BOARD # 57: Transforming STEM (Science, Technology, Engineering, and Mathematics) Education Perceptions in Rural High School Students

Dr. Sandeep Langar, The University of Texas at San Antonio

Dr. Sandeep Langar is an Associate Professor in the Department of Construction Science in the Klesse College of Engineering and Integrated Design at The University of Texas at San Antonio.

Amani Qasrawi, The University of Texas at San Antonio

Amani Qasrawi is a civil engineer pursuing a Ph.D. in Construction Science and Management at The University of Texas in San Antonio. She completed her undergraduate studies in Civil Engineering at Al Balqa Applied University in Jordan and Construction Science and Management at The University of Texas at San Antonio. Throughout her academic career, she has been involved in research and teaching. She is working as a Graduate Research Assistant and Graduate Teacher Assistant at UTSA.

Dr. Tulio Sulbaran, The University of Texas at San Antonio

He received his Ph.D. in Civil Engineer from Georgia Institute of Technology with concentration in Construction Management with a minor in Computer Engineering and strong statistical background. He has over 8 years of work experience in the A/E/C (Archite

Transforming Science, Technology, Engineering, and Mathematics Education Perceptions in Rural High School Students

Author[1], Authro[2], and Author[3]
The University of ABC, State, Country

Abstract
Investing in Science, Technology, Engineering, and Mathematics (STEM) education is critical, especially as technology evolves rapidly and integrates with various professional fields supporting STEM across the United States. Thus, a need for technically adept students who can meet the needs of the STEM professional field(s). This need is particularly significant in the construction industry, where a diverse and technologically skilled workforce is essential. However, the industry faces challenges related to its perception among high school students and their parents, which can limit opportunities for women and minorities. Thus, this study explores how a STEM summer camp (intervention) influences the perceptions of minorities from rural high schools. The research study utilizes a pre-test to establish a baseline understanding of participants' (rural high school minority students) perceptions, followed by an intervention through a STEM-focused summer camp designed to enhance their knowledge and skills. After completing the summer program, the research assesses changes in participants' views on STEM careers and their interest in pursuing STEM fields through a post-test. The pre-and post-tests were conducted as online surveys (hosted via Qualtrics) that consisted of open- and closed-ended questions. The findings indicate that interventions in the form of summer camps significantly impact the participant's (minorities from rural schools) perceptions of the realization of the importance of STEM as an educational avenue and career, the intent to pursue STEM post-secondary degrees and careers and have a learning experience that exceeds expectations.

Keywords: Rural Female High School Students, STEM, Perceptions

Introduction and Background

Science, Technology, Engineering, and Mathematics (STEM) education is vital to the nation's growth, security, and competitiveness, with a need to emphasize education to alleviate some of the concerns [1]. This is particularly true when we compare the US high school student's performance with their peers internationally, especially for science and math scores where they were not in top-ten nations [2]. Although there has been significant effort in the last decade to address the issue on numerous fronts, such as the growth of STEM-focused schools, the level of impacts of the interventions due to multiple reasons, such as limited literature on STEM-school outcomes, student selection criteria, and others continue to limit the effectiveness of the efforts [3]. Further, the educational disruptions due to the COVID-19 pandemic have also contributed to a decline in secondary student performance and learning, with average mathematics scores in 2022 lower than the previous years [4]. Furthermore, the Program for International Student Assessment (PISA), which measures the maths, science, and reading literacy of 15-year-old students, found that the math literacy score was "*lower than the average in 25 education systems* and *not measurably different from the average in 12 education systems*" from a total of 81 participating countries, and education systems from more than 30 countries had an average score higher than the US, with countries such as Singapore and China topping it [5]. Thus, there is a significant need to improve

US students' maths and science skills to ensure that the country maintains its competitive edge and needs of the STEM-based industries.

It is widely recognized that the US needs to train a highly skilled and diverse engineering and scientific workforce to maintain global competitiveness [6]. For example, the industry and occupational employment projections overview indicates that the professional, scientific, and technical services sector is expected to be the fastest-growing sector from 2023 to 2033 [7]. Furthermore, the US Bureau of Labor Statistics has predicted significant STEM jobs growth from 2023 to 2033 [8]. In 2023, there were approximately 10.7 million STEM jobs, which is expected to rise to around 11.8 million by 2033. This increase of about 1.1 million STEM jobs over the decade represents a growth rate of 10.4% [8]. Therefore, given the needs of the industries supporting STEM and the growth in the STEM fields, there is a need for students who have developed complementary skillsets to meet the industry needs.

