

Developing Near-Peer Relationships: An Afterschool Pre-Health Professions Mentorship Program

Morgan Jansing, Ashley Titus, Lex Salazar, Gracie Davis, Hailey Williams, Madison Brown, Matt M. Chumchal, and Molly H. Weinburgh

Abstract:

This study explored student experiences during a near-peer mentorship program for historically underrepresented students in STEM and the health professions. Generally, mentoring has been conceptualized as a more experienced community member training a less experienced member in acquiring necessary technical or interpersonal skills. When the individuals are within seven years of age and have similar backgrounds and interests, they are referred to as near-peer mentors. This specific program consisted of near-peer undergraduate student mentors and high school student mentees with an interest in a career in health care. The program met for six after-school sessions to delve into the processes associated with pursuing a post-secondary degree. Our findings suggest that the success of the program may be attributed to the intersection of administrative/technical components and the near-peer aspects of the program. The administrative/technical components were seen in the length of the program and the sequence of sessions. The near-peer aspects were evident in the mentee/mentor being (a) close in age, (b) women of color, (c) students, and (d) interested in healthcare which we propose resulted in the development of reciprocal relationships that provided academic, social, and emotional support. This article also discusses the important administrative components that made this program possible. From the findings we suggest that near-peer mentoring can be very beneficial for both mentee and mentor, especially for high school students who seek mentors.

Keywords:

mentorship, near-peer mentorship, STEM, pre-health high school students, pre-health undergraduate student

Author Note

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Introduction

The relatively high attrition of women and people of color as they move from elementary school to university programs and careers in health professions has been well documented (Association of American Medical Colleges, 2019; National Center for Science and

Engineering Statistics, 2023). The metaphor of a leaky pipeline has been used as an appropriate description for understanding key moments of dropout in a student's progression toward reaching desired health-related career goals (Almukhambetova et al., 2023). Many factors have been suggested as reasons for the attrition, with several

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interventions recommended for slowing or stopping the “leaks.” One intervention for the health profession is mentoring, usually targeting undergraduate students or medical students (Atkins et al., 2020; Dickens et al., 2021). To address attrition, a mentoring program focused on supporting high school students and grounded in techniques found to be successful for undergraduate students was developed. The study reported here examines the mentoring program for young women of color interested in a career in health care. The mentoring program was conducted by undergraduate pre-health students (mentors) at Texas Christian University (TCU) for high school students (mentees) attending the Texas Academy of Biomedical Sciences (TABS), an early college high school, for students who desire careers in the medical field.

Literature Review

In a seminal study of high school mentoring programs, Ashbacher et al. (2010) reported that participation in an ethnically diverse high school student support group, such as a mentoring program, increased the likelihood of continuing in science, engineering, and mathematics. For underrepresented minority (URM) students, mentoring is a well-established mechanism for fostering career pathways in science, technology, engineering, and mathematics (STEM) (Atkins et al., 2020). Thus, three scholarly areas inform the present study: near-peer mentoring, mentoring toward post-secondary education, and motivation in STEM.

Near-Peer Mentoring

Historically, mentoring is conceptualized as a more experienced community member training a less experienced member in acquiring necessary technical or interpersonal skills (Atkins et al., 2020). When the individuals are close in age and have similar backgrounds and interests, the mentorship is referred to as near-peer mentoring. Recent scholarship has suggested that undergraduates can be effective near-peer mentors for other undergraduates, high school students, and even middle school students (Lee, 2019; Tenebaum et al., 2014; Zaniewski & Reinholz, 2016). Research conducted exclusively on Black women in undergraduate programs indicates the power of mentors and mentees sharing the same gender and race (Dickens et al., 2021). Near-peer mentoring may be aptly positioned to be successful with socioemotional mentoring because of the potential identity similarities between the mentor and mentee. Compared to near-peer tutoring, engagement in a near-peer mentoring program significantly increased middle school students’ academic motivation and grit (Destin et al., 2018). The near-peer mentoring model also acts as a “continuum of learning opportunities” in STEM for both mentors and mentees as it provides experience and goal development for furthering one’s career in science (Tenebaum et al., 2014, p. 383).

Mentoring toward Post-Secondary (College Prep Skill)

Research on mentoring programs for high school students suggested that they have needs that differ from college students. As matriculation to college is necessary for many STEM careers, support that aids in the removal of barriers at this stage (i.e., college application) is very important (Alfred et al., 2019). High school students can find guidance from mentors with tasks related to applying to college (e.g., resume building, application writing, and financial decision-making), which can be helpful in reducing the mental stresses associated with the complicated application process (Qua et al., 2020).

