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# Inclusive Pedagogy among STEM Faculty at a Hispanic Community College*

*Pedagogía inclusiva entre el profesorado de STEM en un colegio comunitario hispano*

*Ekirajawaa ewiichikana sa'aka na ekirajüshiikana sünain STEM sulu'u wane ekirajiipalee alijunairu'u eekai wattayin saalin wayuu aashaje'erain alijunairu'u*

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**Abstract**

In the United States, community colleges (CCs) are institutions that award technical degrees and prepare diverse students to continue their education at a four-year institution. The diversification of the student body requires an integrated teaching approach that addresses students' particular needs. Therefore, faculty from science, technology, engineering, and mathematics (STEM) in a mentoring program at a Hispanic CC participated in online focus groups over three semesters. Cultural sustaining pedagogy (CSP) and intersectionality frameworks framed this study to highlight the importance of students' identities, disciplines, and instructional modalities intersecting with students' learning process. Findings revealed that faculty involved in the mentoring program became more aware of the needed pedagogical changes, strengthened collaboration with peer mentors to refine teaching strategies, and showed greater empathy for students' academic and emotional needs. Lastly, faculty developed a greater understanding of the nuances of students' lived experiences and, as a result, their diverse learning needs.

**Keywords:** Community College, hispanic institution, pedagogical strategies, STEM.

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**Resumen**

En los Estados Unidos, los colegios comunitarios (CC) son instituciones que otorgan títulos técnicos y preparan a una población estudiantil diversa para continuar su educación en instituciones de cuatro años. La diversificación del estudiantado requiere un enfoque de enseñanza integrado que aborde sus necesidades particulares. Por lo tanto, el profesorado de las áreas de ciencia, tecnología, ingeniería y matemáticas (STEM, por sus siglas en inglés), perteneciente a un programa de mentoría en un colegio comunitario hispano, participó en grupos focales en línea durante tres semestres. Este estudio se estructuró bajo los marcos de la pedagogía de sostenimiento cultural (CSP, por sus siglas en inglés) y la interseccionalidad, con el fin de destacar la importancia de cómo las identidades de los estudiantes, las disciplinas y las modalidades instruccionales interactúan con su proceso de aprendizaje. Los hallazgos revelaron que los docentes que participaron en el programa de mentoría adquirieron una mayor conciencia de los cambios pedagógicos necesarios, fortalecieron la colaboración con mentores pares para perfeccionar sus estrategias de enseñanza y mostraron una mayor empatía hacia las necesidades académicas y emocionales de los estudiantes. Por último, el profesorado desarrolló una mayor comprensión de los matices de las experiencias de vida de los estudiantes y, en consecuencia, de sus diversas necesidades de aprendizaje.

**Palabras clave:** colegio comunitario, institución de servicio a hispanos, estrategias pedagógicas, STEM.

**Jüküjia palitpütchiru'u**

Chayaa Estados Unidos, na ekirajiipaleekana eekai ewiichijirain wayuu (CC) shia piia ekirajiipalee ekaí eitaasüin pütchi katsuinsükat süpüla ekirajawaa jochon, otta sa'atajajin wakuwa'ipa na ekirajaanakana eekai naatawain süpüla o'unajawaa sulu'u ekirajiipalee laülaasü piei (4) juya joolu'u. Tü naatawaa akuwa'ipaa namüin na ekirajaanakana achuntashi wane jukuwa'ipa ekirajawaa ewiichikana süpüla keraajaa tü achuntajakat namüin ewiichikana. Müshiijese'e na ekirajüshiikana sünain ciencia, tecnología, ingeniería otta matemáticas (STEM), sa'akajee wane a'yatawaa pa'anapajirawaa pütchi sulu'u wane ekirajiipalee alijunairu'u eekai wattayin saalin wayuu aashaje'erain alijunairu'u, eitaasü sulu'u ouutkajawaa sünain pütchikat yaaje'ewat internet sa'aka apünüin (3) semestres.Tü achajawaakat pütchi joolu'u sa'akajee pütchi CSP otta asirúajirawaa sulu'u naatawaa akuwa'ipaa, süpüla e'raa anasükalü ma'in jukuwa'ipa na ekirajaanakana, ekirajawaa otta jukuwa'ipa ekirajawaa sa'aka achajawaa pütchi namüin. Tü achajawaakat pütchi e'raajashi sünain na ekirajüshiikana eekai a'yataashiikana sulu'u pa'anapajirawaa pütchi e'raajashi jukuwa'ipa wanajaain ekirajawaa, katsuinjirashi pütchi pa'anapajirawaa pütchi namaa na ekirajüshiikana laülaayuuka süpüla anasükalü ma'in jukuwa'ipa ekirajawaa otta anasükalü saa'in namüin na ekirajaanakana sa'aka ekirajawaa otta kapülaa saa'in wayuu. Sünainchoo, na ekirajüshiikana e'raajashi jukuwa'ipa a'yatawaa mmaipaa namüin na ekirajaanakana otta naatawaa ekirajawaa achuntashi joolu'u.

