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Creating a Sense of Belonging by Engaging Skilled Technical Workers as Role Models in STEM

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The National Science Board (2019) defined the Skilled Technical Workforce (STW) as millions of men and women with STEM skills and knowledge who do not have a bachelor's degree. This segment of the STEM workforce is crucial but often underappreciated. To ensure that we support all areas of the workforce, it is important that we recognize this important population and provide the resources necessary for them to thrive in their chosen profession. Maslow's "Hierarch of Needs" demonstrates that individuals need more than just skills. They also need to feel a sense of belonging (1968). Research shows that a lack of belonging can lead to negative emotional patterns, cognitive impairments, health issues, and even behavior challenges (Baumeister & Leary, 1995). Mentorship has been identified as one strategy that employers can use to prevent these negative outcomes and aid employees in developing a sense of belonging at work. This article will examine how one organization used role modeling, a psychosocial support function in mentoring, to expose skilled technical workers (in training) to STEM technical careers at a national lab and how that experience helped technical employees enhance their sense of belonging within the organization. The author also examined employees' degree of satisfaction with the overall program experience. Sixteen post-program surveys were collected, and 7 semi-structured interviews were conducted with employee participants. Results showed that all employees were satisfied with their program experience, and that sharing knowledge had a positive impact on their sense of belonging within the Lab environment.

Keywords: STEM, skilled technical workforce, belonging, role modeling

Introduction

The purpose of this study was to examine how one organization used role modeling to expose Skilled Technical Workers (STW), in training, to STEM technical careers at a national lab and how that experience helped technical employees enhance their sense of belonging within the organization. Through survey data and interviews, the author was able to better understand employee motivation for participating in the program and the overall impact their involvement had on their sense of belonging and desire to participate in similar activities moving forward. The following sections provide a general overview of the skilled technical workforce and research related to belonging and mentoring in STEM. Research methods and program details are described followed by an analysis of the results, a discussion, and conclusion. At the center of this study is a focus on the role that skilled technical workers (STW) play in STEM and how involving this sector of the workforce in professional development activities can have a positive impact on both student exposure to STEM technical careers and employee sense of belonging within their own individual workplace.

Literature Review

For years, the STEM workforce was defined as individuals with a bachelor's or advanced degree. In 2021, the National Science Board (NSB) and the National Center for Science and Engineering Statistics (NCSES) changed that narrative by redefining how we identify the STEM workforce (Gillespie, 2022). Because of their work, data in the Science and Engineering Indicators report now reflects all people who use science skills in their everyday jobs (Gillespie, 2022). This sector, now identified as the Skilled Technical Workforce (STW), includes more than 17 million individuals that play a crucial role within STEM (National Science Board, 2019).

While challenges exist for this growing population, there are also many opportunities that have been identified to elevate the conversation and increase the level of support that this sector receives. Those recommendations include modifying the message being shared with students, parents, educators, and counselors to increase awareness around skilled technical career opportunities; focus on data to build partnerships; build awareness around funding opportunities and the impact of those investments; and create partnerships across educational institutions and

industries that can strengthen pathways to career opportunities (National Science Board, 2019).

Partnerships are an essential part of STEM education and can boost both student engagement (21st CenturyEd, 2025) and employee development (Moore, 2024). Smith et al. (2025) found that partnerships in STEM can provide access to resources that may not be available at some institutions and pathways to experiential learning opportunities that provide valuable opportunities to gain hands-on work experience. Mentors play a significant role in the success of experiential learning programs and often serve as facilitators, coaches, and role models (Ewance, n.d.).

Role modeling, a psychosocial support function in mentoring, (National Academies of Sciences, Engineering, and Medicine, 2019; Kram, 1985; Ragins & McFarlin, 1990), provides an opportunity for individuals to inspire others and encourage perseverance in their field of interest (Harden, 2024). Mentorship implies a more personal, one-on-one relationship (Kram, 1983) while role models provide examples of behaviors and pathways to achieve success (Gibson, 2004; Lockwood & Kunda, 1997). Harden (2024) found that role models foster a sense of belonging by helping individuals see themselves in roles that feel challenging to navigate. Carr et al. (2019) used an example to show that when employees feel like they belong, an organization with 10,000 employees can see a "56% increase in job performance, a 50% drop in turnover risk, and a 75% reduction in sick days" resulting in more than $52M in annual savings (para 6).

This study highlights how one organization was able to engage skilled technical workers as role models in STEM and how that experience helped illuminate employee's perception of their value within the organization. By examining this experience, we also gain insight into how professional development programs can be used to enhance student exposure to STEM technical careers and engage more technical employees (role models) in similar professional development experiences.

Theoretical Framework

The need to belong is identified as the third level of Maslow's "Hierarchy of Needs" (Maslow, 1968). In the context of the workplace, Waller (2020) found that this fundamental need to belong involves the development of quality relationships, a sense of being valued, shared characteristics, and an organizational culture that provides a safe place for individuals both physically and psychologically. Waller (2020) noted that while having similar characteristics (e.g. age, education, ethnicity, gender, professional or social background) can be helpful, a balance between similarities and differences may be more ideal in fostering an environment where employees are able to develop and maintain a sense of belonging. By using belonging as the guiding framework for this study, the author was able to (1) understand the importance of creating spaces where employees feel valued and (2) determine how those efforts can have a positive impact on individuals, programs, and organizations.