Motivation in STEM

A female student’s motivation to pursue a STEM degree has been shown to be positively influenced by: membership in a community that allows for the exchange of STEM knowledge and career knowledge (Zhang & Barnett, 2015), encouragement from family, peers, and STEM-oriented adults (Perez-Felkner et al., 2014), and mentoring (Zaniewski & Reinholz, 2016). Membership in a community can also be essential to overcome feelings of not belonging in science (Good et al., 2012; Purdie-Vaughns et al., 2008). Through an extensive literature review, Crisp and Cruz (2009) emphasize the value of strong and supportive relationships that have the potential to develop in mentoring programs. Finally, mentoring serves as a support structure that normalizes academic challenges in science unique to URM students (Zaniewski & Reinholz, 2016). Hughes et al. (2024) posited that many URM students are uniquely challenged by an academic system that is based in a stereotype of the lone, white male scientists. Thus, near-peer mentors of similar characteristic provide a “mirror” for success.

The purpose of this study was to explore student experiences during a near-peer mentorship program for young women of color interested in a healthcare career. Thus, we used exploratory methods to gain insight into the experiences of mentees and mentors within this unique program.

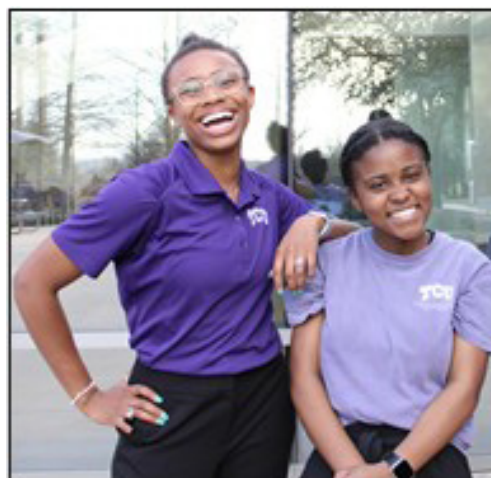
Program Description

The Molding Melanin Magic (MMM) mentoring program, the focus of the present study, was designed to provide mentors and mentees with similar STEM career goals the opportunity to discuss and participate in activities that bolster the knowledge and skill sets necessary for applying to academic programs of interest and concrete potential career paths. Grounded in her own experiences, an undergraduate student created MMM as part of an honors thesis. Identifying as a woman of color, the undergraduate student designed a mentorship program to provide high school women of color (mentees) mentorship by undergraduate women of color (mentors). With guidance from faculty, undergraduate mentors have maintained the program, which continues to use a near-peer mentoring approach that fosters meaningful relationships while providing workshops on relevant topics.

Developing Near-Peer Relationships: An Afterschool Pre-Health Professions Mentorship Program (continued)**Program Recruitment**

During the Fall of 2022, mentors and mentees were recruited from TCU and the TABS High School. The undergraduate STEM mentors were recruited at the university using various strategies. These included advertising through a weekly newsletter for TCU Pre-Health students, recruiting students during Pre-Health science classes, and placing flyers around the science building. An important component of the mentor selection process was the vetting of applicants. Applications and interviews were used to assess if the mentors possessed a genuine interest in this specific program, represented a variety of STEM majors, and were strongly committed to helping younger students along the STEM pathway.

The high school selected for the mentorship program was chosen due to our established working relationships with the staff, which resulted in administrative support for the program at the high school and college levels. The MMM leadership team recruited the mentees by presenting the program information during homeroom classes a month prior to the program start date. At that time, the mentees were given interest intake forms to start the formal application process. The mentees were paired with a mentor of similar interests using an intake form. In total six mentors and eleven mentees were selected for the Spring 2023 MMM Program. Following the selection processes, triads of one mentor and two mentees were deliberately matched to ensure a commonality of interests and aspirations in and outside the classroom (Figure 1).

Figure 1. The MMM Leadership Team**Mentoring Sessions**

The mentorship meetings occurred after school at the high school every three weeks. Each of the six sessions was typically an hour and a half long. Most meetings maintained a similar format by starting with an icebreaker activity, a new topic was introduced to the large group (Table 1), and then small group breakouts/discussions. The speakers usually interacted with the mentees for half of the session. While the small group breakouts were centered on activities or discussion prompts relating to the meeting topic, informal discussions occurred frequently during these portions of the meetings.