**Pütchi katsuinsükat:** Pütchi katsuinsükat: ekirajiipalee ewiichijirain wayuu, ekirajiipalee alijunairu'u, jukuwa'ipa ekirajawaa, STEM.

## Introduction

Community colleges (CCs) represent a significant portion of the postsecondary education in the United States (U.S.). As of 2026, there are 1,105 CCs, from which 923 are public, 36 are Tribal, and 56 are independent. Most degrees awarded are associate degrees (814,211) and certificates (706,483). Other CCs' characteristics of their student body include that 67% are part-time, 32% are first-generation (first in their homes to attend higher education), 32% are in the 22-39 age range, 50% are Native American, 48% are Hispanic, and 38% are Black students (American Association of Community Colleges, 2026). There are

multiple reasons why CCs are essential to student advancement nationwide, including affordability, flexibility, workforce alignment, and holistic support for diverse learners (Hispanic Outlook on Education Magazine, 2026).

Based on the student enrollment, institutions can be designated as Hispanic-serving institutions (HSIs) if they have full-time equivalent undergraduate enrollments of at least 25% Hispanic students. In the U.S., there are 226 HSI CCs, and one of those is where this study was conducted (Hispanic Association of Colleges and Universities, 2026). CCs have lower enrollment and degree attainment in science, technology, engineering, and mathematics (STEM) compared to 4-year institutions. The Science and Engineering Indicators (2026) noted that 19% of students attending a CC earned STEM associate degrees compared with 87% who attained STEM bachelor's degrees. Therefore, CCs need to improve student enrollment, persistence, and graduation rates in STEM disciplines. An innovative strategy that institutions are using is to incorporate students' voices into how courses are taught, designed, and assessed. Cook-Sather et al. (2023) highlighted the use of pedagogical partnerships, in which students and faculty work together to create more equitable and inclusive instructional practices. This is an opportunity for students to advocate for themselves and for others who have suffered from misinformation, lack of representation, and impostor syndrome (Cook-Sather et al., 2023). Faculty can also help improve their instruction by inviting students to provide constructive critique regardless of student identities (Von Vacano et al., 2022).

In addition, CCs, particularly those that enroll underserved student populations, are making efforts to implement culturally responsive practices and help diversify the STEM workforce. Through faculty workshops and student feedback, instructors adopt a cultural asset mindset and incorporate pedagogical practices such as increased group engagement. Faculty also have the opportunity to assess their classroom presence, understanding of the content, and its effect on students (Pickering et al., 2023; Von Vacano et al., 2022). A specific case of mathematics faculty participating in faculty development to learn and practice inclusive active learning was addressed in Van De Car et al.'s (2026) study. Van De Car et al. (2026) noted the importance of fostering inclusive classrooms through active learning strategies such as jigsaw, carousel walks, and the 1-min paper. Likewise, Espino's (2026) study highlighted a CC adopting culturally relevant pedagogy in a STEM seminar, in which students improved their sense of belonging, STEM identity, self-efficacy, and engagement. When students feel welcome, they are more comfortable in their STEM programs, perform well, and contribute to their field, increasing their self-efficacy and motivation.

When CC students are personally, academically, and professionally supported through a well-designed curriculum, mentorship, and career assistance, they are more likely to feel valued and to see their contributions as important. As a result, students can find their academic journey meaningful and find reasoning to persist (Espino, 2026). Furthermore, Von Vacano et al. (2022) noted that when students receive peer instruction that improves student learning, promotes a welcoming environment, and

contributes to their peers' understanding of science careers, this can have a high and long-lasting effect on students. Likewise, making classrooms in gateway courses, such as mathematics, more supportive, engaging, and welcoming can play a key role in reducing disparities. These new approaches can be even more important for underrepresented students and non-native English speakers, as most CCs with HSI designations have important student bodies with these characteristics. This study aimed to underscore CC STEM faculty's awareness of the pedagogical changes and motivations resulting from having a student mentor embedded in their courses. The research questions framing this study are the following:

1. What new pedagogical strategies did STEM faculty implement as a result of having a peer mentor embedded in their classroom?
2. How did STEM faculty's understanding of students' learning needs change as a result of having a peer mentor embedded in their classroom?

