Original Research Paper

Breaking Barriers: Fostering STEM Belonging and Success through Early Student-Faculty Interactions

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Abstract: Higher education institutions struggle to improve student retention and graduation rates, particularly in STEM fields. The First2 Network recognized specific challenges to first-generation college students and set out to improve persistence of both first-generation and underrepresented STEM majors in their first two years of college to increase degree completion. Fairmont State University's College of Science and Technology, as a part of this statewide First2 Network grant initiative, implemented several targeted events aimed at improving relationships between students and faculty, a known barrier to persistence. Two of these events targeted incoming STEM freshmen: a Summer Bridge Program and a fall SciTech Social. In August 2023 and 2024, a week-long summer Bridge Program was designed and implemented for a select group of first-generation and underrepresented incoming STEM freshmen. The students moved onto campus early to spend three days engaged in activities designed to prepare them "to college", while attending workshops on study skills, participating in activities designed to increase their sense of community, and networking with college faculty. Survey data indicated that after the program, students felt more comfortable interacting with faculty, were more knowledgeable of academic resources, and had a higher sense of belonging at college. Since 2022, the college has implemented the "SciTech Social", an annual picnic during the first week of the fall semester designed to promote early student-faculty interactions for all incoming freshmen. During the event, students and faculty mingled over lunch, participated in social games to encourage conversations, engaged in lawn games, and explored STEM club information tables. The event has grown annually, with increasing participation and positive feedback from both faculty and student attendees. Survey data indicated that students who attend the social feel they are more likely to engage with faculty throughout the semester and visit faculty during office hours. These early opportunities for student-faculty involvement help students feel less intimidated by their professors, which may significantly impact the likelihood of student academic success and persistence in STEM majors.

Keywords: student-faculty interactions, belonging, first-generation college students, STEM

Introduction

The number of first-generation college students is increasing at institutions nationwide, but these "new-to-college" students encounter multiple barriers, including academic preparedness, sense of belonging, imposter syndrome, and financial strain, which limit their retention and likelihood of graduating (Davis 2019). As of Spring 2025, there are a total of 602 students in Fairmont State University's College of Science and Technology with 226 (38%) designated as first-generation students. While there are 124 first year students enrolled in the college, 51 (41%) of those students are first-generation, which face these barriers. The institution, which is a hilltop campus in the suburban community of Fairmont, West Virginia, has

developed targeted early interventions with support of the First2 Network (Howley 2021). These include Bridge Program workshops and out-of-classroom social gatherings with faculty and incoming freshmen science, technology, engineering, and math (STEM) majors.

"Bridge Programs," or pre-college programs designed to aid in the transition from high school to college, are diverse in their designs, audience, and focus, with the ultimate goal of student persistence. One such program implemented by the United Way of King's County was the "Bridge to Finish" program, designed to reduce the impact of financial barriers (Henderson *et al.* 2023). These programs focused on providing food services (42.5%), housing (10.9%), and emergency grants (11.2%), with 11.7% utilizing multiple services. Other Bridge Programs pair community college faculty with high school teachers to align their courses or provide internet modules in high schools (McCabe 2005), exposing students to college material before starting their freshman year. Idaho State University found some early success implementing a seven-week summer program called Bengal Bridge, consisting of two general education courses to "jumpstart" the students (Frischmann *et al.* 2017). Bridge programs involving early college high schools have been created for Hispanic students in Utah and California and were designed to engage them in college content while in a familiar, comfortable high school atmosphere (Trevino and Mayes 2006; Gandara 2004). Early college models teaching high school students college material in their last two years of high school have also been employed, including Bard schools in New York (D'orio 2022). Zhe *et al.* (2020) described a ten-week summer bridge program used to successfully recruit students into STEM majors at the University of Akron. Fairmont State had, in fact, previously implemented a two-week research experience as a sort of bridge program for several years in the past (Stover 2024). While effective, the timing interfered with summer jobs making recruitment often difficult. All of these extensive bridge programs, while different in scope and design, proved effective in college retention or recruitment to some extent. Many were long-term focused on college content preparation or reducing financial burdens. What was not addressed was the efficacy of a short-term Bridge Program and engaging social events to break down barriers between faculty and students and encourage a "sense of belonging".

Fostering a sense of belonging within the campus STEM community is important in improving the entry and persistence rates of first-generation STEM students. Strayhorn (2012) urges that sense of belonging is an essential part of academic success because of a correlation of feeling belongingness with the behaviors of seeking and using campus resources and engaging in campus activities. Gopalan and Brady (2019) studied 4-year colleges and also found a positive association between belongingness and use of campus services and persistence.