Table 1. Mission Statement Development Prompts via ChatGPT 3.5

Session 1	Session 2	Session 3
<u>Introductions</u> <ul style="list-style-type: none"> Program goals Mentoring pairings revealed 	<u>*Resume Building</u> <ul style="list-style-type: none"> Resume do's and don'ts Designed resume with mentor 	<u>Career Vision Board</u> <ul style="list-style-type: none"> Defined purpose of vision boards Mentor/mentees created boards <u>Headshots</u> <ul style="list-style-type: none"> Taken for mentors and mentees
Session 4	Session 5	Session 6
<u>Career Discovery</u> <ul style="list-style-type: none"> Mentees presented the pros and cons of health care careers <u>STEM Mentor Panel</u> <ul style="list-style-type: none"> Mentors answered mentees' anonymous questions about their college experiences 	<u>Financial Literacy</u> <ul style="list-style-type: none"> FASFA and CSS discussed Q&A session regarding college financial aid <u>*College Applications</u> <ul style="list-style-type: none"> College admissions process How to be the best applicant 	<u>*College Faculty Tips</u> <ul style="list-style-type: none"> The rigors of STEM Study strategies Positive interactions with professors Laying the groundwork for being a good college STEM applicant

* Presented by a guest

Guest speakers, who included college faculty and community members, were invited to speak to the large group on various topics, such as resumé-building and preparing college applications, or to provide professional encouragement. Additionally, the

mentors were asked to participate in a panel and answer anonymously submitted questions from the mentees regarding college, their majors, and their personal lives as undergraduate STEM students.

Developing Near-Peer Relationships: An Afterschool Pre-Health Professions Mentorship Program (continued)**Methods****Participants**

The Spring 2023 MMM program included six mentors and eleven mentees. Following human subject research protocols (TCU #IRB 2022-430), we received guardian consent and student assent from three mentees and student consent from six mentors (all 18 years of age or older) to participate in the study. All mentors and mentees self-identified as women of color.

Data Collection and Coding

Data were collected during the after-school mentoring sessions. During all six sessions, the large and small group mentee/mentor breakouts were voice-recorded. All recordings were later transcribed. The study team analyzed the data following the guidelines by Miles et al. (2014), with second-cycle open coding using Dedoose (a web-based application for analyzing and visualizing data). Specifically, pattern coding was utilized to develop themes and statements as they emerged from the transcripts. This qualitative technique provided a rich description of the mentors' and mentees' experiences during the MMM program.