Along with facilitating STEM education across the nation, it is vital to ensure equitable access to quality education and opportunities for success, especially for marginalized segments of society. In the US, educational inequalities exist based on family socioeconomic status, with children from lower-income backgrounds receiving poorer grades, test scores, and college attendance rates when compared to their higher-income peers [9], [10]. Further, multiple factors, such as the school location, can determine the level of resources enrolled students can utilize when at school, and students from low-income neighborhoods are less likely to receive “underresourced schools” with school resource availability intertwined with district’s “property wealth” in most cases [11], [12]. In addition, low-income communities are also challenged by limited streams of federal funding [11]. Recent research shows that students from rural areas often lack access to advanced STEM coursework, have fewer educational resources, and receive less exposure to STEM role models and career opportunities [13]. These factors can cumulatively impact a student's interest in pursuing career opportunities for students from economically constrained backgrounds, especially with limited access to resources.

Additionally, with the rise of Artificial Intelligence (AI) and the necessity to explore new paradigms while collaborating with AI, it becomes crucial to strengthen STEM skills among future generations. The issue of lower scores and interest among high school students is particularly challenging for students from rural areas. Students from rural areas face many barriers, including limited access to quality education and resources. Such issues hinder their academic performance and reduce their interest in STEM fields. Addressing these gaps is essential for providing all students equitable access to quality education and opportunities to succeed.

Based on the background and the need for enhancing research interest among the population, the research measured the summer camp (intervention) impacts on the participant population (high school students from rural areas) for their perception of the:
1) Importance of STEM subjects and Soft Marketable Skills.
2) Perceptions for post-secondary degrees in STEM disciplines and pursuance.
3) Intent to pursue post-secondary degrees and a career in STEM-related disciplines.
4) Learning experiences at the Highschool Summer Experiences.

Research Methodology

The research used an experimental research method involving three-phased research that involved: experiment preparation, including the development of intervention and measurement instrument (Phase I); conducting intervention involving the pre-test and post-test (Phase II); and measuring intervention impacts using descriptive data analysis (Phase III). The three-phased research aimed to determine the impact of summer camps (intervention) on the population [high school students from the Rural Independent School Districts [(R-ISD)] to measure the intervention impact and assess changes in participants' perceptions of STEM careers and their interest in pursuing STEM fields. R-ISD's are school districts operating in the rural areas. Rural areas for this study have been defined as "*any locality that has a population of 50,000 inhabitants or less, and is generally characterized as having fewer than 1,000 inhabitants per square mile*" [14].

Phase I:

The first phase involved the development of intervention (summer camp) and measurement instruments. This involved establishing collaborations with research stakeholders (R-ISDs), developing a summer camp plan and material (intervention), and developing pre- and post-test instruments to measure the intervention. The first step in this phase was identifying R-ISDs that could be eligible as per the pre-established definition. In addition, researchers also advertised the opportunity to the potential participants in the Education Service Center of Region 20 (State Name). After identifying potential participants, identified stakeholders were invited to online information sessions about the summer camps. About four R-ISDs initially agreed to participate. However, this number was reduced to two R-ISD due to resource constraints and other commitments on the part of the school districts and/or the teachers affiliated with the school districts. After obtaining confirmation from the R-ISD stakeholders, supporting materials such as student applications and summer camp flyers were developed and distributed to the R-ISD representatives. During this phase, the participating R-ISD selected teachers and/or school counselors (one from each R-ISD) were invited to collaborate with the research team to plan, implement, and evaluate the intervention (summer camp).

After establishing collaborations with research stakeholders (R-ISDs), a summer camp plan and material (intervention) was developed. Previous published framework and findings were used as the point of departure for the intervention (Summer Camp) development [15], [16]. The intervention (summer camp) was initially designed to be completed in one business week with 16 sessions. Out of the 16 sessions, five were aimed at enhancing STEM/TEKS, seven for Soft Marketable Skills, three for Career and Higher Education in STEM, and one for STEM Field trip. In addition, the designed instrument had time for regular breaks so that the students. The designed instrument also had time allocation for pre-test (conducted at the beginning of camp) and post-test (conducted at the end of summer camp).

For this study, the pre and post-tests were conducted using a survey method. The survey method was selected for its ability to help identify trends and perceptions at a given point in time. Qualtrics was purposively selected to host an online survey as it has been widely accepted in academia and previous experience of the research team. After identifying the pre and post-test platform, the survey instrument was developed. The pre and post-test survey instruments had similar questions to determine the impact of the intervention (summer camp). After the development of survey instruments, the researchers obtained approvals from the Institutional Review Board (IRB).

Phase II:
The intervention was initially planned as a five-day summer program at the University of AAA. However, due to a federal holiday coinciding with one of the days, the program was adjusted to a four-day schedule by extending the hours each day to accommodate the full content. No sessions were removed, ensuring the change did not impact student learning or the objectives of the summer camp.

