Peer Mentorship in a Virtual University Setting: A Hispanic Perspective on How Mentorship Broadens Participation in Advanced Degrees

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Abstract

Mentorship is crucial in providing a platform for academic and leadership development and success among underrepresented groups in STEM. Studies on mentoring students from underrepresented groups in STEM demonstrate the characteristics of strong peer relationships, superior communication skills, and favorable academic and career development factors toward starting careers in engineering at undergraduate and advanced degree levels. Despite knowing these factors in academic and professional success from interactions with professors and academic advisors, we posit that having graduate students promote the pursuit of advanced degrees to undergraduate students can support underrepresented populations to pursue graduate-level degrees and start their careers at more advanced levels. We extend these insights by analyzing factors that enable successful mentoring towards increasing Hispanic representation in graduate school with a hybrid platform mentorship program (in-person and virtual interactions).

This program brings together graduate students and undergraduates that identify as Hispanic with the goal of facilitating mentoring relationships for achieving personal, academic, and professional goals of undergraduate and graduate participants through (1) building community, (2) academic development, and (3) professional development. Different workshops and social activities were hosted to enhance mentoring participation.

During the program's first iteration, we recruited 12 graduate student mentors to pair with 12 undergraduate students from various departments in the Grainger College of Engineering at the University of Illinois. The program enabled 50% of our graduate student participants in the first cohort to obtain their first experience being a mentor. By the end of the first iteration, 91% of the graduate mentors indicated an interest in skills to perform better, as mentors were given the necessary tools to help their mentees through the process. None of the undergraduates from the first cohort were eligible to apply to graduate school as they were not graduating yet. However, all of the three senior undergraduates in an ongoing second cohort have been admitted to graduate programs with fellowship offers. Based on preliminary data, our program highlights how representation, guidance, and monitoring are crucial components for successfully boosting students' interest in graduate school participation.

Introduction

Mentoring is a word that is commonly used in academia, but obtaining the right mentor is not a straightforward process. In particular, minority students in STEM fields (science, technology, engineering, and mathematics), especially where fewer Hispanics (i.e., those who self-identify as a descendant of a Spanish-speaking population or community [9]) pursue these career paths, have a harder time finding a mentor who has the background that the mentee is seeking or a mentor who can serve as a good role model. As of 2020, the Hispanic population in the U.S. was 18.7%, which experienced a high population growth of 23% between 2010-2020 [11]. In STEM fields, however, only 8% of the STEM-related workers are Hispanic [5], and only 7.68% of research doctorates were awarded to Hispanic people as of 2021 [10]. The representation of Hispanics in STEM is increasing at a slow rate compared to the general population, making it questionable whether there is enough Hispanic representation in STEM roles today. Because the U.S. Hispanic population is expected to continue rising, it is important to improve their representation in STEM through better accessibility to leadership opportunities and more equitable institutional practices to promote success of Hispanic students in STEM fields.

Mentorship is one of the paths that students can take to advance themselves, which is crucial in providing a platform for academic and leadership development among underrepresented groups in STEM [13]. Studies on mentoring students from underrepresented groups in STEM demonstrate the characteristics of solid peer relationships [12], mentorship communication skills [4], and favorable factors in academic and career development [3]. It is also vital for people from marginalized communities in STEM to see someone from their community in a higher position to bring inspiration to them [5], highlighting the importance of visibility of their community. While these practices promote success towards earning degrees in STEM for marginalized groups, it remains difficult for undergraduate students to learn about potential pathways for advanced degrees to further their careers because they need exposure from a mentor to guide them through the benefits, costs, and steps of obtaining an advanced degree [2].

In this paper, we present our work in designing and implementing a mentoring program between Hispanic graduate students and undergraduates towards increasing Hispanic representation in STEM graduate programs. In our context, mentoring happens between a graduate student and an undergraduate to support the undergraduate in learning about graduate programs and to allow graduate students to practice their leadership. The mentoring program was established on a 1-on-1 basis to promote better access for the necessary skills mentors can offer to undergraduates' academic and professional needs. Our program was designed during the COVID-19 pandemic, when most academic teaching was conducted in a virtual environment. Then, it was adjusted for the hybrid setting in the following semester to study the effects that virtual-type mentoring has on our target population.