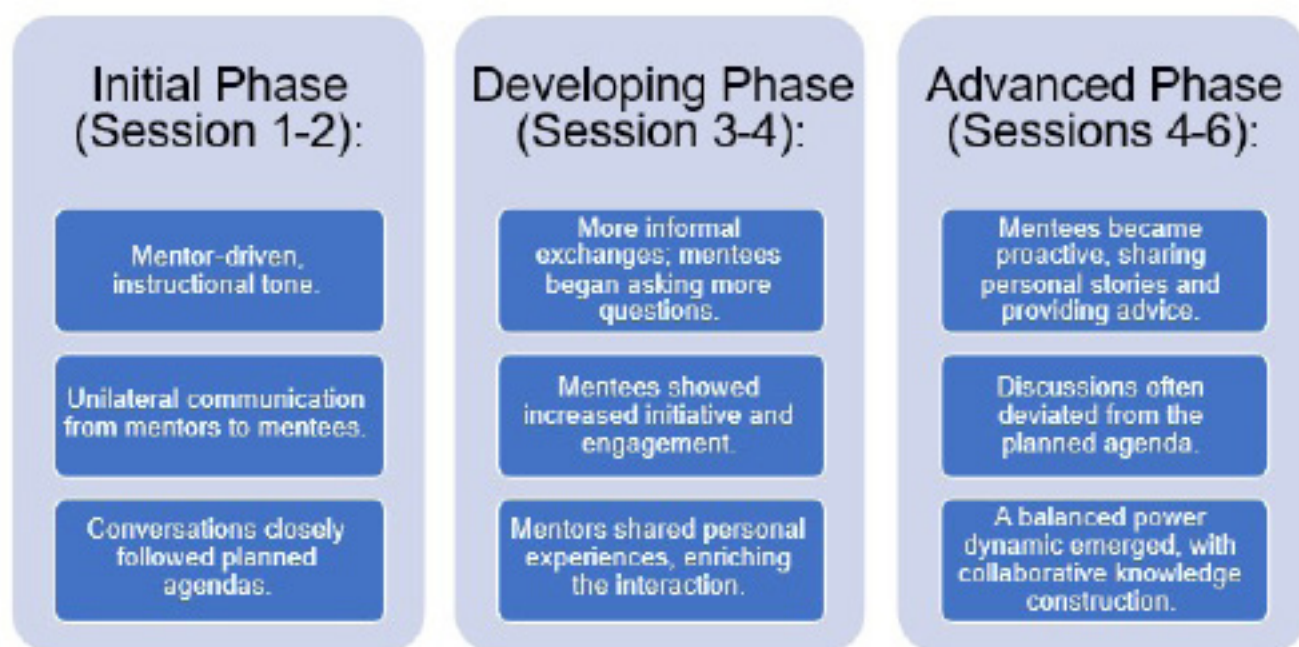
Results

Three major themes emerged from the pattern coding of the mentoring sessions: (a) near-peer relationships, (b) college preparation skills, and (c) career motivation. Unexpected within these themes was the identification of three progressive phases of interactions: *initial*, *developing*, and *advanced*.

Progression phases of interactions

The three progressive phases were found in all three themes (Figure 2). The *initial phase* occurred during the beginning of the MMM program (typically during sessions one and two). As anticipated, the initial phase was characterized by the mentor speaking more and adopting an instructional tone. During this phase, a more unilateral communication pattern was established from mentor to mentee during the small group discussions. Additionally, the discussions did not deviate appreciably from the planned agenda. As the mentoring continued during the semester, the *developing phase* emerged. This phase occurred during the middle of the program (typically during sessions three and four). The *developing phase* was characterized by a shift from mentor-driven conversations to informal exchanges, with the mentee asking more questions. The more casual feeling of the sessions encouraged the mentee to take the initiative in raising topics of concern. As the mentors shared experiences from their academic journey with their mentees, the mentors' own perceptions of their college experiences and career paths were further refined and expanded. The *advanced phase* developed during the latter portion of the program (sessions four, five, and six). The *advanced phase* was characterized by mentees taking a proactive role in asking questions and sharing their personal stories of struggles. It was not unusual for the discussion to deviate from the planned agenda. During this phase the mentees even offered advice and support to their mentors. The progression from mentees as passive participants in the mentoring process to active participants was documented across the six sessions and within all three themes.

Figure 2. Progression Phases of Interaction Between Mentors and Mentees with a Summary of the Interactions that Characterize Each Phase



Developing Near-Peer Relationships: An Afterschool Pre-Health Professions Mentorship Program (continued)**Emerging themes**

Analysis of the mentee/mentor sessions revealed three major

themes. As shown in Figure 3, each theme progressed through the progression phases of interaction.

Figure 3. Emerging Themes from the Mentoring Project with a Summary of the Interactions that Characterize Each Progression Phase

		Phases		
		Initial	Developing	Advanced
Themes	Near-Peer Relationships	Mentees asked basic, factual questions.	Mentee questions became personalized; mentors adopted a conversational tone.	Mentors and mentees shared personal struggles, leading to co-created discussions.
	College Preparation Skills	Mentors and mentees discuss technical and procedural issues related to the application process.	Exploration of topics tailored to specific interests, such as HBCUs and career-related concerns.	Mentees independently sought resources and clarified academic pathways with mentors.
	Career Motivation	Mentees expressed general career aspirations with limited knowledge of options.	Mentees refined career goals, acknowledging challenges.	Mentors and mentees engage in open discussions about personal motivations and shared experiences.

Near-Peer Relationships

For this program, mentees and mentors were (a) close in age (the largest age span between a mentee and mentor was five years), (b) women of color, (c) current students, and (d) interested in a career in healthcare. The ease in relationship building and reciprocity observed between the mentors and mentees was attributed to similarities in these four key attributes. Being close in age to the mentees, the mentors had recently encountered many of the same issues that were important to them. As women of color interested in healthcare, the mentors shared additional connections with the mentees. During the *initial phase* of the near-peer relationships theme, the mentees appeared to take the knowledge offered by the mentor at face value and, in the beginning, asked simple questions:

Mentee 1: "Do you have a job?"

Mentee 2: "How are presentations in a big class? Like, in a big classroom?"

Mentee 3: "Like, what classes are you taking?"