York (2025) indicates that students' sense of belonging can change, which makes interventions such as Bridge Programs and faculty-student social gatherings capable of making significant impacts in well-being, persistence, and academic achievement. Students without a sense of belonging tend to fall through the cracks and struggle to succeed academically because they do not seek help from instructors and mentors. Therefore, early intervention efforts aim to help students feel more comfortable seeking help from their STEM professors, campus resources, and peers as quickly as possible when adjusting to college life.

Office hour visits are an important resource in seeking help. In fact, Guerrero and Rod (2013) found a positive correlation between the frequency of office hour visits and course grades; yet Hsu *et al.* (2022) found that 10.9% (57.8 of 531) of STEM student respondents avoided office hours because they "perceived them as scary or identified a social stigma surrounding attending office hours." First-generation students may be even more susceptible to this negative perception of office hours due to the nature in which they've dealt with problems throughout their lives up until college. Shaw *et al.* (2023) explains, "If persistence and self-reliance got them to college, first-generation students share anecdotally that they hesitate to seek assistance on how to navigate the new environment of college." Finding ways to encourage students to utilize office hours becomes an important hurdle to overcome.

Nadler and Nadler (2000) found that students' engagement in informal contact hours with faculty correlated with improved academic performance, college satisfaction, and retention. Similarly, comfort in approaching campus resources could increase the persistence of first-generation college students. Shaw *et al.* (2023) share that first-generation college students report higher awareness of campus resources than continuing-generation students; however, they are less likely to use campus services. They also found that students experience an increased sense of belonging at their institution when using student support services such as academic advising, financial aid, and mental health services.

Fairmont State's Bridge Program and faculty-student social gathering, called the SciTech Social, aimed to foster a supportive STEM campus environment to bolster students' sense of belonging.

They also engaged students with academic opportunities and promoted the use of faculty office hours. This study evaluates the impacts of these programs on mitigating the challenges faced by first-generation STEM students at Fairmont State University.

Methods

Fairmont State University collaborated with the First2 Network to plan and implement the Bridge Program and SciTech Social. The First2 Network (Howley 2021) is an NSF-funded collaborative group of universities and other organizations across the state of West Virginia working to increase the retention of students in STEM fields. They particularly focus on rural, first-generation, and low-income students, as those students often face the most barriers to success. Fairmont State University has been part of the First2 Network since it began in 2015, using the process of improvement science (Bryk 2015) to test the impact of "change ideas" such as those addressed in this paper. First2 Network provided multiple forms of support for the studies presented here. In addition to providing funding, the organization also provided coaching on both the instruments and processes implemented with these change ideas. Data collection for each of the surveys occurred with Qualtrics and required participants to review and provide informed consent prior to participation.

Bridge Program

Fairmont State University's Bridge Program has supported incoming STEM students by providing structured academic preparation and social integration. The main objective was to facilitate the transition from high school to college through workshops, mentorship opportunities, and community-building activities. The Bridge Program was designed with a long-term perspective, integrating multiple interventions to enhance student retention and success in STEM disciplines. The initiative aimed to strengthen students' academic self-efficacy, improve their sense of belonging, and encourage engagement with faculty and campus resources.

The program was designed to be convenient for and attractive to students, moving them into their dormitories earlier in the same week, preventing interruptions in summer work schedules. Activities included workshops on test anxiety and STEM stressors to equip students with strategies to manage academic pressures; campus resource sessions introducing students to academic support services and student affairs; faculty and peer mentor meetings to facilitate early connections between students and the university's academic community; campus scavenger hunts and class schedule walk-throughs to provide students with familiarity and confidence in navigating their new academic environment; and evening fellowship activities to reinforce a sense of community among program participants. A notable program component was the Speed Networking event, introduced in the 2024 program, which utilized a structured format to encourage engagement between students and faculty. In this session, students were paired into groups and rotated every seven minutes to meet different STEM faculty members. Discussions focused on shared interests, ongoing research projects, student aspirations, and potential career pathways. Twenty-five faculty members representing nine disciplines participated in this event.

The Bridge Program ensured participants continued into a first-year seminar course led by the Bridge Program facilitator. This course reinforced the foundational skills introduced during the Bridge Program, providing ongoing support throughout the fall semester. The first-year seminar course also served as a consistent faculty point of contact for students as they navigated academic and social challenges in their first year.