### *Context*

To address high rates of students receiving D and F letter grades or withdrawing (DFW) from the course, peer mentors who had successfully passed the course were selected. The average DFW rate for the courses of interest prior to the start of the peer mentor intervention was 30%. Peer mentors were required to attend each class session and hold out-of-class office hours. Specifically, the peer mentor intervention was designed for courses with the institution's Science, Engineering, and Mathematics (SEM) department. The intervention began in Spring 2023 with one course and has continued through Spring 2026 with over 20 courses. This study took place at a Hispanic-Serving Community College (HCC) in the Southwest United States near the US-Mexico border, and the peer mentoring initiative grew from a Department of Education Title III grant for which the institution was a recipient. The purpose of the grant was to increase the number of Hispanic and low-income students attaining postsecondary degrees. Finally, the institution enrolls approximately 7,200 undergraduate students; 75% of those enrolled identify as Hispanic, and 98% receive some sort of financial aid (U.S. Department of Education [NCES], 2023).

### *Literature Review*

This review centers on scholarship by key researchers exploring intersectionality, a term coined by Kimberlé Crenshaw (1989), which defines how social identities *intersect* to create personal experiences of discrimination or privilege. Following that is an exploration of literature that focuses on students' abilities within Science, Technology, Engineering, and Mathematics (STEM) disciplines and how they intersect with their identities.

### *Intersectionality*

Maria Viveros Vigoya's research explores intersectionality using a sex and gender and critical race lens, specifically in a Latin American context. Viveros Vigoya (2015) ascertained whiteness as an element of privilege that perpetuates inequality in Colombia for Black populations, who witness whiteness and its perceived level of success as aspirational. Maria's scholarship has since explored how masculine norms intersect with class, color, race, and region (Viveros Vigoya, 2023).

Another prolific scholar is Angela Davis, whose research and activism focus on women, race, and class. Davis draws on personal experience growing up in segregated communities to champion civil rights (Davis & Platt, 2013). While Davis' work spans several decades and topics, an important publication, *Women, Race & Class* (Davis, 1984), focuses specifically on the nation's history of women's rights for Black women.

While there are additional scholars whose research explores the intersection of identities, the final researcher examined in this narrative is Patricia Hill Collins. *Intersectionality as Critical Social Theory* (Collins et al., 2021) addresses power relations of race, class, and gender. Additionally, Collins et al. (2021) argued that oppressed people across multiple identities create power to build resilience and strength.

### *STEM Intersectionality*

As noted, Science and Engineering Indicators (2026) reported that 19% of students attending a community college earned associate degrees compared to 87% who attained a STEM bachelor's degree. Gaps in STEM achievement are wider for underrepresented identities. Black and Hispanic students are less likely to pursue STEM fields and thus earn STEM degrees at lower rates than their White and Asian peers (Chen, 2009; Fry et al., 2021; Santiago et al., 2024). Similarly, this identity is underrepresented in STEM professions compared to their White counterparts.

Representation, or the lack thereof, of various identities within the STEM workforce may perpetuate students' self-efficacy and determination to succeed both during their degree program and into a STEM career. Academic performance, therefore, is not just an outcome of one's intellectual capabilities but is also shaped by racial and/or social identities. Chiu and So (2025) studied how social identity influences STEM career aspirations and academic engagement. Their study drew on K-12 and college students in Hong Kong, and the data suggest that students' national and local identities influenced their desire to pursue STEM degrees and/or careers. While their analyses controlled for variables such as participants' gender, other researchers have explored gender differences in STEM degree attainment and career aspirations.

Measuring self-efficacy for scientific tasks and academic self-efficacy in science allowed Robinson et al. (2022) to discover that these constructs reflected college students' career aspirations in STEM fields. However, females reported lower academic self-efficacy. Data also showed female students may need additional

support to feel confident in STEM courses. Other researchers have found that such gender differences emerge earlier, as Liu (2018) did, surveying over 17,000 students in seventh and ninth grades, as well as parents, teachers, and school administrators in China. Findings revealed the impact of gender-math stereotypes; specifically, the aspiration to pursue a STEM field was higher for boys than for girls.