Although the program had specific topics for each of the six sessions, sessions also included unstructured time, allowing for relationship development between the mentors and mentees. In the early sessions (typically sessions one and two), the mentors were the drivers of the conversation. Mentors often began lines of communication by giving advice on the session topics and adding personal experiences explaining how the mentor initially struggled with a given activity or something that they wished they had known about before college:

Mentor: "Are you guys in any clubs and stuff like that?"

Mentee: "We have PULSA, we have UIL, we have NHS"

Mentor: "Okay, that's good, that's good. My biggest, my biggest piece of advice is to make sure to get into those clubs. Like make sure you're working hard and do volunteer hours and stuff like that, because that looks really good on resumes."

Mentee: "Yeah."

Mentor: "And that could . . . because then you may not do good on your SAT, for example, but you could do really good in one aspect. Like your resume, showing you did all these clubs and stuff like that, and that really pulls together your whole application. That's a really big thing."

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The research team identified the near-peer relationship *developing phase* by the personalized questions from the mentees. As these relationships developed, mentees appeared to feel more at ease and asked their mentors increasingly personal and meaningful questions. In addition, mentors adopted a more conversational tone during mentoring sessions. For example, the mentors related current movies to classwork.

Mentor: *"I think the cool thing about college and stuff is that yeah, the classes are harder but they're more . . . have you seen the movie Five Feet Apart?"*

Mentee: *"Yeah, I cried."*

Mentor: *"How it connects to school. We were literally in class and we learned about how cystic fibrosis happens and all this stuff. So I feel like it's more applicable."*

The mentee's questions seemed to stem from the small age gap between the mentee and mentor, who were only three years apart and still in school. Questions primarily focused on school-related topics such as stress, challenges with classes, fears, and career goals/desires. For example, one mentee stated, *"I don't want to stress out. Are you stressed out in school?"*. While the mentors still offered advice during the developing phase, they appeared to feel more at ease during the small group discussions by allowing the mentees time to think and lead the conversations with their questions or concerns rather than filling time with general advice. For example, during the *developing phase*, mentees shaped the conversation with questions like: *"Can you, like, become a doctor or like a dermatologist with any associate's degree?"* and *"For you, what math class was the hardest?"*

The *advanced phase* was identified by the inclusion of private information and personal stories of struggles that helped contextualize the mentee's concerns. Within this phase, both mentors and mentees expressed their fears, challenges, and desires on a more equal playing field. During one session, a mentee related how a life choice had resulted in a family conflict:

Mentor 1: *"What colleges are you thinking of?"*

Mentee: *"UT Austin . . ."*

Mentor 1: *"Why UT Austin?"*

Mentee: *"My fiancé's over there."*

Mentor 1: *"Ah, you got engaged"*

Mentee: *"Yeah."*

Mentor 1: *"No way! Congratulations!"*

Mentor 2: *"What, did you actually get engaged?"*

Mentee: *"Yeah."*

Mentor 1: *"How did your parents react?"*

Mentee: *"They kicked me out. So, I'm like, living solo right now. No, it's okay, it's okay, like my dad's . . ."*

Mentor 1: *"Was it for that specific reason? Cause you got engaged?"*

Mentee: *"Yeah."*

During the *advanced phase*, reciprocity between mentors and mentees was also seen as the mentees gave support and advice to their mentors. Unlike during the *initial phase*, when mentors were the source of knowledge, during the *advanced phase*, mentors and mentees were found to be co-constructing knowledge and reaching a consensus about how to handle certain scenarios and feelings.

Mentee: *"I just could tell it wasn't clicking. How do you do it?"*

Mentor: *"I just found other things to do. I started coloring and I really like that."*

Mentee: *"OK"*

In this conversation, the mentee was expressing feelings of stress due to finding a mathematics class difficult. The mentor suggests a strategy that worked for her and the mentee seems to agree that this might work.

College Preparation Skills

Throughout the MMM program, mentees developed foundational knowledge about higher education during formal full group activities (i.e., mentor and college faculty panels, financial literacy presentation) and during the small group mentor/mentee discussions. The research team characterized the *initial phase* within the college preparation skills theme by the more formal presentations and the direct questions mentees asked their mentors. Mentee questions usually were about gaps of information about the college experience and the application process for college. Questions tended to be technical in nature.

Mentee: *"What is the difference between public, private and community college?"*

Mentor: *"The difference is that basically public schools are funded by the government and usually private schools are smaller and more expensive."*

Thus, in the *initial phase*, most questions focused on factual information with no personal stories. During this time, the mentees tended to ask more questions that were targeted and sought definitive answers. In addition, during these discussions, the mentees gained a more thorough understanding of the college application process.