Regarding institutional context, the University of Illinois at Urbana-Champaign maintains several efforts to increase diversity in STEM fields by incorporating programs and allowing fellowships for training students from historically excluded communities. Examples include the research and community initiatives through the Institute for Inclusion, Diversity, Equity, and Access' (IDEA) Grassroots Initiatives to Address Needs Together (GIANT) program within the Grainger College of Engineering (GCOE), the Sloan University Center of Exemplary Mentoring, and the diverse Graduate College fellowships that support graduate students financially, academically, and professionally. As of Spring 2023, the GCOE had 13,254 registered engineering students, of which 840 self-identified as Hispanic (6.33%). Of these 840 Hispanic students, undergraduates made up 664 (5% of GCOE), and graduate students made up 176 (1.3% of GCOE) [14].

Throughout the program, we hosted workshops to enhance mentoring participation with topics such as the importance of mentoring, leadership skills development, and career pathway expectations. Social events were also included to build community among participants. We invited speakers who identified as Hispanic and held a graduate degree to promote visibility of Hispanics in STEM. Participants were also encouraged to meet independently, virtually or in person. Our contributions are listed below:

- We create a program structure for the development of Hispanic engineering students' academic, professional, and social needs
- We provide questions for assessing interactions in the mentoring dynamic between graduate students and undergraduates
- We identify traits from mentoring interactions that empower Hispanic students in engineering toward their academic and professional goals

For broader impacts, our work created a platform for mentoring relationships between graduate students and undergraduates to enable a successful mentoring experience towards increasing representation of historically excluded communities in advanced degree programs and STEM roles.

Program Structure

The program aims to promote higher interest in graduate school among Hispanic undergraduate students while providing leadership development opportunities to Hispanic graduate students. Mentoring can play a crucial role in achieving this goal by providing students with the support and guidance they need to navigate the complexities of the graduate school application process. Mentors can help students identify potential graduate programs and funding opportunities, refine their research interests, and develop the necessary skills to be competitive applicants. Mentoring can also provide students with valuable insights into the graduate school experience, including navigating coursework, developing a research agenda, and building professional networks. Moreover, mentoring can foster a sense of belonging and community

among Hispanic students, providing them with a supportive network of peers and mentors who share their experiences and aspirations.

The program's emphasis on fostering positive mentoring relationships will be carried out through three types of activities. The first type comprises community-building events that bring students and engineering faculty together, with the aim of motivating participants to pursue their personal goals and feel a sense of belonging in STEM. The second type of activity is focused on academic development, which seeks to enhance participants' knowledge of graduate pathways and improve their skills. The final type of activity consists of professional development workshops, where students will learn how to apply their mentoring skills in work environments.

Establishing a sense of community is a key aim of the program. To achieve this, we begin by introducing the program's objectives and expectations during a mentor kickoff event. Monthly activities are organized to encourage participants to interact with one another both online and in person, including "lunch and learn" sessions featuring motivational talks on setting goals. At the end of the year, a reading day celebration is held to highlight the participants' accomplishments.

The program focuses on enhancing academic development for participants through a two-pronged approach. First, we organize events to connect participants with experienced advisors, such as department faculty, program directors, and industry or national laboratories representatives. Second, we aim to address inequalities in online education by providing resources and support to all participants. We invite administrators to discuss admission requirements and differentiate undergraduate and graduate coursework to assist those interested in professional-based degrees. Additionally, graduate student panels are organized to provide insights into the differences between graduate and undergraduate coursework and their personal experiences.

The professional development aspect of the program also serves two main goals: 1) it seeks to improve access to career opportunities for participants, and 2) it aims to connect students with professionals in their respective fields. We achieve these goals through talks by engineers and researchers from government agencies who share their experiences and provide valuable insights into career paths for internships or jobs immediately after graduation. Participants are also supported by the Illinois Leadership Center to help them apply their mentoring skills in team settings and work environments. Participants are paired based on their interests and expected path for an advanced degree to ensure that mentoring pairs are well-matched. This approach accommodates variations in goal setting while also providing structure to ensure that each participant achieves goals in academic and professional dimensions.