While the aforementioned studies raise concerns about underrepresented students, other research has explored ways to improve these students' self-efficacy, academic performance, and desire to pursue STEM fields. These constructs increase as a result of the environment in which students learn. Pedagogical techniques such as active learning and group assignments have increased students' self-efficacy and academic performance (Kuchynka et al., 2021; Long, 2025). Similarly, embedding peer mentors into courses increases students' academic self-efficacy and sense of belonging (Contreras Aguirre & Long, 2026; Long et al., 2025; Zaniewski & Reinholz, 2016). Peers assist students with academic content, exam preparation, and assignments while also advising them on institutional support resources. This is especially profound for students who may be the first in their family to attend college or who are returning to college as older students.

It can be ascertained that students' intellectual ability to perform well in STEM courses is not the only predictor of their success. Identities and environmental settings also contribute to whether students persist through a degree program and pursue a STEM career. A scholarship exploring how students' STEM abilities are shaped by identity, context, and even power relations has emerged from the literature review, which influenced the study's conceptual framework, as explained in the following section.

### *Conceptual Framework*

Almost 40 years ago, educational leaders began discussing how to place greater emphasis on equity and diversity in education, particularly by focusing on the intersection of culture and teaching. Gloria Ladson-Billings, author of Culturally Relevant Pedagogy (CRP) (1995), proposed three main elements that help better understand this pedagogical approach: First, student achievement is the academic development of students due to instruction; second, cultural competence is the appreciation of one's culture and/or knowledge of others' culture, and third, sociological awareness is the student's capacity to apply real-world problem-solving knowledge learned in school. Numerous researchers have expanded Ladson-Billings's CRP in distinct contexts and disciplines. For example, in higher education, Espino (2026) used CPR in a community college seminar to foster an inclusive and supportive community with diverse perspectives. The study's findings revealed that students developed a stronger sense of community and belonging, resulting in higher student engagement and the reinforcement of their STEM identity and self-efficacy. Furthermore, CPR can be observed in college students' interest in taking courses that meet curricular requirements and align more closely with their identities and experiences (Von Vacano et al., 2022).

More recently, Ladson-Billings (2014) revised her original CRP concept to Culturally Sustaining Pedagogy (CSP), arguing for greater flexibility in understanding culture and in critically addressing questions of equity and justice. One of her arguments is that culture is fluid and dynamic, and students must be "subjects in the instructional process" (Ladson-Billings, p. 76). There are multiple elements to consider when adopting CSP, including individual identities, discipline-specificities, and instruction modality (e.g., hybrid and asynchronous). CSP continues to expand and evolve, aiming to address contemporary issues of inequality. Along with CSP, active learning, a student-centered approach that uses activities and strategies to promote higher-order thinking, is a well-known practice for improving learning (Van De Car et al., 2026). Active learning has been linked to better understanding of mathematics and improved sense of belonging for minority STEM students (Rainey et al., 2019; Snyder et al., 2016).

## Methodology

To address high rates of students receiving D and F letter grades or withdrawing from the course, students who had successfully passed courses were selected as peer mentors. Specifically, the peer mentor intervention was designed for such courses with the institution's Science, Engineering, and Mathematics (SEM) department. This study is part of a larger research project that began in Spring 2023 and explores the impacts of peer mentoring on students' academic and social success in SEM courses. As an example of the number of participants in the mentoring program, Table 1 shows information about participants in Fall 2025. Subsequent semesters have similar numbers. As the study progressed, however, the findings suggested that the program influenced instructors' teaching styles and their work with peer mentors to best serve students. Thus, this particular study reflects data collected from Spring 2025 through Spring 2026. Over the course of three semesters, data collection included 12 focus groups: six for faculty and six for peer mentors. In total, the number of participants, e.g., those in SEM courses, was approximately 8 faculty and 6 peer mentors.

**Table 1**. Mentoring program participants in Fall 2025

| *Number of Courses* | *Number of Instructors* | *Number of mentors* | *Number of students* |
|---|---|---|---|
| 41 | 18 | 22 | 706 |

**Fuente:** Authors.

To address the research questions, the research team used a qualitative approach, which allowed participants to share their experiences in ways that quantitative data may not (Tracy, 2020). The research team utilized purposive and criterion sampling (Tracy, 2020) to recruit participants who served as instructors and peer mentors for the peer-mentored courses. While the peer mentoring program has evolved to include courses outside the SEM department, the research team solicited participants within the SEM department.