As the sessions moved into the *developing phase*, the question reflected the thoughtful mentor-mentee pairing and the increasingly relaxed atmosphere. For example, curiosities about Historically Black Colleges and Universities (HBCU) emerged during the sessions. Although the mentors attended TCU and not a HBCU, they had considered HBCUs during their own selection process and could share what they had learned during this experience. As the mentors and mentees were in health-related programs, the mentees also asked career-specific questions that pertained to their desired areas of study. The question shifted to topics such as how the mentor decided to attend TCU and what they considered when making their choice.

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Mentee: *"I don't know what math courses I need, and I know you don't need that much math to be a nurse."*

Mentor: *"Yeah, I think it honestly depends on the college you want to go to and what..."*

Mentee: *"The requirements are."*

Mentees approaching the end of the MMM program showed movement to the *advanced phase* by taking the initiative to answer their own questions. They requested additional College Preparation Skill knowledge outside of the MMM program:

Mentee: *"[The Counselor and I] pulled up the university and we did a call with my mom, the university uhm, I did UT Austin."*

Mentor: *"Okay."*

Mentee: *"And then I did the head of their nursing program. And then we made sure that my courses would align."*

This progression from asking the mentors informal questions about college in general to asking their high school counselors and college staff about specific program questions is a great example of the maturation of College Preparation Skills.

Career Motivation/Feelings About Science

Given the STEM focus of the MMM program, career goals were a central focus of discussions throughout the mentorship program. As the mentees progressed through the program, findings indicate a gradual change in their comments and discussions regarding their career goals. Similar to the near-peer and college prep themes, mentees moved through three stages. During the *initial phase*, discussions regarding career goals, the mentees centered on general statements about potential careers (Figure 3). Typically, the mentees' statements were matter-of-fact and reflected a limited understanding of what the careers actually entailed: *"I want to be a nurse"* or *"I think I want to be a pediatrician."* Their remarks also suggested that the mentees were not aware of the full range of healthcare careers.

As the mentees moved through to the *developing phase*, they refined their career goals through the career discovery activity (Figure 3). This activity provided students with the necessary exploration and space to reflect on the pros and cons of their careers of interest. The mentoring sessions progressed to a point where the mentees felt comfortable discussing the potential down sides of their chosen career paths.

Mentee: *"... something I liked about [nursing] is that I would interact with patients by giving them physical and emotional support. And something I dislike is being an on-call nurse because since it's so demanding . . . I would have to sacrifice a lot of things, maybe like going out or if I had other plans, I might have to cancel that due to being needed more in the job."*

Mentor: *"Why you want to do nursing?"*

Mentee: *"I don't, I don't know."*

Mentor: *"Choosing a profession is about weighing what is attractive to you and the best fit for you."*

Nearing the end of the program, some mentees exhibited behaviors within the *advanced phase* regarding the Career Motivations theme (Figure 3). With this theme, as with the other two, mentees began to ask more personal questions about career choices.

Mentee: *"Why do you want to?"*

Mentor: *"Oh, because well like from personal experience uhm growing up I didn't really have a lot of acne and then I did and it just really took a hit to my self-confidence. And then I heard uhm this person I really look up to and she also dealt with the same thing and then she wanted to be a dermatologist."*

Mentee: *"Me too, the thing is, I used to have a lot of acne. And so, I visit my dermatologist and she's really nice and helpful. So, she's pretty much the one who inspired me to become one."*

In this instance, the mentor and mentee shared similar experiences, sparking an open discussion about the challenges of dealing with acne and how it inspired their interest in pursuing a career in medicine. This personal connection encouraged students to speak more candidly and confidently about their career goals during these meetings.

Discussion

A literature search on mentoring programs informed the design of the MMM program, grounding it in strategies proven successful in other initiatives (Atkins et al., 2020; Lee, 2019; Qua et al., 2020). Although the MMM was not a duplication of the successful programs we found, we expected our data to provide similar results. Our research adds to the knowledge base, providing information and advice for others wishing to develop a similar program. While we acknowledge that each university and high school creates a unique context, we also acknowledge the universal value of mentoring.

