mentoring program overview

The mentoring program started as an initiative due to a grant DACC received from the US Department of Education. The initial goal of the mentoring program was to increase their students' transfer to a 4-year institution, whose rate (16%) is far below the national average (35%) [3]. In the Spring 2023 semester, the mentoring initiative started with a pilot curriculum used by one mentor embedded in a biology class. The mentoring program has grown in subsequent semesters, with at least 16 mentors embedded in other SEM courses every semester. As a result, the number of people involved, e.g., student mentees and faculty, has increased, as well as more staff, which establishes a better structure and follow-up of mentors' training and performance. Starting in the Fall 2024 semester, mentors received mentoring training sessions to improve their knowledge and skills in guiding and advising students. The training sessions reviewed best practices for mentoring students and provided mentors with practical ways to implement the practices.

Peer mentors, who are they?

The peer mentoring program solicits students who were academically successful in the SEM courses to serve as resources for students in and outside of the classroom. Most of the peer mentors major in the college's SEM department. Peer mentors attend every class and provide tutoring outside of the class. Further, peer mentors are trained on campus resources, including financial aid, academic advising, and food pantry services, and are expected to share knowledge of resources with the students. The peer mentors are either returning DACC students or attend the college's affiliated four-year university. The experiences of peer mentors may contribute to the clarification of their career goals and the development of skills necessary for the workforce.

Literature review

Peer mentoring involves continuing students guiding first-year students [8]. Effective peer mentors help students transition to college, remain enrolled, and persist through to degree completion [6], [8]. This is one initiative aimed at student retention, argued to increase when students are integrated with their institution in academic and social settings [10], [11]. Researchers have studied peer mentoring by paying particular attention to the academic and social impacts of peer mentors on student mentees. For example, studies show mentees achieve higher GPAs [6] and graduation rates [9] compared to students who do not have a peer mentor.

There has been less research exploring the impact of the peer mentor role on peer mentors themselves, however. First-generation students serving as mentors to first-year,

first-generation students participated in a qualitative research study exploring the leadership skills gained during their time mentoring students [13]. Mentors reflected on their experience in guiding students and how they exhibited exemplary leadership practices. Furthermore, mentors can make a difference in student mentees' academic experience by creating inclusive learning spaces [17]. One study suggests peer mentors reported gaining leadership skills necessary to be competitive in future careers [12]. This same study revealed that although mentors found it challenging to act as resources, yet enjoyed sharing their experiences. Similar outcomes were revealed in another study, which also suggested peer mentors achieve an increase in their self-efficacy [6]. On the contrary, peer mentors may have lower self-efficacy and thus provide less valuable support to their mentees [8]. Given the limited and mixed evidence, this study aims to address the gap in the literature by identifying how students make meaning of their experiences as peer mentors and what components contribute to their career plans.

Theoretical framework

Due to the impact that the peer mentor role may have on their future career, the study is framed using the career construction theory [5], which underscores personal meaning of one's lived experiences, constructing careers through a sense of meaning, and clarifying plans. Three components contribute to this theory: vocational personality (or career identity), career adaptability, and life themes. Vocational personality is a person's career-related abilities and interests, and pertains to *how* an individual constructs a career. Career adaptability allows the person to construct a career that pertains to what career they desire. Life themes, the third component, deal with *why* a person selects that career. These themes emerge through one's lived experiences and personal stories and are often connected to one's personality and purpose. Career construction theory allows a person to construct a career by giving meaning to vocational experiences.

The career construction theory [5] has been used as a framework for assessing individuals' employment pursuits using a variety of methods. A systematic literature review revealed that researchers who utilize career construction theory as a framework have taken qualitative approaches via individual interviews, participant workbooks, and others. Such methods allow the participants to envision their careers while reflecting on how their experiences align with those intentions [14]. One such study utilized the established "My Career Story (MCS)" [14], [15]. MCS is an autobiographical workbook and "contains written exercises and goal-setting activities essential to successful career planning" [16, p. 3]. In this mixed-methods study, researchers provided career counseling to secondary students and, among other data collection procedures, conducted focus groups to assess participants' perceptions of the MCS. Findings suggest the MCS benefits were related to the promotion of direction, self-discovery, information, connection, and self-awareness" [17, p. 192].