Upon arrival on the first day, a pre-test was administered via Qualtrics to assess baseline knowledge. Every day, students arrived at the camp with their teachers from R-ISD and the teachers remained with them during the entire duration of the summer camp. Attendance was recorded daily to monitor participation. Each session during the camp followed a consistent structure, beginning with a 15-20 minute theoretical introduction highlighting the importance of the topic. This was followed by hands-on activities designed to reinforce the concepts covered. These activities included individual tasks/games and team-based projects/games to encourage collaborative learning and engagement. Additionally, selected sessions featured guest speakers from the industry who shared their expertise and real-world applications of the topics discussed. Regular breaks were provided throughout the day to ensure students remained focused and energized.

At the end of each day, assessments were conducted to evaluate the effectiveness of the sessions and the student's understanding of the material. Students were informed that their performance in the hands-on activities would be tracked to promote a sense of competitiveness and motivation. A post-test was administered to measure learning outcomes on the summer camp's final day. All participants received certificates of participation, and outstanding students were recognized for their achievements.

Phase III:
After the summer camp, all participant data was downloaded from Qualtrics, and descriptive statistics was conducted to determine the effectiveness of the summer camp on the participants. Seventeen students completed the pre-test, and sixteen students completed the post-test, as one participant was absent on the last day of the post-test assessment. All students experienced the same intervention and were affiliated with R-ISD. The study received responses from seventeen participants for the pre-test and sixteen participants for the post-test.

Results
The intervention impact on the population was measured in the areas of participant perception for the: 1) Importance of STEM subjects and Soft Marketable Skills; 2) Perceptions for post-secondary degrees in STEM disciplines and pursuance; 3) Intent" to pursue post-secondary degrees and a career in STEM-related disciplines; 4) Learning experiences at the Highschool Summer Experiences. Most of the participant students in the summer camp were females.

Overall Importance of STEM Subjects and Soft Marketable Skills:
As depicted in Figures 1 & 2, there was a significant improvement in the perceptions of the importance of STEM skills and Soft Marketable Skills among the participants. For the participant perception regarding STEM importance, there was a 13% increase in the "*Extremely important*"

category and a 10% decrease in the category of "*Neither important nor unimportant*" among the participants after intervention measured by the post-test, suggesting that the intervention successfully highlighted the critical role of STEM skills in today's careers. The reduction in the category of "*Neither important nor unimportant*" indicates that the participants who were previously unsure recognize the importance of STEM education—overall, indicating that the intervention had a significant impact on the participant population (Figure 1).

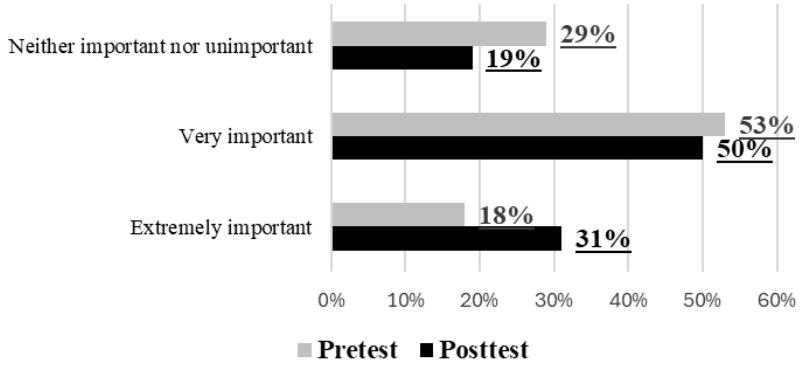

Figure 1: Participant perception of the importance of STEM subjects

A stronger trend among the participant perception was observed for the soft marketable skills. There was a 20% increase in the category of "*Extremely important*" and an 18% decrease in the category of "*Neither important nor unimportant*" among the participants, indicating that the intervention had a significant impact on the participant population (Figure 2).