### *Data Collection and Analyses*

Data were collected through focus groups, and the researchers designed a semi-structured interview protocol that allowed follow-up questions during the focus groups. The focus groups were usually conducted by the end of the semester in an online format, lasting, on average, 1 hour. Questions directly related to the research questions; that is, the researchers inquired about changes in pedagogy and teaching strategies resulting from having a peer mentor in their course. Focus groups were audio-recorded and generated into written transcripts. The research team ensured the accuracy of written transcripts by listening to audio files. Thematic coding analyses were employed, in which the researchers read the transcripts, grouping quotes into codes and topics (Merriam, 2009; Tracy, 2020). The team utilized inductive coding, allowing themes to emerge from the data. Final themes are presented as findings. In line with best practices in qualitative data analysis, quotes from transcripts are used to supplement themes, enhancing the credibility of the researchers' interpretations (Tracy, 2020).

## Findings

The data collected throughout the year included faculty from SEM and non-SEM disciplines; however, due to the scope and purpose of this study, only faculty and peer mentors from SEM were included in the findings. The following findings were generated from thematic analyses as described in the aforementioned section. The first theme addresses the role of peer mentors in the classrooms, making faculty aware of needed changes to better support students' learning. Additionally, the second theme focuses on how peer mentorship and faculty collaboration enhanced student engagement and academic performance, thereby refining pedagogical strategies. Lastly, the third theme describes faculty becoming more conscious of students' needs related to technology, academic content, and emotional support.

### *Influence of Student Mentors in the Classroom*

This theme underscores the importance of having student (peer) mentors in SEM courses for faculty in improving pedagogy and teaching strategies. Furthermore, peer mentors allowed faculty to create an environment that fostered equitable learning across all students. For example, a faculty member assigned to a science course reflected on the impact of a peer mentor for students seeking academic support:

> Her presence helped me realize how easily and naturally students approached her in a friendly manner. Even though I initially encouraged students to seek help from her in addition to me, it was clear that they felt comfortable doing so on their own. She provided practical advice that students could apply right away, which made her support even more valuable in the learning process. -faculty, science, Spring 2025.

This same faculty member, having observed the frequent consultation between students and the peer mentor, went out to explain that they "ask[ed] for [the peer mentor's] opinion on different approaches to conducting a few labs," as the course included both lecture and lab requirements. This reflects the ability of the instructor to develop new teaching strategies to best serve the needs of the students within the science course.

Similarly, a math instructor who participated in a Spring 2025 focus group noted relying on the peer mentor to assist students in class while the instructor helped "him be a stronger math student and tutor." This had an impact in and out of the classroom, as peer mentors were required to hold office hours or study groups.

A chemistry professor who participated in a Spring 2025 focus group reflected on his routine of reaching out to students with low grades and requesting the peer mentor to do so as well, as evidenced in the following quote,

> The students that actually do need the help are a lot shy. They don't really reach out. So I do normally reach out to my students. I also have my peer mentor reach out to students. I will look at grades. I'll look at assignment submission. If I see students are falling behind or not doing well, I'll just tell, you know, the peer mentor, 'can you reach out to this student and ask them if they need help? What we could do to improve their grade.' -faculty, chemistry, Spring 2025.

A similar experience was shared by a Mathematics professor, who noted the important role of the mentor in identifying students who were having difficulty in the class and in finding a mentor they could trust. The following quote shows the faculty's perception on this subject: "It was a good… good to have the mentor to capture that they had this struggle, because they… I do not believe that they would have come to me. I try to be approachable, but it's… it's, like, embarrassing" -faculty, math, Fall 2025. The same faculty realized that some mentors were really talented and could take advantage of that to improve their teaching. For instance, this professor expressed the following,

> My first mentor was really quite gifted at communicating with other human beings, just in general. She was good at guiding questions, and so we had this series of conversations that made me… understand what I'm doing in these active learning sessions to try to guide people and find words to describe the practice, that's something that impacted me. -faculty, math, Fall 2025.

Likewise a Physics faculty explained a similar situation where he continuously request feedback from the mentor about the class content, so the students benefit from this ongoing improvement, the faculty mentioned, "I asked the mentor, if the examples were too many, if the questions were too many, how did they feel, and of course, after class, of course, they talk about it again at their level" -faculty, physics, Spring 2026.

The heavy influence that mentors have in the classroom extends beyond student learning outcomes; it also significantly impacts faculty teaching style, format, form, and delivery. Faculty increased their awareness of their teaching and found mentors who can provide continuous feedback and criticism on their teaching approach.

***Pedagogical Strategies***

The synergy that faculty and mentors developed throughout this mentoring program could achieve that; together, they developed strategies and initiatives improving student engagement and motivation. The mentor intervention to those students who needed more support and the faculty's willingness to try different pedagogical approaches are addressed in the following quotes.