Methodology

A case study design was chosen because it allows individuals to make meaning of their own experiences. To assess participant's sense of belonging and degree of satisfaction with the program, interview and survey data were analyzed. All data collection procedures adhered to an approved IRB protocol. Sixteen technical employees completed a post-program survey and 7 participated in an individual interview. Semi-structured interviews, the primary focus of this study, provided an opportunity for the author to gain insight into how individuals make meaning of their own experiences (Merriam & Tisdell, 2016). Transcripts from each interview were reviewed, analyzed, and coded based on the theoretical tenets of the belonging framework - quality relationships, perceived value, shared characteristics, and organizational culture - (Waller, 2020). The following theme was identified and is presented in detail in the results section below: Developing a Sense of Belonging While Sharing Knowledge.

Program & Participants

This study focused on technical employees at a national lab that volunteered to participate as role models during a 4-week professional development program for skilled technical workers in training. In partnership with a local technical college, the Lab was able to expose a small group of 5 trainees to technical career opportunities in a national lab environment. The Lab, an NSF major facility with over 800 employees in various scientific and non-scientific roles, hires technicians in various capacities to support the scientific work being performed. The technical college enrolls more than 1700 students, 50% part-time, that range in age from 17-years-old to individuals who are learning new skills to switch careers later in life.

In 2023, the Lab received a mini grant from the ECMC Foundation (Educational Credit Management Corporation Foundation) to develop a professional development program designed to broaden participation in STEM by building the skilled technical workforce. Five students enrolled in the welding (1) and electricity (4) programs at the technical college were selected via application to participate in 5 professional development sessions held at the Lab on Friday mornings from January 2025 – March 2025. The themes for each week included the following: Week 1 - Welcome and Overview of Technical Careers at the Lab; Week 2 - Electronics Shop; Week 3 - Electrical Power and Infrastructure; Week 4 – Welding at the Lab; and Week 5: Recognition, Appreciation, and Evaluation. During these sessions, participants

we ır very with staff, participated in tours/demos, and learned more about STEM technical careers in welding and electricity. Students participated in a networking lunch with technical employees after each session. They also received a small honorarium and gift card for their overall program participation. Lab employees were recognized during an appreciation luncheon at the end of the program and received verbal acknowledgment, certificates, gift cards, and 'thank you' notes.

Sixteen Lab employees representing the following functional areas served as role models: instrumentation, electronics, facilities, safety, welding, and administration. Role models (Lab employees) shared knowledge about their individual career paths, answered participant questions, provided tours/demonstrations, and networked with participants over topics such as career success. This study examines how the Lab's 16 employees served as role models for the student participants and how that experience helped the employees enhance their sense of belonging within the organization. In the following section, I will first present the results from the survey data followed by feedback received from employee interviews.

Results

Program Satisfaction

Post-program surveys were administered to 18 employee participants (e.g. 2 female, 16 male; 2 Black, 16 White). Sixteen of the 18 employees provided survey responses to 3 close-ended questions and 1 open-ended question. The analysis showed that the program had an overall positive impact on survey respondents. One hundred satisfied with their experience in the program, the amount of time required of them for the program, the description of expectations before the start of the program, and the level of communication provided by the program manager. One survey respondent noted the following, "The program was very well planned and executed! I'm looking forward to future iterations of this collaboration that involve hands-on work by the students." Another respondent shared, "I feel both the students and the Lab employees got something out of this experience. I would be more than happy to participate in a future program." Another participant noted that he not only enjoyed showing the students around the Lab during the tour but was also able to expand his own knowledge about his place of employment. Overall, employees appreciated the opportunity to serve as role models and felt that this experience provided benefits for all involved.

Developing a Sense of Belonging While Sharing Knowledge

Lab employees who served as role models expressed great appreciation for being invited to participate in this inaugural program. During interviews, all role models shared the value they found in providing this type of professional development opportunity to trainees and the important role they played in sharing their knowledge. In this study, pseudonyms were used to identify employee comments. Table 1 provides a sample of relevant quotes.

Table 1.
Theme & Example Quotes

Theme	Example Quotes
Developing a Sense of Belonging While Sharing Knowledge	• [This program] illustrates th • at it takes a village to make science happen…You need people from a wide variety of skillsets to make an organization like this successful. • The program made me feel valued in the sense that there's some recognition for years of service and that my knowledge and expertise are worth something. • This place is not just about science. It's broader…Helping students see that, and helping staff understand the impact they can have, is what makes this kind of program valuable. • It sparked conversations about how important it really is to get people into the trades. Even brief interactions can lead to meaningful dialogue and remind us why this kind of outreach matters.

Ron, a welder, noted that he enjoyed talking to students who were interested in following in his footsteps. "It's cool to talk to the students who are where you were," he said. "They don't have to believe what other people say, they can see [from our experience] that there are opportunities." He was excited to share his story and noted the impact of working for a company that appreciates their employees.