We think the most interesting finding from this study lies within the intersection of the administrative/technical components and near-peer relationships. The technical structure of the program not only provided educational information to the mentees but also served as social-emotional support for all participants. Six 90-minute sessions over a semester provided sufficient time for the three phases of interactions to emerge as the mentees became more comfortable with the near-peer mentors. Because the 90-minute meetings can seem short when so many topics could be covered, it was tempting to view casual conversations or offhand discussions as expendable downtime. However, the data supports that through "free talk," the third *advanced phase* developed, which was characterized by a more balanced power dynamic between mentor and mentee. With fewer sessions, the progression phases may not emerge as they did in this program. On the other hand, increasing the number of sessions could make it challenging for high school students to maintain their commitment.

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Successful program implementation relied on a strong commitment from stakeholders at both the partner high school and the university. At the high school, key stakeholders included administrators, counselors, and teachers whose support was essential for recruiting mentees and communicating with parents. This involved distributing flyers and forms and presenting the program to students during school hours or at special events. Conducting mentoring sessions at the high school improved accessibility for mentees, making administrative approval and support, including access to the building, critical to the program's success. At the university level, engaged and dedicated mentors played a pivotal role. Mentors who demonstrated maturity and shared similar backgrounds with the mentees proved to be particularly effective. Through this project, we also recognized the importance of persistence when developing a program of this scope. In addition to supporting the mentors, the mentor program leaders coordinated guest speakers and developed workshop materials. Mentors and program leaders with grit and the ability to creatively navigate challenges were instrumental in ensuring its success. Strong oversight from the university was another crucial factor, particularly the involvement of a trusted faculty or staff member who could serve as a sounding board for students creating or administering the program. Finally, adequate funding—whether from the university or external sources—coupled with proper oversight was essential to sustaining the program.

Careful planning and attention to the administrative/technical components amplified the near-peer relationship building. As indicated by our findings and similar studies (Destin et al., 2018; Dickens et al., 2021), utilizing near-peer mentoring appeared to have positive results and has the potential to encourage URM students to select STEM majors and careers. The small age differential is a strength that should be capitalized upon. It appears to diminish the possibility of the mentor feeling that their experiences would not be understood by the mentee. The early-year college student brought fresh perspectives drawing from recent memories of insecurity and unfamiliarity with college processes. In addition to age, near-peer implies other similar characteristics, including race, gender, and career interests. Thus, college-level pre-health students advising high school students interested in pre-health provided a platform of commonality that grounded the relationship from the beginning. Though not necessary, pairings that took into account similar interests helped strengthen the program.

The interactions between the mentees and mentors underwent notable change during the program, as seen by progression across the three phases (initial, developing, and advanced). The program began with learning outcome goals that were more procedural than social/emotional. However, the ability

of the mentors to relate to the mentees became apparent due to the close age relationship and the mentors' recent experience with similar questions/concerns as the mentee. Community building was exhibited within this program, as seen by the three phases of interactive development. The MMM mentors noted the importance of developing relationships with peers while in college. By beginning that process in the safe space of a STEM-oriented near-peer mentoring program, mentees have low-stakes opportunities to develop their voices and co-create supportive relationships. While additional longitudinal research is necessary to understand STEM-oriented near-peer mentoring programs, we hope that these relationship-building experiences translate to skills that serve the mentees in their further pursuits of careers in STEM and pre-health.

In summary, the program's duration, combined with intentional pairings that ensured commonalities between mentors/mentees, facilitated the progression of mentees from passive participants in the mentoring process to active participants. The mentees in this program could 'see' themselves in the mentors and had time to build a relationship. The high school mentees had a vague idea of "healthcare careers" but had little actual knowledge of the variety or academic paths to the careers. The college mentors were able to provide information, suggestions, and support as they had recently been in the same situation as the mentees.

We propose that programs such as the MMM mentorship program may help to reduce the "pipeline leak" from elementary school to careers. For others wishing to start a university to high school mentoring program, we would offer several suggestions. Start with establishing clear goals and structure for the program. This provides directions for selecting the high school partner and the recruiting of mentee. It is very important to select a school where one of the teachers is invested in helping with the scheduling sessions and recruiting mentee. Equally important is matching the mentee/mentor pairing so that true dialog results during the more open times during each session. We found that free talk time is very important and should be allowed as it spontaneously occurs.