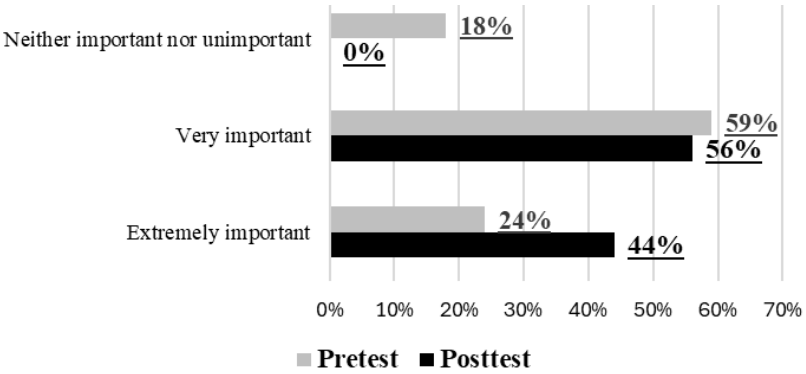

Figure 2: Participant perception of the importance of Soft Marketable Skills

Perceptions for post-secondary degrees in STEM disciplines and pursuance:
The results also indicate improvements in the participant perceptions of post-secondary degrees in STEM disciplines and the pursuit of those disciplines (Figures 3 & 4). For example, there was a 7% increase in the category of "Extremely important" and a 12% decrease in the category of "*Very unimportant*" among the participants. Thus, indicating that the interventions had positively impacted the participant perceptions measured by the post-test. The results also indicated a significant reduction in the number of respondents who felt it was "*neither important nor unimportant*," indicating that the intervention has some degree of impact on changing the unsure

participants. Thus, the results indicate that the intervention significantly impacted the participant population's perceptions of post-secondary degrees in STEM disciplines (Figure 3).

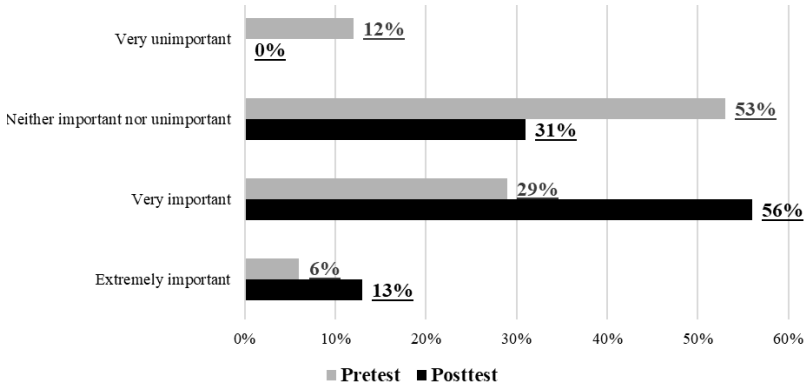

Figure 3: Participant perception of post-secondary degrees in STEM disciplines.

The results also indicate a similar trend for participant perception to pursue post-secondary degrees in STEM disciplines (Figure 4). There was a 13% increase in the category of "*Extremely important*" and a 6% decrease in the category of "*Very unimportant*" among the participants after intervention measured by the post-test. The results also indicate a significant reduction (10%) in the number of respondents who felt that it was "*neither important nor unimportant,*" which suggests that the intervention has some degree of impact on changing the unsure participants. Thus, the results indicate that the intervention had a significant impact on the participant population for the perceptions of post-secondary degrees in STEM disciplines (Figure 4).

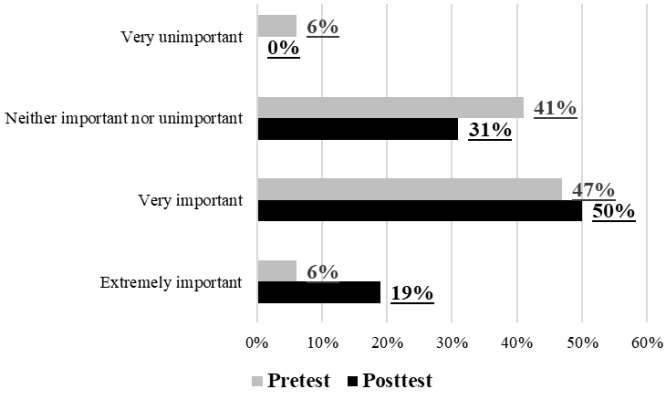

Figure 4: Participant perception to pursue post-secondary degrees in STEM disciplines.

Intent to pursue post-secondary degrees and a career in STEM-related disciplines:
The research also aimed to determine the impact of the intervention (summer camp) on the participant's intent to pursue post-secondary degrees and a career in STEM-related disciplines (Figures 5 - 8). The intent would most likely indicate their willingness to pursue a STEM degree and career in the future. Again, the results for this sub-category indicate a significant impact of the intervention.

After the post-test, there was a 13% increase in the "*Extremely likely*" category for the participant intent to pursue post-secondary degrees in STEM disciplines (Figure 5). Although the category of

"*Extremely unlikely*" showed no impact, the category of "*neither likely nor unlikely*" again saw a significant improvement of 46% after intervention measured by the post-test (Figure 5).