During the 2023 and 2024 Bridge Programs, participants completed pre- and post-surveys to assess changes throughout the program. The pre-survey was administered during the opening lunch, while the post-survey was conducted after the final session. These surveys measured participants' self-efficacy, career interests, sense of belonging, and comfort in engaging with faculty. The design and implementation of the survey instruments varied between 2023 and 2024, reflecting changes in oversight and research focus. In 2023, the survey was developed with the support of an external advisory group, which also assisted with data analysis. A standardized survey was administered to all of the First2 Network institutions hosting research immersion or Bridge Programs. This instrument included a core set of questions applicable to all participating institutions, supplemented by a section of site-specific questions tailored to Fairmont State University. In contrast, the 2024 survey was independently designed, as the advisory group no longer provided a standardized instrument. While the 2024 survey retained elements inspired by the previous iteration, it was intentionally more concise, focusing specifically on the learning objectives of the Fairmont State Bridge Program. This revision allowed for a more targeted assessment of program outcomes.

The 2023 and 2024 surveys incorporated pre- and post-program components to measure changes in student perceptions and experiences. Key areas of

inquiry included career aspirations and interest in STEM disciplines, self-efficacy in STEM coursework, confidence in engaging with faculty and seeking academic support, and sense of belonging within academic and STEM-related communities. Despite these common themes, the surveys exhibited several structural and analytical differences. The 2023 survey assessed students' overall sense of belonging at their institution, whereas the 2024 version refined this focus to examine belonging specifically within the campus STEM community. Additionally, the 2023 post-survey included a section evaluating students' perceptions of the program's value and identifying the components they found most beneficial.

A significant methodological distinction involved the aggregation of survey responses. In 2023, responses were anonymized and aggregated, preventing direct comparisons between individual students' pre- and post-survey data. Conversely, the 2024 survey employed a linked-response approach, enabling paired comparisons to assess individual student growth over the duration of the program. This methodological shift allowed for a more precise evaluation of the program's impact on student development.

SciTech Social

The Fairmont State SciTech Social first began in August 2022. During previous convenings of First2 student leaders, it was suggested that efforts be made to break down the barriers between faculty and students using an informal event in a small STEM-focused social setting at the beginning of the academic year. The event could expose freshmen to their STEM faculty, STEM clubs, and campus resources, in hopes of generating a sense of belongingness on campus among STEM freshmen. In addition, the event might encourage these students to join campus clubs earlier in their education, to visit STEM faculty offices more frequently, and to utilize campus resources more readily. The event was first implemented during the first week of the fall semester in 2022 and has continued to be held every August since. Over the course of three years, the change idea has developed into a first-week, informal College of Science and Technology lunch picnic in the SciTech quad for all STEM majors, faculty, and staff. The August 2024 event included icebreaker activities such as yard games (i.e. cornhole, ladder ball, and giant Jenga) and a "Faculty Did What?" BINGO card game. The BINGO card was filled with relatable life events and accomplishments, and students gathered signatures from STEM professors who had the relevant life experiences. Faculty were asked to actively engage with students and offer their signatures as the students stood in line for food. Raffle prizes encouraged students' participation in completing a "Full Bingo" and submission of a post-survey.

During the first week of classes of the Fall 2024 semester, but before the day of the picnic, faculty invited all STEM majors to the Social and provided class time for students to complete a Qualtrics pre-survey. Extra emphasis for attendance was provided to the 124 STEM freshmen enrolled at the institution. The pre-survey gauged students' awareness of campus resources, their sense of belonging, and their intimidation level toward faculty. During the picnic, students used a QR code to check-in and self-report their major, year of school, and first-generation status. A post-survey was linked at the top of the BINGO cards, and students were required to fill out the survey before their completed BINGO card could be entered for the raffle prize. The post-survey was also administered by faculty in their classes the week immediately following the event. Students were instructed to only fill out the post-survey one time. The post-survey was mostly identical to the pre-survey, allowing a comparison of student attitudes before and after the event. A separate questionnaire was also completed by the faculty immediately following the event. An end of semester survey was sent by email to all SciTech students at the institution and served as a follow-up to assess sustained effects of participation in the SciTech Social. Non-STEM majors who came to the event were not turned away, but only survey data from STEM majors was analyzed.

Bridge Program Results

In 2023, fourteen students participated in the Bridge Program. However, only seven students who planned to continue with the First2 Network during the academic year were surveyed. All seven First2 students filled out the post-survey, but only six filled out the pre-survey. Demographic information was only collected during the pre-survey. Of the six who filled out the pre-survey, half self-reported as a first-generation college student. Half of the students identified as male, and half identified as female. Four of the students were white, one was black/african american, and one was mixed white and black/african american. The students planned to major in forensics, occupational safety, engineering (type not specified), computer science, and biology (two students).