A mathematics professor who participated in a focus group in Fall 2025 highlighted the following: “The extra support [from the mentor] my students received, those that sought it out seemed to do better in the course and have a deeper level of understanding of the course topics.” This faculty underscored the critical role of the mentor in student academic performance and learning outcomes. A peer mentor who participated in a focus group in Spring 2026 reinforced what the mathematics professors mentioned and gave an example of how she supported students:

> So, anytime I would see a student go up to my professor, and they would talk about anything about retakes or anything like that, I would, I would take them to the side a little bit, and I'd be like, I have office hours right after this class if you need any help…which is why I started doing those, the worksheets, where, I would break down the problems, not just step-by-step, but, like, I have, like, a column of, like, the actual algebra, and then I have a column of, like, the actual reasoning and, like, why this is happening.

Students could better respond to the highly demanding SEM courses by feeling that an extra pair of eyes is monitoring their academic performance and that additional support is available.

Similarly, a Physics faculty member highlighted the mentor's intervention in keeping students informed about the course's deadlines, assignments, and activities. He even mentioned how the mentor went further, using other platforms more commonly used by students to communicate class-related aspects. The following quote summarizes the experience of this Physics faculty, he mentioned,

> I see the mentor giving me the feedback that they asked about this, that is in the announcement, so I just remind them. So I see that, you know, that part of the mentor is taking care of it really well, because they chat with each other, even using several other, you know, chat platforms that are more comfortable at their level. So, yeah, so on the part of announcements, the mentors are really doing great on it by reminding the students. -faculty, physics, Spring 2026.

The continuous and personalized communication this mentor had with the students taking a Physics class was notorious to the instructor. It is well known among faculty that communicating with students via the official school email and the Canvas Learning Management System is challenging. So, this peer mentor used other chat platforms to ensure students received the information and responded.

Furthermore, and more importantly, is how faculty improved student engagement by focusing on the student learning process. An example is a mathematics professor who said,

> We do active learning in class, in the in-person and on the Zoom meeting. Well, I try. And, I feel that the mentor is…good… we connect to make sure that we're not just focused on the correct answer, we're focused on the process -faculty, math, Fall 2025.

This professor used active learning in the math class, and one of the aspects the peer mentor and faculty addressed was that students focused more on the learning process than on the right answer, which gave them the confidence to make mistakes and learn from them. A math instructor who participated in a Spring 2025 focus group reported using Zoom breakout rooms in an online, synchronous course in which she had a peer mentor. She felt comfortable in encouraging student participation through these rooms with the assistance of the peer mentor, stating, "I think [the course is] going really well, having the mentor in the online meetings in particular, since I have them broken into groups and breakout rooms, helps more effectively go answer [when] their hand raises." Despite teaching in a virtual format, a commonality among faculty in this study was the importance of student engagement and the need to create a sense of presence regardless of the course modality.

Peer mentors noticed students' struggles with online classes, as well as their own struggles with maintaining communication and collaboration with students. The following quotes remarked on peer mentors' difficulties with online courses:

> The online course, we… I've met with, so far, one student, and every time it's just been brief emails, and…… if it's an online course, a lot of them just don't reach out as much as they would in person -peer mentor, physics, Fall 2025

Since online class is more about, you know, your own… learning at your own pace, and you're learning at your own pace, so it was more about, going over what they are trying to understand, since online is kind of challenging for them - peer mentor, chemistry, Fall 2025.

These two quotes underscore the challenges posed by online courses delivered by peer mentors. Faculty are also aware of these and other challenges linked to online classes and have reported some strategies to keep students engaged.

Another important aspect pertaining to pedagogical strategies is how faculty added instructional elements to the class based on the peer mentor feedback, for instance, the Physics faculty shared,

> I see those common questions that they ask the peer mentors, of course, in some specific topics…when they ask something so much, then I make a very short video on that concept, and when I put in the course, and even during the next course, when I put that, you see them not ask that part of the question again -faculty, physics, Spring 2026.

Overall, faculty, with the support of peer mentors, could create a more equitable and positive academic environment where all students feel seen, heard, and valued, whether through peer mentor contact or through a different pedagogical approach. Every semester that faculty have interacted with peer mentors has led to new insights into how students can learn better, stay engaged, and persist.

### *Faculty Understanding of Student Needs*

Faculty realized their students' particular needs by communicating with peer mentors. In some cases, students were struggling with technology, and in others, with more specific class content. Faculty could better understand student needs and offer alternatives and solutions that helped students feel more confident and even increased their chances of passing their classes successfully. For example, a math faculty in fall 2025 shared their experience with their students having difficulties with the course LMS, Canvas, mentioning, “The mentor that's embedded in my course has been guiding students on how to use the LMS.” This faculty added that this usually happens among students taking first-semester courses, noting that “6 or 7 out of our 20 students needed assistance with basic Canvas navigation. It's a developmental course, it's one of the ones people get in the very first semester they arrive at the CC. A Biology faculty in spring 2026 echoed this same students' struggle, emphasizing how this was more evident among post-traditional students. The biology faculty added, “Some of the older students struggle more with the technology.” After this experience, faculty were more aware that students needed more time and practice to learn and navigate Canvas.