Community building events play a vital role in enhancing the STEM identity of students by providing a platform for sharing challenges and overcoming obstacles. When Hispanic students' accomplishments are recognized and celebrated publicly, it serves as positive reinforcement and aids in retaining them in STEM [12]. The academic events are tailored to

support participants in successfully completing their degree milestones based on their degree level. Professional events provide insights into post-graduate opportunities and help develop the skill sets necessary for participants to become successful, inclusive engineers. In summary, the program's objectives are reflected in all these activities, which aim to address the personal, academic, and professional needs of Hispanic engineers.

Through our program, we aim to investigate two questions concerning the success of virtual mentorship:

> Research Question 1: How can graduate students offer customized guidance to undergraduates applying for graduate school?
>
> Research Question 2: In what ways can we use virtual activities to engage students and boost their confidence in their future professional prospects?

To answer these questions, we host various events providing enrichment activities to facilitate peer interaction and help participants navigate their individual goals. The effectiveness of these events is evaluated through surveys and feedback forms. Table 1 provides a list of the events held during the program's first iteration during the 2021-2022 academic year.

To evaluate the effectiveness of the program, we conduct data analysis using a range of tools. At the outset of the program, participants are required to complete an interest inventory survey about their academic outlooks, engineering fields of interest, and attitudes toward mentoring. Undergraduates are specifically asked about their knowledge and interest in graduate school and related items, such as application requirements. Graduate students are asked about their confidence in leadership and mentoring skills. The survey is administered again at the end of the academic year to observe changes in undergraduates' knowledge and interest in graduate school and graduate students' confidence in mentoring abilities.

To ensure students' active participation, specific expectations are set for all mentee pairs, including attendance at all events, completion of surveys, and incentives for engagement. Incentives included feeding attendees at each event and gift card compensation for responding to surveys. Participants were also eligible for registration funding to attend a professional conference of their choice.

Recruiting and Selecting Participants

Recruiting efforts consisted of advertising in the Grainger College of Engineering's weekly email newsletter, posting flyers in one of the engineering buildings on campus, sharing the opportunity with faculty and staff that regularly interact with students, and verbal advertising through student organizations that included our target audience. These efforts were intended to broaden access through various communication preferences that students may have.

Table 1: Event Categories and Corresponding Events in 2021-2022

Targeted Goal	Planned Event Title	Objective
Academic Development	Real Talk: Grad Life!	Promote a clear idea of the graduate school experience by inviting the mentors to speak about their personal graduate school challenges and outcomes.
	Pathway to Graduate School series	A series of workshops that involve discussing the preparatory materials for a graduate school application and building knowledge on what to expect and how to prepare.
Professional Development	Designing Inclusive Habits for your Workplace	Promoting better practices for optimizing time and creating new habits that can help students be more focused.
	Advanced Interviewing Skills	Preparing students for interviews – industry focused.
Leadership Development	Importance of Mentoring	Introductory event. Introducing mentors and mentees and establishing program goals.
	Internship Prep & Social	Community building event, where program leaders provide details on where and how to find and apply for internships.

For the first iteration of the program in the 2021-22 academic year, we received 35 applications from both undergraduates and graduate students across STEM fields. We selected 12 graduate student mentors to pair with 12 undergraduate students from various departments in the Grainger College of Engineering at the University of Illinois for our first cohort. Out of the 24 participants, 63% identified as male, 33% identified as female, and 4% identified as trans. Figure 1 displays the distribution of academic fields represented in this first cohort, where 22 of the 24 participants are engineering students (both undergraduate and graduate). The "Other" category consists of a doctoral student in Mathematics and another doctoral student in Speech and Hearing Sciences, which are both considered non-engineering fields at the University of Illinois. These participants were selected based on criteria in Table 2, which focused on creating a community of self-identified Hispanic engineering students with a 1:1 mentor-mentee ratio. Undergraduate applicants were reviewed on their motivation for preparing for graduate school,

and graduate student applicants were evaluated on their motivation or willingness to mentor an undergraduate student.