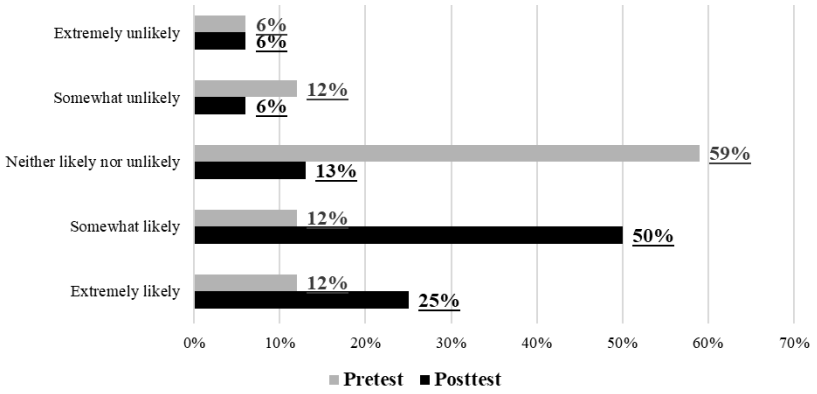

Figure 5: Participant intent to pursue post-secondary degrees in STEM disciplines

The respondent's intent to pursue post-secondary degrees in STEM disciplines was verified by asking the students the "*likelihood*" they would enroll in construction-related courses (one of the STEM fields) (Figure 6). A similar positive trend was observed in most of the categories. After the intervention measured by post-test, there was a 12% reduction in the respondent category for "*Extremely unlikely,*" a 21% increase in the category of "*Somewhat likely*," and a 6% increase in the category of "*Extremely likely.*" Thus, the trends for pursuing post-secondary degrees in STEM disciplines aligned with participant's likelihood to enroll in construction-related courses in higher education (a sub-category).

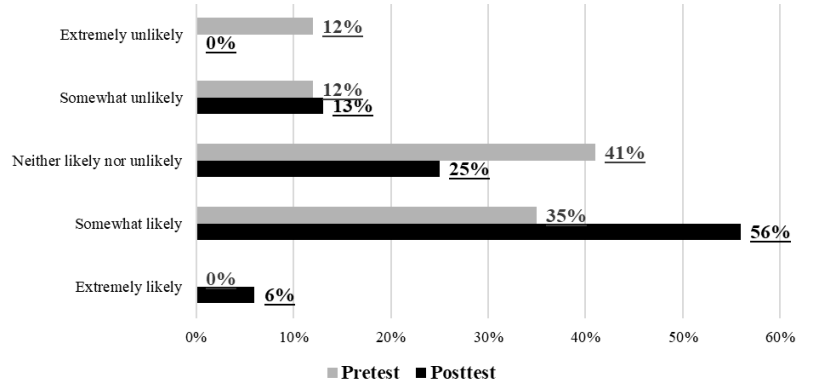

Figure 6: Participant likelihood to enroll in construction-related courses in higher education

A similar positive trend of the impact of the intervention measured by post-test was observed by the participant's intent to pursue a career in STEM-related disciplines (Figure 7). There was a 25% increase in the category of "*Extremely likely*" and a 6% decrease in the category of "*Extremely unlikely*" among the participants after intervention measured by the post-test. The results also indicate that respondents that there was a significant reduction (29%) in the number of respondents who felt that it was "*neither important nor unimportant,*" which indicates that the intervention has a significant impact on changing the unsure participants about their intent to pursue a career in STEM-related disciplines. Thus, the results suggest that the intervention substantially impacted the participant population's perceptions of post-secondary degrees in STEM disciplines (Figure 7).

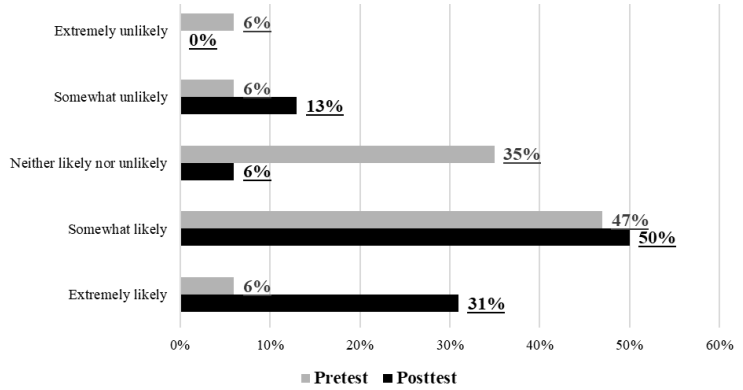

Figure 7: Participant intent to pursue a career in STEM-related disciplines

The respondent's intent to pursue a career in STEM-related disciplines was verified by asking the students the "*likelihood*" that they would select a career in the construction of agricultural infrastructure, a discipline that could be affiliated with STEM (Figure 8). A similar positive trend was observed in most of the categories. After the intervention measured by post-test, there was a 6% reduction in the respondent category for "*Extremely unlikely*" and a 19% increase in the category of "*Extremely likely.*" Thus, the trends for pursuing post-secondary degrees in STEM disciplines aligned with participant's likelihood to enroll in construction-related courses in higher education (a sub-category).