Furthermore, faculty confirmed that students had specific difficulties with class content, which were addressed with peer mentors. Students trust their peer mentors and, in many cases, talk more often with mentors than with faculty. In particular, mathematics remains a struggle for many students. Two math faculty members who participated in focus groups in fall 2025 mentioned this. “Some of my students struggled with the concept of fractions, but they did not attend either my mentor's office hours or my own.” And “Students struggle with math. They are constantly struggling to learn new concepts, prepare adequately for exams, and complete assignments on time.” Sometimes it is more than just difficulty with concepts; students do not know how to navigate college. A physics faculty noted this behavior in their students and proposed the following,

> Some students don't reach out, but they're struggling. So the idea is that they're not… and that's, like, more an online class. So, I implemented one part of saying that if you reach out to your mentor, you can get an extra point…it increases the students being able to finish their course successfully -faculty, physics, Spring 2026.

The physics faculty realized that connecting students with a peer mentor had positive learning outcomes. This same professor observed that "There is that connection where students will be able to ask them [mentor] some questions that they don't ask you [to the faculty]." Revealing the deeper connection again, students develop with peer mentors. On this same subject, a math faculty highlighted the important role of the mentor in the classroom, adding,

> For individuals, the mentor has made a difference, right? Like, maybe not for the whole group, but for individuals within each group…if someone needs 4 hours every week, they could go to tutoring or use Upswing, but having a relationship seems to make a difference-faculty, math, Fall 2025.

Likewise, a biology faculty member said something similar, mentioning, "I think it [the mentor] made a difference in terms of how the students felt about the class and being more determined to succeed." Not only do peer mentors matter for students' academic performance, but they also serve as a bridge between faculty and students. With the participation of the mentor in the classroom, students seem to be better prepared when it comes to interacting with their professors, as noted by a physics professor, who shared,

> For the classes with peer mentors, when they [students] ask any questions… by the time they get you, you see they ask questions, like, they're already very much prepared for some discussion. The opposite happens in classes with no mentors. -faculty, physics, Spring 2026.

This was an interesting discovery by this professor, who realized that students who maintain continuous communication with their peer mentors process the class content better, as evidenced in the learning outcomes. This same professor describes the experience of having post-traditional students in the physics class, saying,

> I would say, the students who are considered older learners, they're different, but in one of the courses I saw is that they want more detail. So some of them… Could be that they just need that course, maybe to apply to med school. So they… so they're already so much prepared. -faculty, physics, Spring 2026.

This quote exemplifies how post-traditional students behave differently from college-age students, who are more intentional about their learning and know how this knowledge will help them move to the next step. Similarly, a chemistry faculty member learned from their peer mentor about students who work full-time, a

common characteristic among community college students. The faculty advised the peer mentor to provide support outside of regular business hours to accommodate such students' schedules, as exemplified by the following quote:

> Students that are in those classes normally have a full-time job, families and other responsibilities. So, having an office hour from 8 to 5 may not really work for them. So I try to have my peer mentors maybe have at least once or twice a week to have an office hour after 5 pm. faculty, chemistry, Spring 2025.

Overall, this theme described how faculty, through their interactions with the peer mentors, became more aware of specific student needs. Other times, the same faculty observed particular behaviors, for example, from students taking online classes or post-traditional students, offering opportunities to engage and keep learning. Data also suggest faculty empathy for students' needs that may intersect with other identities such as caregiving responsibilities, full-time employment, and age, among others.

## Discussion and Implications

The existing literature indicates that students with diverse identities may be less likely to succeed in STEM degree programs. STEM degree achievement gaps exist amongst gender, racial, and other social identities (Chiu & So, 2025; Liu, 2018; Robinson et al., 2022). While research is mixed, reasons for these gaps may be related to the lack of representation of diverse identities in the STEM workforce. This study, however, does not reinforce this deficit framework. Rather, this research confirms the impact of effective pedagogical interventions on students' self-efficacy specifically within STEM disciplines (Contreras Aguirre & Long, 2026; Kuchynka et al., 2021; Long et al., 2025). Prior literature demonstrates that active learning, group assignments, flipped classrooms, and peer support, among other techniques, can increase students' academic and social performance; this study, however, explored the impact of a peer mentoring initiative on faculty teaching styles and their understanding of students' unique needs.