After reviewing applications, mentoring pairs are matched based on their topics of interest, their academic and professional goals, and expected path for an advanced degree. Ideally, graduate student mentors will overlap with an undergraduate student's field(s) of interest either through their academic background or research and professional experience (e.g., internships, full-time work before graduate school). In case there is minimal overlap in interests and degree path, an undergraduate is paired with a graduate student mentor for support towards learning about the graduate school application process in general. To account for the resulting variation in goal setting, we provide structure in the types of goals that each participant should achieve in academic and professional dimensions, described in the Program Structure section.

To ensure active engagement between the mentoring pairs, participants were informed of potential termination for lack of participation. If a mentor or mentee experience prolonged lack of communication between their assigned pairing, the unresponsive party would be replaced with another student willing to commit to the program. Unfortunately, two of our graduate student mentors experienced a break in communication from their assigned mentee despite the guidance given in pairing notifications and sending emails describing strategies for open communication between participants.

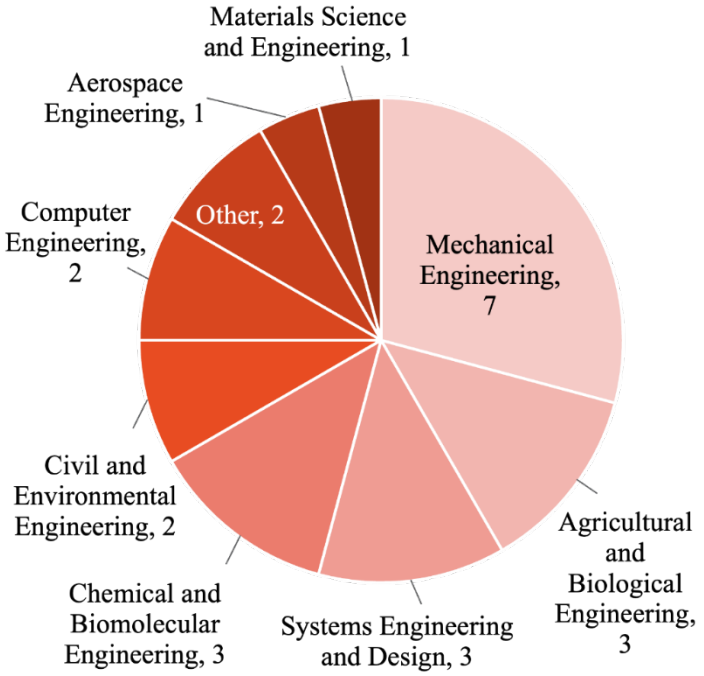

Figure 1: Fields of Study represented in the first cohort (n = 24)

Table 2: Student Eligibility and Review Criteria for Applications

Eligibility		Review Criteria
Undergraduate Student	Self-identify as Hispanic	Motivation for learning about or pursing graduate school
	Enrolled in an engineering degree program	Interest level in Master's or Doctoral degree programs
Graduate Student	Self-identify as Hispanic	Willingness to mentor a student towards their academic or professional goals
	Enrolled in a graduate STEM degree program	Program fit from the applicant's motivation to be a mentor

Assessing Student Interactions

Information about each participant's experiences in the program is collected through a series of surveys distributed throughout the academic year. Within the first few weeks of the program, the initial survey collects information about each participant's expectations of the mentoring program, their current knowledge of programs and requirements relating to graduate admission, and their topics of interest for events. After the academic year is completed, an end-of-year survey was given to ask the same questions as the initial survey with added questions about accomplishments from the program to measure knowledge and tangible outcomes.

To answer the first research question, the surveys asked about the participant's thoughts on how mentoring initiatives, such as our program, could support Hispanic students to achieve their academic and professional goals. Participants were also asked what was helpful or what the challenges were in achieving their current position in their academic journey and professional career so far. Afterwards, the surveys branch for each group of participants (i.e., mentees and mentors) to appeal to the program goals for each one. Graduate student participants were asked open ended questions about their mentoring and leadership skills plus how they felt about the presence of Hispanic students in their respective academic departments. Then, undergraduate participants were also asked to rank their familiarity with topics relating to graduate admission, such as the Graduate Record Examination (GRE), Research Experiences for Undergraduates (REU) programs, and writing personal statements.