In 2024, the surveys were administered to all students participating in the Bridge Program. Thirteen students participated in total. Only eleven filled out the pre-survey and ten filled out the post-survey. Of the eleven students who filled out the pre-survey, nine self-identified as a first-generation college student. Eight participants were male and three were female. Ten of

the students were white, and the other student was mixed American Indian/Alaskan native, black/African American, and white. The students planned to major in chemistry, biology (two students), civil engineering technology, mechanical engineering technology (three students), and electrical engineering technology (three students). Additionally, one student planned to double major in biology and chemistry.

Most of the survey questions asked students to rate their agreement with different statements using a Likert scale, with 1 representing "strongly disagree" and 5 representing "strongly agree". In the results below, higher scores mean students agree more strongly with the statements. The slight difference in sample sizes between the pre- and post-surveys should be considered when interpreting averages. The data from both 2023 and 2024 suggests that the students who participated in Fairmont State's Bridge Program increased their sense of belonging in STEM, their comfortableness interacting with faculty members, and their knowledge of campus resources. These key results are summarized in Figures 1 and 2. The standard deviations, p-values, and effect sizes of the 2024 results are detailed in Table 1 in Appendix A. Statistical analysis was not performed on 2023 data because of the low number of responses.

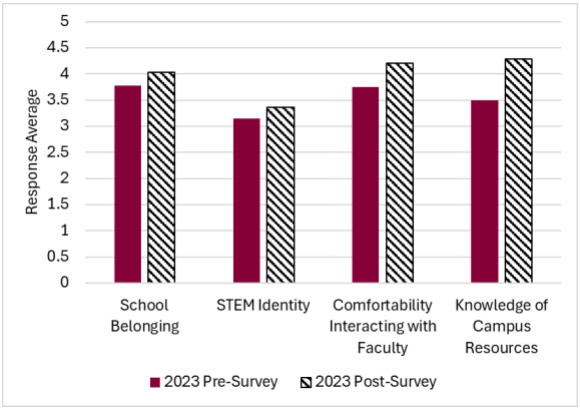

Figure 1. Key Results from the 2023 Bridge Program Data. *Pre-survey (solid) and post-survey (striped) results from Fairmont State's 2023 Bridge Program survey data.*

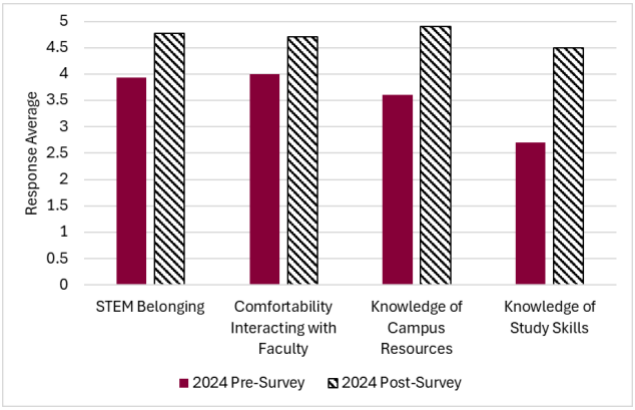

Figure 2. Key Results from the 2024 Bridge Program Data. *Pre-survey (solid) and post-survey (striped) results from Fairmont State's 2024 Bridge Program survey data.*

Belonging

The 2023 surveys had a section on both the pre- and post-survey titled "School Belonging". Students rated statements such as "I will feel accepted at college", "I will feel respected at college" and "I will feel like I fit in at college". The average score on the Likert scale for the statements about School Belonging increased from a 3.77 to a 4.03. There was also a section on "STEM Identity", which is likely linked to students' sense of belonging in STEM. This section asked students to rate statements such as "I see myself as a 'science person' or an 'engineering person'" and "I have come to think of myself as a 'future scientist or engineer'". The average of responses to the statements on STEM Identity increased from a 3.14 to a 3.36.

The 2024 pre- and post-surveys contained a section on students' sense of belonging in the STEM community on campus. It included statements such as "I feel comfortable in my campus' STEM community and classes" and "I feel that I belong in my campus STEM community". One of the statements in this section addressed students' comfortableness interacting with faculty and so was removed from the average so it could be looked at separately. The average score of the other belonging questions increased from 3.93 to 4.77, with the change in each question being statistically significant ($p<0.05$). Additionally, all of the belonging questions received at least four more "strongly agree" responses in the post-survey compared to the pre-survey.

Interactions with Faculty

The 2023 surveys asked four questions about students' confidence and comfortableness interacting with faculty members. The students rated statements such as "I feel comfortable asking my STEM faculty members for help when I have difficulties in my courses" and "I feel comfortable conversing with my STEM faculty and staff". The average score on the questions about faculty increased from a 3.75 to a 4.21. The 2024 surveys had one statement about interacting

with faculty: “I feel comfortable speaking with faculty or other First2 Institutional Team members on my campus”. The score of this question increased from 4.00 to 4.70, with a p-value of 0.02, and five more students answered “strongly agree” on the post-test.