This study aimed to address two questions. First, *what new pedagogical strategies did STEM faculty implement as a result of having a peer mentor embedded in their classroom?* This question was answered by data collected in faculty and peer mentor focus groups. While faculty were the main drivers of changes in teaching strategies or embedding new academic activities to supplement course content, data suggest that peer mentors were active partners in transforming the classroom environment. The presence of peer mentors allowed faculty to create an environment that fostered equitable learning across all students. Faculty attributed changes in pedagogy to include active learning assignments in which students completed in-class exercises. The peer mentor assisted in responding to students' questions in real time, an effort

that would have fallen to the instructor. Moreover, faculty reported that such techniques were not feasible without the peer mentor, suggesting they would not happen in a non-peer-mentored course.

Peer mentors were also largely instrumental in innovative teaching strategies. As peer mentors were required to hold office hours, they identified ways to engage students. Often, peer mentors would consult with the course instructor to determine what content to review with students in office hours, in individual and group settings. Peer mentors developed learning games, worksheets, and other opportunities for students to practice difficult math and science content. Peer mentors reported that these opportunities were popular, with many students attending their sessions or specifically requesting resources.

The second research question addressed *how STEM faculty's understanding of students' learning needs changed as a result of having a peer mentor embedded in their classroom. This question* was answered through focus groups with faculty, who reported an increase in empathy for students' unique learning needs, which also intersect with students' identities. Peer mentors served as a mechanism of communication between students and the faculty. This resulted in peer mentors directly providing information to faculty, who then offered solutions that helped students perform well in their courses. Faculty provided guidance on how to assist students with course technology, which was useful for older students unfamiliar with such requirements. Additionally, the data show that faculty were understanding of students with other identities, such as those with parental responsibilities or who worked full-time. Learning about these unique experiences helped faculty identify how best to support all their students. Much of this awareness led them to rethink their pedagogical techniques.

This study demonstrates the importance of multiple touchpoints within STEM education instruction, particularly at a community college. Furthermore, the institution where this study takes place is an HSI, where 98% of students rely on some form of financial aid. The data collected in this study also point to other student identities, e.g., parenthood, full-time employment, older students, first-generation status, and others, that are illuminated in the STEM classroom. As a result of the peer mentor intervention, faculty developed a greater understanding of the nuances of students' lived experiences and, in turn, their diverse learning needs. Synergy forged between the faculty and peer mentor enabled innovative teaching strategies to be embedded both in and outside the classroom.

This study has implications for teaching, practice, and research. This study is part of an ongoing study, and the peer mentoring program was started due to the historic DFW rate of 30% of the courses of interest. Since the peer mentoring program started in Spring 2023, data collected through Spring 2025 shows an average DFW rate of 25% across the courses. These data suggest that the peer mentoring initiatives increase student pass rates. Data from Fall 2025 through Spring 2026 have not been collected. Peer mentoring provides students with access to additional academic and social support that they may not feel comfortable asking for from a faculty. Thus, it

can be ascertained that peer mentoring enables faculty to implement novel pedagogical strategies to increase student engagement and self-efficacy specifically within STEM disciplines. Prior research identifies gaps in STEM degree attainment among underrepresented identities (Chen, 2009; Fry et al., 2021; Santiago et al., 2024). Yet, by adding a peer mentor embedded in math and science courses, such gaps may decrease, enabling a more diverse STEM workforce.

Future research could explore academic outcomes of peer mentoring on student retention and completion rate, as well as longitudinal career outcomes – whether or not students such as those enrolled at a Hispanic Serving community college pursue a STEM career. Perhaps what is most unique about this study's findings is the way in which peer mentors serve as a conduit for increasing faculty understanding, awareness, and empathy of students' unique needs. Without the peer mentor, faculty may have limited knowledge of what students need to thrive within a STEM program.

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## Declarations

### *Author contributions*

**Hilda Cecilia Contreras Aguirre:** Concept. – Cur. datos – Red. borr. orig. – Rev. y ed. – Approval of the final manuscript submitted to the journal.

**Maryanne Long:** Investig. – An. formal – Red. borr. orig. – Rev. y ed. – Approval of the final manuscript submitted to the journal.

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The authors declare no conflict of interest.

### *Data availability statement*

The data will be available upon request to the authors.

### *Ethical implications*

The authors declares that this article has no ethical implications regarding its development, writing, or publication.

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