Since the program was designed for a hybrid academic environment, we also collected information with the surveys about the participants' experiences in the program as this study occurred during the 2021-2022 academic year. To help answer the second research question, we wanted to learn how students felt about the ease of accessing resources on campus and their outlooks for the program enhancing their academic and professional development. To improve engagement with the participants, the hybrid aspect of the mentoring program needed that insight to address potential challenges in the hybrid environment of our university at the time.

The process for our study was reviewed and approved by our university's Student Affairs office and Institutional Review Board.

Results

Outcomes from the first cohort show increased interest for pursuing advanced degrees from undergraduates and improved leadership skills from graduate mentors. None of the undergraduates from the first cohort were eligible to apply to graduate school as they were not graduating yet. Instead, we focus on how the undergraduates find it important to connect with a graduate student mentor to learn about graduate school pathways and strengthen career interests. For the graduate mentors, we find that the program helps them practice inclusive mentoring to serve the needs of their own community. Below, we describe participants' reported outlooks for the program, how graduate students offer guidance to undergraduates towards graduate school (RQ1), and how the hybrid academic environment affected participants' confidence in their future professional pathways (RQ2).

Goals and Outlooks

Participants were asked to pick their top three outlooks for the program based on program goals for each group. Undergraduates (n = 12) had to choose out of the options shown in Figure 2a. Out of seven choices, the top three related to navigational aspects of applying to graduate programs and REU programs. These goals from undergraduate participants also reflect how they generally prioritize academic skills development towards applying to graduate programs over professional development. This demonstrates a general need for understanding of those processes and how to prepare each piece of graduate program applications, which is not typically covered in academic coursework. The least chosen options include research activity, learning about the GRE, and learning differences between undergraduate and graduate study. The choices about research activity being least picked is likely due to most of the undergraduate participants having a preference for pursuing a Master's program after graduation, in which research experience may not be required. This is expected as our program includes preparation for Master's degrees rather than solely focusing on doctoral degrees.

Survey results from graduate mentors (n = 12), displayed in Figure 2b, showed their most chosen goals included learning how to be a better mentor (91%), leadership development (83%), and access to professional opportunities (58%). These top three choices demonstrate for graduate students in our study that developing academic skills was not a priority as they may obtain it through their departments or research advisors. This points out a need for graduate students to obtain leadership skills or mentoring opportunities to further their careers outside their academic programs. The least picked choice, to identify or strengthen their research area, is likely due to the program enabling mentors to gain other skills beyond research and improving academics, plus statements from their program applications generally mentioned giving back to their own community as their motivation.

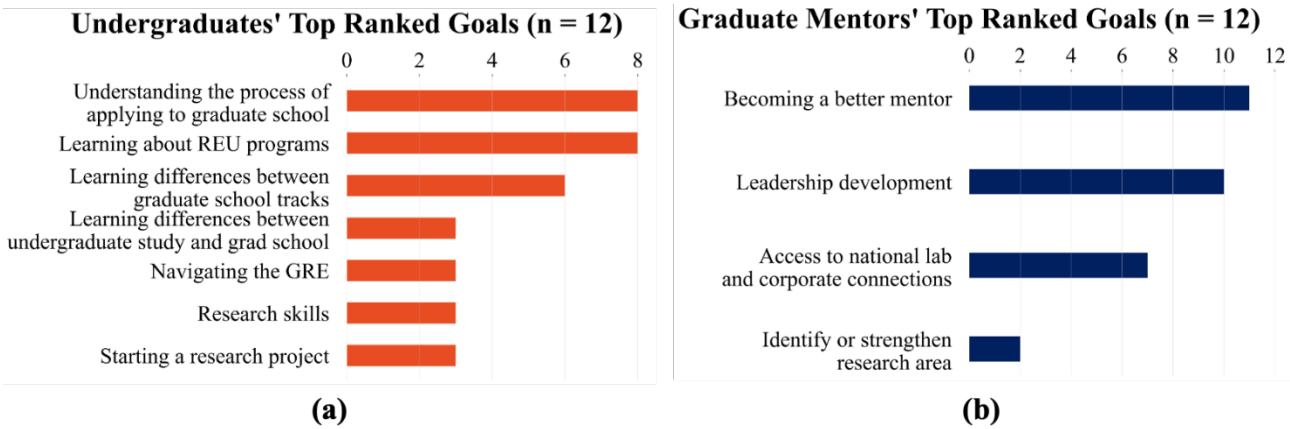

Figure 2: Top ranked goals for the program by (a) Undergraduate participants and (b) Graduate student participants