Campus Resources and Study Skills

Two questions on the 2023 surveys addressed students’ knowledge about and comfortableness utilizing campus resources. These questions were “I know where to go for help when I encounter difficulties in my STEM classes” and “I feel comfortable seeking out help at campus resources such as the library and the tutoring center”. The average score of these two questions increased from a 3.50 to a 4.29.

The 2024 surveys asked students to rate their knowledge about "Available resources on my campus to help students succeed” on a scale of 1 to 5, with 1 meaning "None” and 5 meaning “A Great Deal”. The score increased between pre- and post-surveys from 3.6 to 4.9, with seven more “5” responses on the post-survey. The students were also asked to rate their knowledge of “Effective study skills that can lead to academic success” on the same scale. The average responses on that question increased from 2.7 to 4.5. There were no “5” responses on the pre-survey and six such responses on the post-survey. Both of these questions had p-values of 0.001 or less.

SciTech Social Results

2023 SciTech Social

Prior to the Fall 2024 SciTech Social, it was already established that both faculty and students felt that the event was a worthwhile event and promoted communication. In 2023 there were 120 student attendees and 80 completed the survey. As a result of participating, 93.0% reported they felt more comfortable talking to STEM professors and 95.3% indicated they were more comfortable approaching professors because of the 2023 SciTech Social. On the follow up survey for 2023, 92.9% of the student attendees felt the event was valuable for a STEM major and 94.1% of freshmen felt it was worthwhile, while all the self-reported first-generation students agreed it was worthwhile. A response rate of 44.0% (24 faculty members) was captured on a faculty survey and indicated 95.5% felt it was a worthwhile event. 85.7% reported the event helped students feel more connected to them, but only 47.6% reported they thought the event encouraged them to visit their offices during the semester. Based on these data, the 2024 SciTech Social was adapted to continue examining these relationships.

2024 SciTech Social

The pre-survey was completed by 125 students during the first week of classes. On the day of the event, 112 student participants checked-in using a QR Code when entering the line to the picnic. Responses indicated 37 freshmen, 23 sophomore, 25 junior, and 24 senior undergraduate student participants, along with three graduate students. Thirty-two percent of the overall student attendees were first-generation and 14 were first-generation freshmen. Only 66 students participated in completing the post-survey after the event, 40 of whom had attended the SciTech Social. The questions were scored on a 5-point Likert scale with 5 being assigned as "strongly agree". The averages of scores are represented. Statistical analysis of the results are included in Table 2 of Appendix A.

STEM Campus Community

Three questions on the pre- and post-surveys assessed changes in students’ feelings toward the campus STEM community. Respondents rated the statements: “I feel respected in my campus’s STEM community”, “I feel comfortable in my STEM community and classes”, and “I feel that I belong in my campus STEM community.” The average response to these three questions was 4.36 on the pre-survey, 4.49 on the post-survey by students who attended, and 4.41 on the post-survey by students who did not attend. The average responses to each of these statements is shown on Figure 3. The average responses of students who attended were slightly higher than those who did not attend. Although a significant difference in belongingness was not measured, the SciTech Social did enhance engagement among the campus’s STEM community by making students more aware of various STEM clubs (see Appendix A, Table 2). STEM majors also expressed the event offered value and was enjoyable as shown in Figure 4.

Interactions with Faculty

Four questions on both the pre-survey and post-survey dealt with students interacting with STEM faculty. Three were identical on both surveys and asked students to rate the statements: “I know where to go for assistance if I run into trouble with classes”, “I feel I can easily contact or talk to my STEM class professors”, and “I feel comfortable approaching the professors of my STEM classes”. The average response of these three questions was 4.57 on the pre-survey. On

the post-survey, the average response of students who did not attend was 4.46, while the average response of students who did attend was 4.52. The average responses by question are included in Figure 3. Both of the post-survey averages are slightly lower than the pre-survey averages, but this is not a significant concern due to the low number of responses.

An additional question asked about the intimidation students felt toward interacting with faculty. On the pre-survey, students were asked to rank the statement "I feel a little intimidated by my professors". The average response on a Likert scale was 2.62. On the post-survey, the students who attended were asked to rank the statement "As a result of attending this event, I feel less intimidated by my professors." The average response to this question was 4.27, as shown in Figure 4. This shows the students self-reporting that they felt more comfortable with faculty as a result of the SciTech Social.