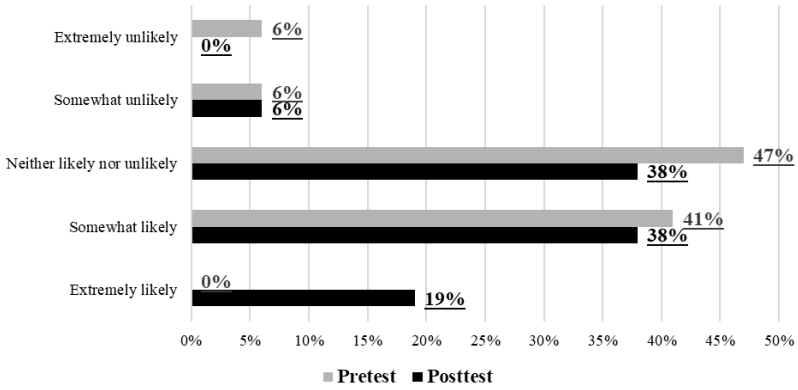

Figure 8: Participant likelihood to select a career in the construction of agricultural infrastructure

Learning experiences at the Highschool Summer Experiences

The research also aimed to determine the impact of the intervention (summer camp) on the participants (high school students from R-ISD). The results (Figure 9) indicate that most participants (44%) selected the "*Exceeds expectations*" category, followed by 38% of the participants who selected the "*Far Exceeds expectations*" category. Thereby indicating that the intervention had a significant impact on the participants.

The positive learning experiences may have sparked participants' interest in pursuing STEM fields. The program likely boosted their confidence, encouraging them to take on more challenging academic and extracurricular opportunities in STEM.

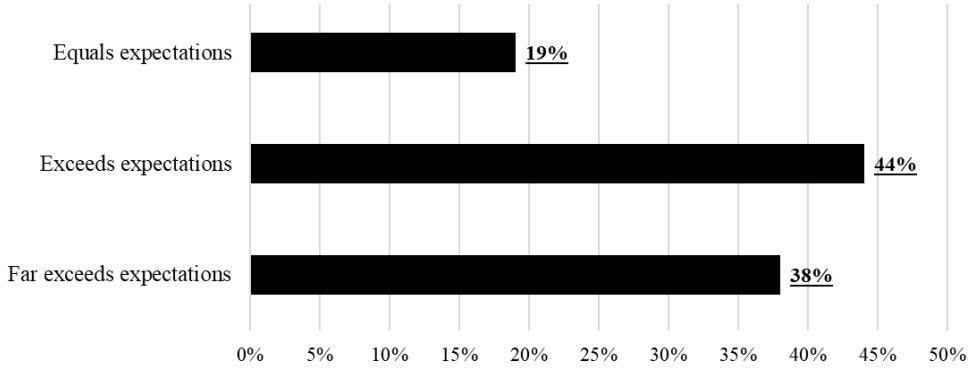

Figure 9: Participant learning experiences at the Highschool Summer Experiences

Conclusion

This research explored how a STEM summer camp (intervention) influences the perceptions of the population (minorities from rural high schools). The intervention impact on the population was measured by post-test in the areas of participant perception for the: 1) Importance of STEM subjects and Soft Marketable Skills; 2) Perceptions for post-secondary degrees in STEM disciplines and pursuit; 3) Intent" to pursue post-secondary degrees and a career in STEM-related disciplines; 4) Learning experiences at the Highschool Summer Experiences.

The research findings substantiate the intervention's effectiveness in enhancing high school students' perceptions of STEM subjects and soft marketable skills within the R-ISD population. Data indicate a measurable increase in awareness regarding the importance of STEM education, with a 13% rise in participants identifying these subjects as "*Extremely important*." Concurrently, there was a 10% decrease in students who found STEM to be "Neither important nor unimportant." This signifies that the intervention successfully shifted student perceptions to value both technical and interpersonal competencies essential for their future careers.

Moreover, the findings reflect a shift in students' perceptions regarding post-secondary degrees in STEM disciplines. The intervention led to a 7% increase in students considering these degrees as "*Extremely important*" and a 12% decrease in those deemed "*Very unimportant*." This suggests that the intervention led to recognition of the significance of higher education opportunities in STEM fields. Additionally, a notable reduction in the number of respondents expressing uncertainty about the importance of pursuing post-secondary education indicates the intervention's success in fostering a clearer understanding of the path ahead for these students.