How Graduate Students Provide Tailored Guidance

For 50% of our graduate student participants, this program was their first time being a mentor. This reflects the importance of providing platforms to enrich their cultural wealth, i.e., making space to connect based on cultural values as institutional practice [13]. The program supports these new mentors during the introduction event, where graduate students were given guidance towards honing their mentees' academic and professional goals to improve their own leadership styles. Among the undergraduates, testimonies mentioned how their mentor helped reflect towards those goals to take further action:

> *"We've discussed the different type of graduate schools and whether or not I would be interested in going to either type. He has been really helpful in explaining the whole process to me and helping me decide which degree I would want to pursue and whether I should pursue it straight away or not."*

> *"I still think it's important to [discuss professional goals] because talking to someone with more experience with anything than yourself is always a good idea."*

> *"I felt very comfortable discussing with my grad student mentor. She was extremely helpful and knew what I wanted to do and helped me fill in the gaps."*

When preparing for graduate school, undergraduates benefit from learning directly from their graduate student mentors as they recently went through the application process. Having a graduate student mentor from the same or a similar marginalized community in STEM also allows an undergraduate to discuss their goals with someone who is academically further along in their career without facing the challenge of approaching faculty that may not understand or recognize their academic, professional, and personal barriers.

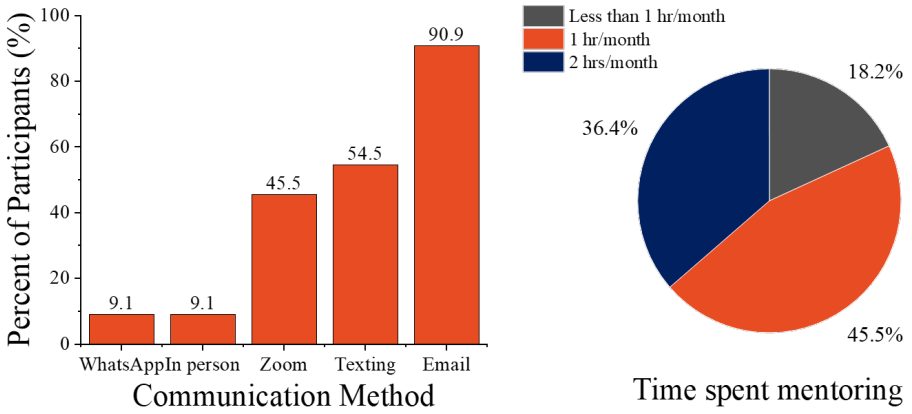

Figure 3: (a) Preferred method of communication for all mentoring pairs, and (b) Hours that each pair spend with each other per month.

One of the program's key traits is giving flexibility to the mentoring pairs in when and how frequent they decide to meet. We analyzed how the mentoring pairs communicate and how often they interact with each other. As seen in Figure 3a, the most popular modes of communication (in descending order) reported are email, texting, and Zoom with some also having in-person meetings and using WhatsApp. These modes of communication offer different advantages and disadvantages, with email being more formal and allowing for longer, more thought-out responses, while texting and in-person meetings may be more casual and allow for quicker back-and-forth exchanges. Zoom combines the advantages of both, allowing for face-to-face interaction while still being convenient and flexible. It is important to note that the choice of communication method can depend on personal preferences and the availability of technology or resources. Ultimately, the success of the mentoring relationship will depend on effective communication and finding a method that works for both parties. Additionally, as shown in Figure 3b, the amount of time spent during mentoring meetings varies between less than 1 hour to 2 hours per month. The most common amount of time reported is 1 hour per month.

The results from academic and professional accomplishments made by the 2021-22 cohort are tallied in Figure 4. Participants were able to conduct research, which is a great way to gain practical experience and build skills that are relevant to their academic and career goals. In addition, two participants secured summer internships, while another participant signed on for a full-time job. This is a significant achievement and demonstrates the value of participating in a mentorship program. Through the guidance and support of their mentors, these participants were able to develop their skills, gain practical experience, and make connections that led to these opportunities. Other accomplishments from the survey include building confidence in their abilities, improving communication skills, developing a better understanding of their career goals, and gaining new insights and perspectives through their interactions with their mentors.