College of Science and Technology faculty members were asked to complete a 2024 SciTech Social faculty survey. The survey had 32 respondents which represents a 58% response rate. All of the respondents considered the event worthwhile and thought the event helped their students feel more connected to them. Twenty-six faculty members agreed that the casual, social style introduction helped students better communicate with them about issues they faced in their courses and 27 reported that the SciTech Social encouraged students to visit their office during the semester. These faculty responses support the value of the SciTech Social for improving student-faculty interactions.

End-of-Semester Survey

At the end of the Fall 2024 semester a follow-up survey was sent by email to STEM students. Of the 27 respondents, 14 reported attending the SciTech Social while 13 reported not attending. The survey examines the relationship between attending the SciTech Social and other behaviors (e.g. vistiing professors' office hours and joining a SciTech club) deemed desirable for cultivating a positive campus STEM community and obtaining academic achievement.

Five questions allowed respondents to self-report the frequency of their behaviors as either 1-3, 4-6, 7-10, 11-15, or 15+ times per semester. If a participant indicated a frequency of 1-3, it was scored with 1 point. Scoring for responses increased by 1 for each new frequency interval (i.e. the response 4-6

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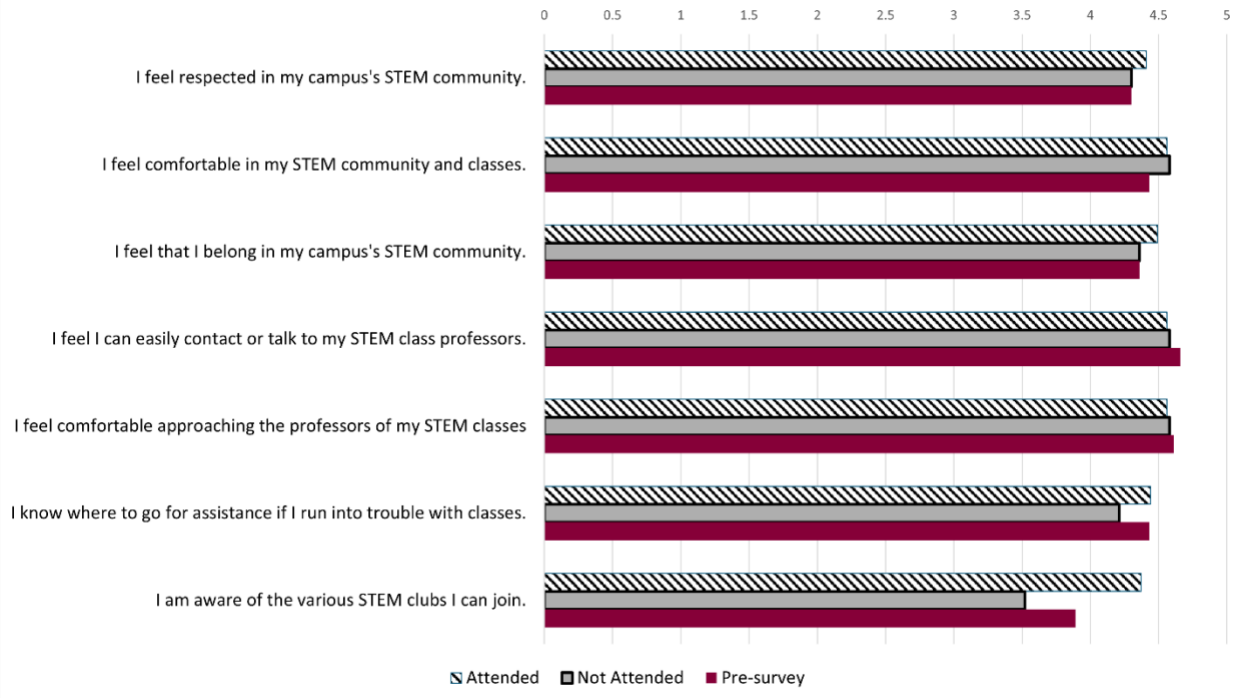

Figure 3. SciTech Social Impact on Student Interactions with Faculty and STEM Campus Community. SciTech Social survey data from Fairmont State's 2024 pre-survey (dark solid), post-survey for students who did not attend (light solid), and post-survey for students who attended (striped).

received 2 points, 7-10 was scored as 3 points, etc.) The frequency average score for each group was determined by dividing the total score by the number of participants in the group. Figure 5 represents the average scores for each group's response to the questions. Unpaired t-tests (shown in Appendix A Table 3) show that the likelihood of students to email or contact professors during the semester is not statistically different between students who attended the social and those who did not (p=0.38). However, the likelihood of students to visit professor office hours and join a SciTech club is significantly higher (p=0.005 and 0.011 respectively) for students who attended.