The intent to pursue higher education and emerging careers in STEM-related fields presents another significant output of this study. Post-intervention results display a 13% increase in the likelihood of participants marking themselves as "*Extremely likely*" to pursue a STEM degree. In terms of career aspirations, there was a 25% increase in students indicating they were "Extremely likely" to consider STEM-related careers. Furthermore, feedback regarding the learning experiences provided during the intervention revealed tangible results, with 44% of participants indicating that their experiences "*exceeded expectations*," while 38% claimed that the "*experiences far exceeded*" their expectations. These findings signify the intervention's role in facilitating positive perceptions and intentions related to STEM disciplines and careers and preparing high school students for successful careers.

Acknowledgment
The researchers would like to acknowledge the support of the US AA (USAA) National AA, Women and Minorities in STEM Program, Award #: AAAA. The findings and conclusions in this publication are preliminary and should not be construed to represent any agency determination or policy.

References
[1] NSF, "What do the data say about the current state of K-12 STEM education in the US? | NSF - National Science Foundation." Accessed: Jan. 15, 2025. [Online]. Available: https://new.nsf.gov/science-matters/what-do-data-say-about-current-state-k-12-stem
[2] Pew Research Center, "Most Americans think U.S. K-12 STEM education isn't above average, but test results paint a mixed picture," Pew Research Center. Accessed: Jan. 15, 2025. [Online]. Available: https://www.pewresearch.org/short-reads/2024/04/24/most-americans-think-us-k-12-stem-education-isnt-above-average-but-test-results-paint-a-mixed-picture/
[3] C. C. Johnson and T. A. Sondergeld, "Outcomes of an Integrated STEM High School: Enabling Access and Achievement for All Students," *Urban Educ.*, vol. 58, no. 8, pp. 1772–1798, Oct. 2023, doi: 10.1177/0042085920914368.
[4] National Science Foundation, "The State of U.S. Science and Engineering 2024." Accessed: Feb. 21, 2025. [Online]. Available: https://ncses.nsf.gov/pubs/nsb20243/talent-u-s-and-global-stem-education-and-labor-force
[5] National Center for Education Statistics, "The NCES Fast Facts Tool provides quick answers to many education questions (National Center for Education Statistics)," International comparisons of achievement: Fast Facts. Accessed: Feb. 21, 2025. [Online]. Available: https://nces.ed.gov/fastfacts/display.asp?id=1
[6] U.S. Department of Commerce, "STEM: Good Jobs Now and for the Future." 2011. [Online]. Available: eric.ed.gov/fulltext/ED522129.pdf
[7] J. Colato, L. Ice, and S. Laycock, "Industry and occupational employment projections overview and highlights, 2023–33," Bureau of Labor Statistics. Accessed: Feb. 21, 2025. [Online]. Available: https://www.bls.gov/opub/mlr/2024/article/industry-and-occupational-employment-projections-overview-and-highlights-2023-33.htm
[8] US Bureau of Labor Statistics, "Employment in STEM occupations," Bureau of Labor Statistics. Accessed: Feb. 21, 2025. [Online]. Available: https://www.bls.gov/emp/tables/stem-employment.htm
[9] D. H. Caro, K. S. Cortina, and J. S. Eccles, "Socioeconomic background, education, and labor force outcomes: evidence from a regional US sample," *Br. J. Sociol. Educ.*, vol. 36, no. 6, pp. 934–957, Aug. 2015, doi: 10.1080/01425692.2013.868784.
[10] K. M. Ziol-Guest and K. T. H. Lee, "Parent Income–Based Gaps in Schooling: Cross-Cohort Trends in the NLSYs and the PSID," *AERA Open*, vol. 2, no. 2, p. 2332858416645834, Apr. 2016, doi: 10.1177/2332858416645834.
[11] National Academies of Sciences Engineering, and medicine, Division of Behavioral and Social Sciences and Education, Board on Children, Youth, and families, Committee on Exploring the Opportunity Gap for Young Children from Birth to Age Eight, R. Hutton, and L. Allen, "Opportunity Gaps in the Education Experienced by Children in Grades K–3," in *Closing the Opportunity Gap for Young Children*, National Academies Press (US), 2023.