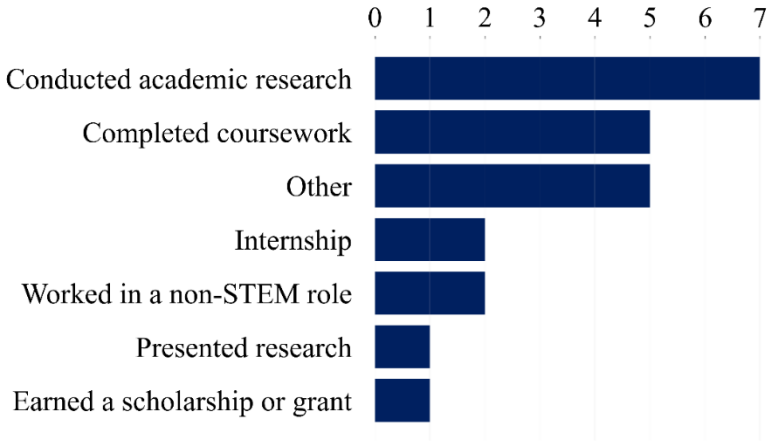

Figure 4: Participant accomplishments in the 2021-22 academic year.

These are all valuable outcomes that can have a positive impact on participants' personal and professional development. These accomplishments demonstrate the importance and benefits of mentorship programs in providing support and guidance to individuals as they pursue their academic and career goals.

Effects on Professional Outlooks from the Hybrid Academic Environment

Based on statements from applicants, a hybrid academic environment posed different needs for each group. There was a need from the graduate students to increase the visibility of the Hispanic engineering community on campus to find stronger support structures while the undergraduates felt our program would be "reassuring" towards making the decision to attend graduate school and an engaging way to "help each other out."

In the end-of-year survey, students were asked whether they agreed a hybrid mentoring program will enhance their academic and professional development on a scale of 1 (strongly disagree) to 5 (strongly agree). Results showed a uniform distribution between neutral and strongly agree, demonstrating a majority of students (67%) benefitted from the program's developmental opportunities but 33% of participants may have benefitted more from other topics during those opportunities. Participants were also asked on a scale of 1 (very difficult) to 5 (very easy) how easy it was to access academic resources on campus, such as academic advisors and library resources. Results showed 81% of the participants mentioned it was easy or very easy while 19% responded it was difficult. Using the same scale, participants were asked how easy it was to access professional development resources, where 45.5% responded it neutral, 45.5% responded easy, and 9% responded very easy. Similarly, they were asked about accessing leadership development resources, where 64% felt neutral, 18% responded easy, and 18% responded very easy. In general, professional and leadership resources were more difficult to access than academic ones for some participants, so it becomes crucial for mentoring programs to include these components as part of students' development.

Discussion

Hispanic students face inequitable gaps in their educational experience such as accessibility to campus resources, navigating professional opportunities, and understanding the process to pursue an advanced degree. With Hispanic graduate mentors, the Hispanic undergraduates can connect with someone within their community that would support them to further explore their interests and ensure accountability. Institutional resources may not fully fit the needs of Hispanic students considering many are still first-generation college students, making the community itself an academic and professional resource if there are graduate students to provide that mentorship. Additionally, mentoring relationships between graduates and undergraduates may provide a more tailored experience when participants are diverse in professional pathways compared to programs that solely encourage research-based career paths.

The survey results indicate several interesting qualitative patterns in the responses of undergraduate and graduate students regarding the mentoring program. For instance, the undergraduate students reported feeling comfortable discussing academic and professional goals with their mentors. Additionally, all the undergraduates rated the importance of connecting with a graduate student mentor to learn about graduate school pathways as 4 or 5, on a scale of 1 (least important) to 5 (most important), indicating that they valued this aspect of the program. On the other hand, graduate students reported benefitting the most from connecting with others and improving their leadership skills, including time management, accountability, and mentoring styles. Both groups of students also highlighted that the program fueled their motivation towards academic and professional goals. These findings suggest that the mentoring program is effective in supporting Hispanic students' academic and professional success by fostering strong connections with mentors and peers, as well as enhancing leadership skills and motivation. Having face-to-face social interaction as a positive factor of success in online learning settings is also supported by prior research at a Hispanic Serving Institution [1].