Study's purpose and research questions

This research study is part of a larger study exploring the impact of the peer mentoring program on student mentees. However, the purpose of this particular study is to examine the experiences of students in terms of their role as peer mentors, their learning as professionals, and how their experiences contribute to their career plans. Particularly, we explore how students make meaning of their peer mentor experiences as they construct their future careers [5]. The research questions driving this study were:

- How do students make meaning of their experiences as peer mentors?
- What components of the peer mentoring program contribute to peer mentors' future STEM career plans?

Methods

A multi-semester qualitative approach was employed, including student self-reflections and focus groups collected to address these research questions. A qualitative design allowed participants to share feedback in their own unique way, which is associated with the lived experiences and stories of the career construction theory [5]. In the Spring and Fall of 2024, qualitative data were collected from student mentors and faculty. As the career construction theory [5] suggests, one's lived experiences contribute to one's personality, purpose, and intended career, mentor focus groups, and reflection questions related to experiences, challenges, and motivation in their mentoring duties. In addition, self-reflection instruments addressed skills acquired as mentors and how they impacted career goals. Similarly, the researchers solicited feedback from faculty in focus groups with questions related to mentors' skill development and personal and professional growth. The local Institutional Review Board approved this study.

Data analysis

Focus groups were audio recorded and transcribed using Zoom software. Researchers read mentor and faculty focus group transcripts while listening to the audio recording, correcting transcripts for any errors. These transcripts, along with mentor-written self-reflections, were used as data. The research team identified themes using comparative techniques [4] and thematic analysis [7]. The themes are presented as findings in the subsequent section. As this study was highly qualitative, trustworthiness was achieved through credibility [16], which was established as the student mentors and faculty provided their own perspectives through the qualitative data collection. The researchers did not alter any of their responses and provided several quotes as rich descriptors to supplement findings.

Findings

Data collected through mentor and faculty focus groups and mentor reflection questions were analyzed for themes [4], [7] and are presented as findings; notably, that peer mentors provide academic and navigational support to students while, at the same time, develop and refine their leadership and career goals.

Academic and Navigational Support

Peer mentors were convinced that their role was important for students, and they were glad to make a difference in students' academic performance. Similarly, faculty agreed that students approached mentors for academic support and their presence was an added benefit during class instruction or labs. The analysis of the faculty and peer mentors' focus groups and reflection questions yielded data on aspects such as the academic and navigational support that mentors provide to students.

Peer mentors expressed how committed and glad they were in their role as mentors and tutors, describing it as a fulfilling experience. For most of them, students started approaching them with class content questions, and as they developed a rapport with students, mentors developed a deeper and stronger connection with students that allowed students to trust in their peer mentors. Some of the peer mentors' quotes supporting this topic are included below:

> *"I have done a little bit of actual mentoring, but because of the heavy workload, it's definitely been tutoring heavy. But once I've established that tutoring relationship with them, then they sort of feel comfortable coming to me with other issues or anything else they want to talk about."*

> *"I feel like the tutoring helps me to establish a relationship with the students where they can get to know me. Because in the beginning. No one came up to me with any kind of mentoring questions. You know. It was all tutoring just because they don't know me. They don't want to open up to me, until I establish some kind of relationship with them."*

Both quotes show the process that peer mentors go through to gain the trust of students. With more emphasis on the tutoring aspects, peer mentors realized that once students feel that they know their peer mentors, they ask more random questions concerning personal decisions, degree preferences, transferring information, and college services. In addition, a lot of the mentoring aspect becomes sharing information to be able to navigate college, and the following quotes support this statement:

"This semester I have people coming in, so you get to help them with your homework, help them with resources to do, sometimes talk about their personal stuff with them, and share ideas and things like that."

"Students have been like inquiring me about the way to meet the advisor. Where are the resources like the computer lab? And then how can I print the paper for free so that they don't have to pay like that."

"There are times that they will just come in for like 30 min. Want to talk and be like, what do you think about this, or I wanted to change my major. What do you think? And things like that? And I could make referrals to some offices that could help them out."

Overall, for some students, the peer mentor is the first person to contact because of their availability and accessibility. Peer mentors realized the important role they have in the classroom and the difference they can make in students' academic and professional pathways. Similarly, faculty confirmed these sentiments and noted the diligence the mentors take in ensuring students understand the course material and obtain effective studying skills. As the mentors are required to pass the course before serving as a mentor, students trust them and often approach mentors before faculty. One faculty noted: *"If they [student mentees] have any issues, they right away turn around and look for her [mentor]. They're like, 'I need you.'"* The access to mentors does not occur solely during class time, as faculty reported mentors hold numerous in-person and virtual office hours. Faculty perceive that most students visit the mentors during office hours for assistance with assignments and to prepare for upcoming exams.