Additionally, the 14 respondents who reported attending the 2024 SciTech Social were asked to respond with a 5-point Likert scale for several questions about how much they valued the event and the impact the event had on their engagement with faculty and the campus community. These questions and their average responses are shown in Figure 4. All averages are 4.0 or above. Even though the post-survey questions discussed in the previous section did not see significant differences between attendees and non-attendees, the end-of-semester survey results indicate the value of the SciTech Social for encouraging student-faculty engagement and students' belongingness on campus.

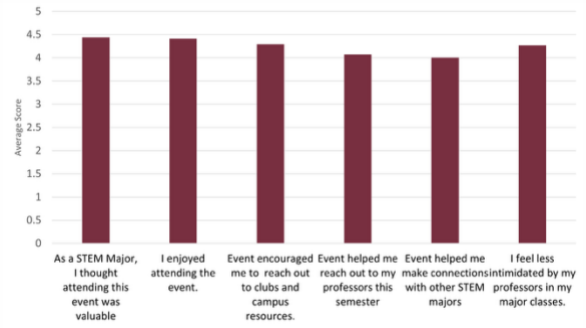

Figure 4 Participants' Perspective of the 2024 SciTech Social. *Attendees' perspective of SciTech Social's Impact on their interaction with STEM Faculty and involvement in campus STEM community*

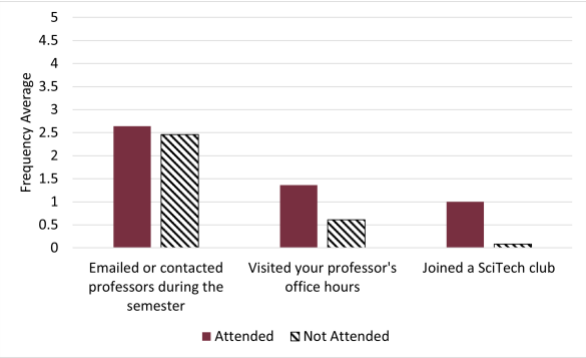

Figure 5. End-of-Semester Survey Data for 2024 SciTech Social*. End-of-semester survey scores from Fairmont State students who attended (solid) and did not attend (striped) the 2024 SciTech Social.*

Discussion & Conclusion

Many bridge programs focus on academic readiness (for example Frischmann *et al.* 2017 and Trevino and Mayes 2006) or financial assistance (Henderson *et al*. 2023), but it is less common for programs to focus on improving students' sense of belonging on campus and in their STEM community. Fairmont State positively impacted the sense of belonging of participating freshmen by focusing on engagement with STEM faculty, peers, and the campus as a whole. By starting college with a stronger sense of belonging, the students are more likely to succeed academically and persist in their STEM degree programs (Gopalan and Brady 2019; York 2025). The large effect sizes for the belonging questions on the 2024 Bridge Program survey suggest that Fairmont's model can be applied on other campuses with large first-generation populations.

While considering belongingness, the Fairmont State Bridge Program still focused on academic readiness by improving the incoming freshmen's knowledge of available campus resources and study skills. During the programs, students were exposed to the library, tutoring center, student success office, career services, and more through presentations by people who worked at the office as well as a campus scavenger hunt. Combining formal presentations with fun activities appears to have been successful, as students reported significantly higher knowledge of campus resources after the program. Up to 50% of students on an average college campus are unaware of the campus resources available to them (Shaw *et al.* 2023).

The Bridge Program is thus removing this barrier for student success. However, many students do not utilize on-campus resources even when they are aware they exist. This is especially true for first-generation students (Shaw *et al.* 2023), the target audience of Fairmont's Bridge Program. Therefore, it would be valuable to do a more in-depth study of the frequency with which Bridge Program participants engage in campus resources throughout the semester and how that compares to the average student.

Both the Bridge Program and the SciTech Social positively impacted students' comfortableness interacting with faculty. After the Bridge Program, students self-reported a stronger sense of comfortableness interacting with faculty after the event than they did before the program began. On the SciTech Social post-survey, students who attended

reported feeling less intimidated by faculty as a result of the event. No data were collected to see whether the Bridge Program participants actually interacted with faculty more than the average student during the semester as a result of this increased comfortableness. This would be a useful follow-up study. However, on the SciTech Social end-of-semester survey, most students who attended the social reported attending office hours more frequently during the fall semester than those who did not. Interestingly, both groups of students were equally likely to email their professors, but the students who attended the social were more likely to engage with their professors in person. The students who interacted with their faculty in a casual environment at the beginning of the semester were less likely to "hide behind a screen" and more likely to actually go to office hours where they could receive assistance in their classes, mentoring, and advising. By removing the intimidation barrier between students and faculty, the SciTech Social encouraged students to interact in-person with faculty throughout the semester and hopefully their entire time at college. These student-faculty interactions outside the classroom have been found to increase students' sense of belonging and chances of academic success and persistence (Nadler and Nadler 2000; Shaw *et al.* 2023; York 2025).