An unexpected finding was that most participants in our first cohort found it either neutral or easy to access professional development and leadership development in a hybrid academic context, which conflicts with findings in prior work [6, 7, 8]. Some factors that may have increased access to such opportunities are the multiple occurrences of workshops for a given topic from our university's Graduate College, the heightened availability of online opportunities as restrictive pandemic procedures were still in place, and how involved some participants were with student organizations that hosted related events. In our case, when opportunities became available online, it increased the accessibility to developmental resources.

A Second Cohort

At the time of writing this paper, an ongoing second cohort has 17 participants, where there are seven mentoring pairs plus one undergraduate matched with two graduate student mentors. This decision was made due to having a surplus of mentors. Out of the three graduating seniors, all have applied to graduate programs in engineering, all have received an acceptance of

admission, and all have decided to enroll in graduate programs. The second cohort is also expected to participate in interviews at the end of the academic year to further evaluate positive and negative factors in their interactions towards program goals.

So far, we provided them with an accountability survey, given halfway through the program to measure how frequent the pairs meet and topics discussed to ensure they are making progress towards their goals. The most common topics discussed between mentors and mentees include professional career goals, academic development and studying tips, and research opportunities. Many mentees also reported discussing their graduate school applications with their mentors. Responses from participants point out that the mentoring program is successful in supporting students in their pursuit of academic and professional success, as these are all critical areas for growth and development. Additionally, some respondents reported discussing leadership skills, such as adaptability and decision making, as well as personal well-being, indicating that the mentoring relationships may be more holistic in nature. The variety of topics discussed demonstrates the importance of a flexible and individualized approach to mentoring, as different mentees may have different needs and priorities.

Regarding what was learned from their mentoring relationships, mentees mentioned learning about different career paths and opportunities, gaining new perspectives, improving communication and feedback skills, and receiving guidance on writing emails and graduate school applications. Some mentees also noted the value of discussing non-professional topics.

Participants suggested included having more regular meetings with a structure of key goals and timelines, opening up the conversation to address specific skills or personal issues, and having more group events that bring together multiple mentorship pairs. Some mentees also mentioned the value of having upperclassmen undergrads as mentors for younger students who may not be interested in going to grad school. The suggestion to have more group events also highlights the importance of creating a community for mentorship pairs to engage with each other and share experiences. In-person events resulted in more frequent interactions between students compared to the first cohort, however, they find it beneficial to have the choice of virtual meetings for convenience. Overall, the results suggest that the mentoring relationship can be a valuable resource for guidance and support in various areas, and that there is room for improvement in terms of communication and structure.

Conclusions

Our mentoring program seeks to address the challenges of ethnicity disparity in higher education STEM fields through peer mentoring between undergraduate and graduate students in engineering. Our research shows that Hispanic STEM students often lack role models to guide them on their STEM journey, making mentoring a critical component for their success. When an undergraduate mentee is paired with a graduate student mentor that has been through a pathway of interest to the mentee, the mentor can offer customized guidance through experience, meetings, and checkups to observe the undergraduate’s progress towards their goals. We hope to

see an increase in research, internships, and graduate program admissions for participants, particularly those who engage in the program for two academic years. We encourage continued participation of multiple students in future cohorts and expect the program to grow given the importance and impact of such initiatives in the Hispanic STEM community.

The combination of virtual and in-person mentoring is an effective approach to support engineering students, particularly those from underrepresented groups in STEM. Hybrid mentoring provides the benefits of both in-person and online mentoring, such as face-to-face interaction and the flexibility of online communication. For Hispanic students, hybrid mentoring can provide a supportive environment that is responsive to their cultural and possibly their linguistic needs, as well as their geographical limitations. In addition, hybrid mentoring can provide Hispanic engineering students with the necessary skills, networks, and resources to overcome the unique challenges they may face in their academic and professional journey. By combining the strengths of both in-person and online mentoring, hybrid mentoring has the potential to create a more diverse and inclusive learning environment that can promote the success of Hispanic engineering students.

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