Furthermore, mentors provided academic and navigational support by offering resources and creating presentations that extend beyond class content. For example, a faculty member reported how their mentor guided students on class registration:

"...the topic about degree audit and how to create their schedule, so I noticed that all the students [in the course] already created their schedules with the set builder schedule, even if they are not able to register yet. So some of them are prepared already, and it's because my mentor provides that information before the registration process."

Other such academic and navigational support included mentors providing language assistance. As the institution is a Hispanic-Serving Institution with many native Spanish speakers, mentors provided support to students in their preferred language. Another student approached a mentor for extra support in improving her English, as one faculty member noted:

> *"I have a student that her English is really bad and so she feels very stressed in the class, and she feels like she doesn't understand. So, she took to [the mentor], and [the mentor] is meeting with her once a week. [The mentor] doesn't speak Spanish, so it's in English."*

In summary, analyses of data collected from mentors and faculty demonstrate that mentors are confident and comfortable in providing academic and navigational support. Such mechanisms include providing tutoring to students during and outside of class time as well as teaching academic strategies, such as how to study, when to visit a professor, and how to register for courses. The next theme that emerged from the data suggests peer mentors have developed and refined their own leadership and career skills.

Leadership and Career Development

As noted, peer mentors are students enrolled either at DACC, where this study took place, or at the 4-year institution, the university associated with it. Faculty reported that most mentors are also pursuing STEM-related degrees, with a few mentors self-reporting their programs as nursing, chemistry, chemical engineering, mechanical engineering technology, and cybersecurity, among others. To identify mentors' leadership and career development, researchers created reflection questions for mentors to complete at the end of training sessions as well as at the end of the semester (Fall 2024). Data suggest mentors have their own career aspirations and goals, and their job as peer mentors provides some of them a time to reflect on their careers. For example, a peer mentor commented this:

> *"When I was presented with the opportunity to be able to help and develop others, it's something that I've been passionate about for a long time and a career field that I worked in for the last 20 years heavily relied upon mentoring."*

A few mentors narrated through both the focus group sessions and the reflection questions the opportunity to work as a mentor and tutor to prepare for their profession. The following quote evidences this peer mentor's thinking:

> *"I like teaching. I've always liked teaching like helping. I hope to once I get done with nursing. Maybe I can come back as a nurse educator at some university or something like that. So I just love to see people when the light goes on they go from confusion to like. Oh, I get it!"*

In addition, peer mentors reflected on other skills gained through their work as mentors and tutors. For example, two peer mentors vented, "*Student interaction, it's a lot easier for me to approach students now and talk with them. I have sharpened my public speaking skills*" and another said, "*During my time as a peer mentor it helped me develop my communication and*

research skills.” Leadership was also mentioned in peer mentors' experiences as an ability that they can apply in the workspace.

Also, faculty who participated in focus groups confirmed mentors' leadership development. Most common amongst faculty responses include how they observed mentors develop effective communication skills as a result of meeting with students, providing individual and group tutoring, and delivering presentations on campus resources. One professor vented,

> *“She has grown as a mentor. She used to be shy, but now she presents. So, in communication, she's grown a lot. And then, also, she organized group studies and presented to them [about] school resources, and she met with a student on a weekly basis”*

Other faculty also noted mentors' communication skills, with one faculty reporting, *“We have always been in constant communication and relate well.”* As noted above, faculty believe mentors also demonstrate effective communication skills by meeting with students in and outside of class time and showing up even when the student mentees do not with one faculty stating, *“Sometimes, students schedule meetings with [the mentor] during the week, but [the students don't show up.”* Despite any attrition of students attending mentor office hours, mentors continue to provide office hours and are flexible in their schedules to accommodate student mentees' needs. This suggests strong leadership skills of the mentors as observed by the faculty. Despite the majority of faculty reporting strong leadership skills, it should also be noted that some faculty perceived opportunities for mentors to improve in this domain.

To a lesser extent, mentors' career development emerged from faculty focus groups, which seems natural as faculty interactions with and observations of mentors tended to relate to their leadership skills, including communication, time management, and ability to empathize with students. Faculty noted that students expressed non-academic issues, and mentors provided information on institutional resources related to mental health, food insecurity, physical health and wellness, and housing, among others.