Ted, another welder at the Lab, noted that he has worked in other areas outside of the Lab and believes that the perspectives that he has received from previous work were instrumental in his ability to add value to this program. "We [technical employees] bring more real-world experience than some others," he shared. "Not to say that the Lab isn't real-world, but it's a different kind of environment."

Many of the student participants shared that they had never thought about a national laboratory as

a potential employer. So, by introducing them to technical workers in this space, students were able to expand their view of future career paths.

For Jay, a facilities superintendent with over 25 years of experience at the Lab, it is time to start preparing the next generation of skilled technical employees. He shared:

> [This program] illustrates that it takes a village to make science happen. It's not just about the science nerd or the academic. You need people from a wide variety of skillsets to make an organization like this successful. The program made me feel valued in the sense that there's some recognition for years of service and that my knowledge and expertise are worth something.

Evan, a research engineer, agreed, "[The Lab] is kind of like a little city," he shared. "A city doesn't run just on water and power. There are a lot of other things that make it all work. And it's the same here. There's someone for everything and every role matters."

Isabelle, a research engineer, shared the following, "This place is not just about science. It's broader… Helping students see that, and helping staff understand the impact they can have, is what makes this kind of program valuable."

Jay, Evan, and Isabelle's comments demonstrate the perceived value they bring to the organization and the feelings of appreciation they gained from sharing their knowledge as part of this program.

For Arnold, an industrial engineer, his participation helped to facilitate conversations among his team that may not have occurred otherwise. "It sparked conversations about how important it really is to get people into the trades," he shared. "Even brief interactions can lead to meaningful dialogue and remind us why this kind of outreach matters." Relationships are critical in our ability to develop a sense of belonging and Arnold's comments demonstrate that even existing relationships can be strengthened when others are engaged in work that they find meaningful and enjoyable.

Lester, a research engineer, noted that his motivation for participating in the program was two-fold. "I need a reliable resource for hiring technicians who are capable of doing the kind of work we do, and I just enjoy helping out with things like this," he shared. He brings a realistic perspective to the program by demonstrating that you can enjoy the work while also fulfilling the organization's needs.

Tony, a technical support professional, felt that he was able to strengthen his connection to the Lab during the first day of the program. "When I was sharing my story and reflecting on my own path, it really resonated with me in a way I didn't expect," he shared. "It made me think about how far I've come, and in that sense, I'd say my connection to the Lab definitely deepened." By thinking back on his experiences and sharing aspects of his journey, Tony was able to see his value and the relationship that he has built with the organization.

Isabelle shared, "I like knowing that I can have an impact and that I can influence…someone to pursue a path they may not have considered. It means a lot." She also noted that seeing other people that look like her and hearing their stories was helpful in developing a sense of belonging and strengthening relationships with coworkers. "I'm not the only one," she shared.

> There are others who are part of this space or will come after me…Hearing others share stories and sharing my own reminded me that not everyone follows a straight path. It was interesting to see those connections and realize that people arrive at this place from all kinds of backgrounds. I'm not the only one who started later [in my career]. Even if your path takes a few turns, you can still build a career full of knowledge and purpose.

She also noted that by sharing experiences, she was able to learn more about her coworkers and connect with them on another level. "Programs like this impact the entire lab," she shared. "It's not just about taking time away from your work… There's a purpose behind it."

Discussion

Research shows that employee belonging is essential to attracting, engaging, and retaining top talent (Cohen, 2022, Efron, 2022, Waller, 2020). Efron (2022) found that when people are appreciated, valued, and able to make meaningful relationships, they feel seen and believe that they belong. This study highlighted how an organization used role modeling, a psychosocial support function in mentoring, to expose trainees to STEM technical careers at a national lab and how that experience helped employees at the Lab enhance their sense of belonging. Carr et al. (2019) found that when employees feel like they belong, job performance increases and turnover risks decrease.

Findings suggest that technical employees experienced a heightened sense of belonging, an overall satisfaction with their participation, and a desire to participate in future programs designed to engage trainees in meaningful career exploration at the Lab. Because data from this study was collected from a single organization, results may not be generalizable to other locations; however, they could be useful for expanded research and the development of future programs. Because of the program's short duration, participants could not perform hands-on activities. However, future iterations of this program could explore ways to expand opportunities to include more hands-on experience. Future studies could also explore how other laboratories engage with their local community and technical colleges to establish partnerships designed to expand the STEM skilled technical workforce.

Conclusion

The World Economic Forum (2025) found that employers are increasingly focusing more on work experience than university degrees. This shift signals a growing recognition that practical skills

and cognitive abilities may be more indicative of future job performance than formal educational qualifications…The diverse requirements of the largest-growing jobs highlight the critical role of occupations that are often accessible through vocational training, apprenticeships, on-the-job experience, or associate degrees. (World Economic Forum, 2025, 61-62)

The skilled technical workforce is growing and will continue to play a significant role in our nation's economic development and ability to innovate. Therefore, we have a unique opportunity to broaden participation in STEM while building organizational cultures that help create a sense of belonging for employees.

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