Accessed: Feb. 21, 2025. [Online]. Available: https://www.ncbi.nlm.nih.gov/books/NBK596380/

[12] "Why Our Education Funding Systems Are Derailing the American Dream," Learning Policy Institute. Accessed: Feb. 21, 2025. [Online]. Available: https://learningpolicyinstitute.org/blog/why-our-education-funding-systems-are-derailing-american-dream

[13] T. Robinson, A. Kirn, J. Amos, and I. Chatterjee, "The Effects of Engineering Summer Camps on Middle and High School Students' Engineering Interest and Identity Formation: A Multi-methods Study," *J. Pre-Coll. Eng. Educ. Res. J-PEER*, vol. 13, no. 2, Nov. 2023, doi: 10.7771/2157-9288.1351.

[14] US Department of Agriculture, "Request for Applications: Women and Minorities in Science, Technology, Engineering, and Mathematics Fields Program." 2025.

[15] S. Langar and T. Sulbaran, "Framework for a Summer Experience based on Transformational Leadership and Constructivism (SumEx-TLC)," presented at the ASC 2021. 57th Annual Associated Schools of Construction International Conference, 2021, pp. 514–503. doi: 10.29007/tbf8.

[16] T. Sulbaran and S. Langar, "Assessing the effectiveness of Constructivism and Transformational Leadership on STEM/TEKS through a Construction Summer Experience," in *ASC 2022. 55th Annual Associated Schools of Construction International Conference*, Georgia, 2022.

Reviewer Comments

There are strengths to this study, including its innovative approach to researching how a STEM summer camp (intervention) influences the perceptions of minorities from rural high schools. It is a valuable contribution to the engineering education field.

- **Response:** Thank you for the positive feedback

Paper is lacking details such as relevant background or purpose and applied literature. The literature cites excellent references but needs to discuss how it supports the current study. I recommend elaborating on the literature background.

- **Response:** We have elaborated the introduction and background section comprehensively which ties to the research study

Overall, the method is great, but there needs to be more discussion on whether it has been used elsewhere, and it would be helpful to discuss more of the instrument used. Was the instrument (pre-test and post-test) validated? Has it been used before? Or is this the first time?

- **Response:** Thank you for the recommendation and we added the information about the framework

What was the sample size (number of participants)? AQ check and

- **Response:** We have added information about the sample size

Was the participant's perception of STEM subject importance statistically significant?

- **Response:** The research presents descriptive analysis of the intervention (summer camp) and no inferential statistical analysis were conducted at this point of time.

Was the perception of soft marketable skills statistically significant?

- **Response:** The research presents descriptive analysis of the intervention (summer camp) and no inferential statistical analysis were conducted at this point of time.

Was the perception of post-secondary STEM degrees statistically significant?

- **Response:** The research presents descriptive analysis of the intervention (summer camp) and no inferential statistical analysis were conducted at this point of time.

Was the intent to pursue post-secondary STEM degrees statistically significant?

- **Response:** The research presents descriptive analysis of the intervention (summer camp) and no inferential statistical analysis were conducted at this point of time.

Was the likelihood of enrolling in construction-related higher education courses statistically significant?

- **Response:** The research presents descriptive analysis of the intervention (summer camp) and no inferential statistical analysis were conducted at this point of time.

Was the intent to pursue a STEM-related career statistically significant?

- **Response:** The research presents descriptive analysis of the intervention (summer camp) and no inferential statistical analysis were conducted at this point of time.

The preferred reference style is IEEE –please see appendix F of authors kit.

In-text Citing

• Place bracketed citations within the line of text, before any punctuation, with a space before the first bracket.

• Number your sources as you cite them in the paper. Once you have referred to a source and given it a number, continue to use that number as you cite that source throughout the paper.

• When citing multiple sources at once, the preferred method is to list each number separately, in its own brackets, using a comma or dash between numbers, as such: [1], [3], [5] or [1] - [5].

- **Response:** We have changed the citation and reference style. We hope it is acceptable.

Congratulations on the success of the camp. It was clearly impactful, at least momentarily, and will hopefully help this cohort of students.

While impressive, it is really not much of a surprise that the students would change viewpoints to match the enthusiasm of the camp speakers, especially when the students had no familiarity with these topics before. The real test is to see how many of these students, in a few years, actually pursue these fields in college, or even go to college.

- **Response:** Thank you for the feedback and we agree with you. We are conducting longitudinal study to determine the sustained impact of the intervention. We intend to report the findings after a year or two.

It would be useful to briefly describe the tasks, projects, and games that had such a positive influence on these students.

- **Response:** It is not within the scope of this study. That can surely be a part of the another study as we have already collected the data.

I think the discussions around the charts can be condensed somewhat.

- **Response:** Thank you for the suggestion and we have made some changes

Did you get approval or an exemption from your university's research compliance board? If so, please add a statement.

- **Response:** We have added the statement, per your recommendation.

Go through the article again. There is at least one incomplete reference in the body of the text, and a stray sentence.

- **Response:** We have revised the article.