Fairmont State plans to continue to implement both of these targeted early interventions in order to continue to support the belonging and academic success of Fairmont State's large first-generation student population. The SciTech Social is fully funded by the College of Science and Technology and does not require outside funding sources to continue. The organizers of the event plan to focus on improving the advertising process so that a larger fraction of first year and first-generation students attend the event. In the future, Fairmont State plans to implement further iterations of the College of Science and Technology Bridge Program, building on the successes of the 2023 and 2024 iterations. The program will be one day shorter but open to a larger population of students (up to 50 incoming freshmen). The 2023 and 2024 activities that emphasized student-faculty interaction and familiarity with campus resources will be chosen for future programs, along with a few of the most practical academic-skills workshops. The shortening of time allows the same level of financial and human resources to impact a larger number of students.

Jeff Davis (2019) recommends addressing 14 issues in the preparation of first-generation students for success in college. The Bridge Program addresses both Issue 2-"First generation students need instruction on study skills" and Issue 6- "First generation students need to be enrolled in University 101 courses" by engaging students in pre-college sessions designed to acclimate students and provide college success tips. The SciTech Social continues the process started during Speed Networking of the Bridge Program in addressing Issue 12- "First generation college students need to develop personal relationships with faculty and non-faculty staff members" by using an informal social event and a silly ice-breaker challenge in the first week of classes to begin the process of breaking barriers. Given the promising results of this study, Fairmont State's College of Science and Technology has taken steps to institutionalize both of these interventions as it strives to improve retention of first-generation college students in STEM majors.

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Appendix A

Table 1. Statistical analysis of 2024 Bridge Program Survey Questions. *Paired t-tests were performed for the ten sets of responses on both the pre- and post-tests. The one extra response on the pre-survey was not included in the statistical analysis.*

Paired t-test	Pre-Test Mean	St. Dev.	Post-Test Mean	St. Dev.	P value	Cohen's d
I feel that I belong in my campus STEM community	4	0.81	4.7	0.42	0.022	0.737
I feel comfortable speaking with faculty or other First2 Institutional Team members on my campus	4	0.66	4.7	0.48	0.007	0.85
I feel respected in my campus STEM community	3.9	0.87	4.7	0.67	0.0111	0.87
I feel comfortable in my STEM community and classes	3.9	0.87	4.7	0.48	0.026	0.704
I feel a connection with the STEM community	3.9	0.56	4.9	0.31	0.0005	1.5
Available resources on my campus to help students succeed	3.7	0.94	4.9	0.31	0.001	1.3
Effective study skills that can lead to academic success	2.6	0.69	4.5	0.7	0.0003	1.58

Table 2. Statistical Analysis of the 2024 SciTech Social Pre- and Post-Survey Results shown in Figure 3.

Unpaired t-test	Attended Mean	St. Dev.	Not Attended Mean	St. Dev.	F test	P value (one-tail)	Cohen's d	Glass's delta
I feel like I can easily contact or talk to my STEM class professors.	4.56	0.5	4.58	0.5	1	0.47		4.56
I feel comfortable approaching the professors of my STEM classes.	4.56	0.63	4.58	0.66	1.831	0.37	4.45	
I feel comfortable in my STEM community and classes.	4.56	1.07	4.58	0.66	0.345	0.43	2.34	
I feel that I belong in my campus's STEM community	4.49	1.08	4.36	0.9	0.64	0.31		32.9
I know where to go for assistance if I run into trouble with classes.	4.44	0.74	4.21	0.74	0.912	0.08	4.09	
I feel respected in my campus's STEM community	4.41	1.07	4.3	0.77	0.476	0.33	1.17	
I am aware of various STEM clubs I can join.	4.37	0.92	3.52	1.37	2.446	0.0007		1.8

Table 3. Statistical Analysis of 2024 SciTech Social End of Semester Survey Results shown in Figure 5.

Unpaired t-test	**Attended Mean**	**St. Dev.**	**Not Attended Mean**	**St. Dev.**	**F test**	**P value (one-tail)**	**Cohen's d**	**Glass's delta**
E-mail and contact your professor	2.64	1.54	2.46	1.51	1.05	0.38	0.077	
Number of times visiting professor's office hours	1.46	0.77	0.66	0.65	1.42	0.005	1.536	
Number of times joining a SciTech Club	1.076	1.18	0.083	0.28	16.9	0.011		3.44