References

- Alfred, M. V., Ray, S. M., & Johnson, M. A. (2019). Advancing women of color in STEM: An imperative for US global competitiveness. *Advances in Developing Human Resources*, 21(1), 114-132. <https://doi.org/10.1177/1523422318814551>
- Almukhambetova, A., Torrano, D.H. & Nam, A. (2023). Fixing the leaky pipeline for talented women in STEM. *International Journal of Science and Mathematics Education*, 21, 305-324. <https://doi.org/10.1007/s10763-021-10239-1>

Developing Near-Peer Relationships: An Afterschool Pre-Health Professions Mentorship Program (continued)

- Association of American Medical Colleges. (2019). State of women in academic medicine: Exploring pathways to equity <https://www.aamc.org/data-reports/data/2018-2019-state-women-academic-medicine-exploring-pathways-equity>
- Atkins, K., Dougan, B. M., Dromgold-Sermen, M. S., Potter, H., Sathy, V., & Panter, A. T. (2020). "Looking at myself in the future": How mentoring shapes scientific identity for STEM students from underrepresented groups. *International Journal of STEM Education*, 7(42), 1-15. [Doi.org/10.1186/s40594-020-00242-3](https://doi.org/10.1186/s40594-020-00242-3)
- Crisp, G., & Cruz, I. (2009). Mentoring college students: a critical review of the literature between 1990 and 2007. *Research in Higher Education*, 50, 525-545.
- Destin, M., Castillo, C., & Meissner, L. (2018). A field experiment demonstrates near peer mentorship as an effective support for student persistence. *Basic and Applied Social Psychology*, 40(5), 269-278. <https://doi.org/10.1080/01973533.2018.1485101>
- Dickens, D. D., Ellish, V., & Hall, M. M. (2021). Changing the face of STEM: Review of literature on the role of mentors in the success of undergraduate Black women in STEM Education. *Journal of Research Initiatives*, 5(3), Article 14. <https://digitalcommons.uncfsu.edu/jri/vol5/iss3/14>
- Good, C., Rattan, A., & Dweck, C. S. (2012). Why do women opt out? Sense of belonging and women's representation in mathematics. *Journal of Personality and Social Psychology*, 102(4), 700-717. <https://psycnet.apa.org/doi/10.1037/a0026659>
- Hughes, R., Ibourk, A., Wagner, L., Jones, K., & Crawford, S. (2024). #Resilience is not enough for Black women in STEM: Counter stories of two young Black women becoming a STEM person. *Journal of Research in Science Teaching*. 61, 744-771. [DOI: 10.1002/tea.21925](https://doi.org/10.1002/tea.21925)
- Lee, M. J. (2019). Increasing minority youths' participation in computing through near-peer mentorship. *Journal of Computing Sciences in Colleges*, 35(3), 47-56 <https://par.nsf.gov/biblio/10130189>
- National Center for Science and Engineering Statistics. (2023). Diversity and STEM: Women, Minorities, and Persons with Disabilities. Retrieved from <https://nces.nsf.gov/pubs/nsf23315/assets/nsf23315-report.pdf>
- Perez-Felkner, L., McDonald, S. K., & Schneider, B. L. et al., (2014). What happens to high-achieving females after high school? Gender and persistence on the postsecondary STEM pipeline. In I. Schoon & J. S. Eccles (Eds.), *Gender differences in aspirations and attainment: A life course perspective*, 285-320. Cambridge University Press.
- Purdie-Vaughns, V., Steele, C. M., Davies, P. G., Dittmann, R., & Crosby, J. R. (2008). Social identity contingencies: How diversity cues signal threat or safety for African Americans in mainstream institutions. *Journal of Personality and Social Psychology*, 94(4), 615-630. <https://psycnet.apa.org/doi/10.1037/0022-3514.94.4.615>
- Qua, K., Pinkard, O., Kundracik, E. C., Ramirez-Bergeron, D., & Berger, N. A. (2020). Near peer mentors to address socio-emotional issues among underrepresented minority high school students in research intensive STEM programs: Perceptions of students and mentors. *Journal of STEM Outreach*, 3(1), 1-15. <https://doi.org/10.15695/jstem/v3i1.06>
- Tenebaum, L., Anderson, M. K., Jett, M., & Yourick, D. L. (2014). An innovative new-peer mentoring model for undergraduate and secondary students: STEM focus. *Innovative Higher Education*, 39, 375-385. <https://doi.org/10.1007/s10755-014-9286-3>
- Zaniewski, A. M., & Reinholz, D. (2016). Increasing STEM success: A near-peer mentoring program in the physical sciences. *International Journal of STEM Education*, 3(1), 1-12. <https://doi.org/10.1186/s40594-016-0043-2>
- Zhang, L., & Barnett, M. (2015). How high school students envision their STEM career pathways. *Cultural Studies of Science Education*. 10, 637-656.