In summary, analyses of data collected from mentors and faculty suggest that mentors exhibit strong leadership development skills. Examples include communication with faculty and student mentees and engaging in public speaking by providing individual tutoring or class presentations. Mentors also confirmed their roles contributed to their career development, with one mentor sharing a desire to have a career involving teaching others and another reporting developing research skills necessary for their intended career. These skills lend to a rich discussion of the impact of the peer mentor position and responsibilities on the peer mentors themselves.

Discussion

The study investigated both the impact on student mentees and the experiences of student mentors on their own career plans. This section triangulates this study's findings with prior research and the selected theory.

The first research question addressed how students make meaning of their experiences as peer mentors, with the first theme, **academic and navigational support**, confirming that mentors provided students with the support necessary to be successful in the courses. Faculty and mentors emphasize that most of their time was spent tutoring students in course content both in and outside of class time. Further, it was revealed that students sought out mentors for help rather than faculty, suggesting that peer-to-peer support was critical in student mentees' academic success. This aligns with prior research demonstrating the key role of mentors in students' academic performance and persistence [6], [9]. The mentors also imparted non-academic knowledge to students by demonstrating how to register for courses, how to talk with faculty, and where to seek mental, personal, and financial assistance.

The second research question examined the components of the peer mentoring program that contribute to peer mentors' future STEM career plans. Findings suggest mentors' **leadership and career development**, a theme that emerged from mentors' and faculty's reflections on how peer mentors gained these skills. Faculty and mentors reported that mentors developed leadership skills through exhibiting effective communication with faculty and students. Mentors were required to communicate with students through in-person and virtual courses while also providing office hours in both modalities. Additionally, mentors gained leadership skills by engaging in public speaking through offering individual student tutoring, facilitating group study sessions, and delivering presentations to their classes. Such mentors' professional development would enrich students' career aspirations and increase their confidence and self-efficacy, as reported by a few scholars [6], [12].

Mentors were able to share experiences in their own words, aligning with the study's career construction theoretical framework [5], which encourages researchers to utilize qualitative approaches to identify how life themes, one of three components of the theory, contribute to one's career identity and career adaptability, the other two components. Findings confirm existing literature that individuals construct a career by giving meaning to vocational experiences [5], [14], [15]. In this study, participants assigned meaning to their responsibilities and experiences as peer mentors and reflected on how they relate to their desired careers. In challenging themselves to become peer mentors and providing support to their mentees, they realized the importance of communication skills and content knowledge to be competitive in their desired careers. Further, some mentors were able to adapt their experiences in refining their career goals, envisioning a position that would involve more human interaction or even teaching others. Finally, the researchers posit that the peer mentor experience, for most of the participants,

has resulted in strong connections with faculty who will likely serve as references for mentors' graduate school and job applications.

Implications and Future Work

Opportunities for future research include assessing the impact of the peer mentor role when these students obtain jobs and/or graduate studies. This would be useful as it pertains to the career construction theory [5] in understanding how mentors' lived experiences contribute to their career identity. In addition, leadership and communication skills can be considered when evaluating mentors' professional development. The findings of this study provide a unique opportunity to incorporate the career construction theory [5] in professional development opportunities for mentors. On-going professional development that provides students with mentoring practices while also scaffolding the theory's [5] three components– vocational personality (or career identity), career adaptability, and life themes– may enhance the mentors' career goals.

Our findings suggest mentors perceived their leadership and communication skills were improved as a result of their experiences. Student mentees and faculty could also participate in assessing mentors' leadership traits and communication effectiveness. Instruments that measure such domains may be useful for mentors when applying for graduate school and careers as well as for interviews. These opportunities for future research and practice would likely enhance mentors' skills, experiences, and career goals while ensuring the success of student mentees.

This research is one part of a broader, ongoing study exploring the impact of peer mentoring on DACC students enrolled in science, technology, engineering, and math courses. Of concern, these courses have historic high rates of students receiving a D or F or withdrawing from the course, often resulting in students dropping out of their STEM programs. Given the demographic context of the study's institution, e.g., high numbers of underrepresented and first-generation students, our findings suggest that investing in the leadership development of peer mentors not only contributes to their success but can have lasting impacts on student mentees. Specifically, the implications of this study may contribute to increasing diversity in STEM programs and the broader workforce.

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