There is a growing shortage of skilled labor in the United States construction industry. As the baby boomer generation prepares to leave the workforce, this problem is getting exponentially worse. As Science, Technology, Engineering and Mathematics programs have become the U.S. Department of Education’s top priority, more young adults are pursuing higher education and entering the STEM workforce. Using quantitative and qualitative research methodologies, this paper provides an explanation as to why a logical method to assuage the labor shortage in construction is to employ vocational programs that prepare young adults to enter the industry similar to how STEM programs are used to prepare students to enter STEM occupations.

**Key Words:** Skilled Labor Shortage, STEM, Vocational Training, Construction, United States

**Introduction**

Since 2001, the Bureau of Labor Statistics has followed the changes in job openings, hires/separations and total employment to assess the presence or extent of labor shortages in the United States. At the start of 2018, for the first time in the nearly twenty years that this data has been recorded, the amount of job openings exceeded the unemployment level, indicating a nationwide labor shortage.

![Figure 1. Unemployment levels and job openings from 2001-2018](image)

Construction is among the industries most heavily affected by this labor shortage and will continue to be. In a Bureau of Labor Statistics News Release, employment projections for 2018-2028 ranked construction as the industry sector with the third highest projected growth over the next 10 years (behind health care and educational services), with an increase in employment of over 800,000.
There are multiple factors contributing to industry growth and the labor shortage. For one, the age of the workforce is heavily skewed. In the same News Release, the BLS describes the current and projected labor force stating that the proportion of workers age 55 and older will continue to increase while the proportion of workers ages 16 to 24 continues decrease (shown in figure 3). Overall, the statistics in this news release provide that the largest segment of the labor force is made up of the baby-boomer generation and that the economic effect of this generation reaching retirement-age and preparing to exit the workforce will be substantial.

When writing about employment projections in the construction industry, Elka Torpey, an economist for the United States Bureau of Labor Statistics, substantiates the claim that we are in the midst of a substantial surge of employment growth in the construction industry. In her article, “Careers in construction: Building opportunity.” published in August 2018, Torpey writes that “Preliminary BLS data show that there were 7.2 million construction jobs in July 2018. That marks the highest employment level for the construction industry in a decade.” (Torpey, 2018). Torpey’s point is that the economic activity from construction has surpassed pre-recession levels. She also
writes that, “BLS expects continued expansion of employment in the construction industry, with more than 7.5 million jobs projected by 2026 as population growth spurs demand for new buildings and infrastructure.” (Torpey, 2018). Meaning that this upward trend is expected to continue for the foreseeable future. (illustrated in figure 4).

The current priority of the U.S. Department of Education is STEM-based programs which focus on four specific branches of knowledge; science, engineering, mathematics, and technology. U.S. Secretary of Education Betsey Devos has centered her educational agenda around STEM. In December 2018, the Committee on STEM Education of the National Science & Technology council published a comprehensive plan for the implementation of a STEM education and in November 2019 the USDE announced “it invested $540 Million to support science, technology, engineering and math (STEM) education, including computer science, through discretionary and research grants in Fiscal Year 2019, in accordance with President Trump’s directive to foster expanded opportunities in these in-demand career fields.” (U.S. Department of Education, 2019).

My hypothesis is that if the implementation of STEM education has been successful in meeting its goals, a similar implementation of programs that provide the education necessary to enter the construction industry would be successful at assuaging the shortage of skilled labor in the United States.

**Methodology**

The research methodology chosen for this paper involved gathering previously established qualitative and quantitative data from nationally-funded databases and peer-reviewed scholarly journals. The quantitative data displays statistical measures of employment status and educational attainment. The
qualitative data includes discussion of the successfulness and effectiveness of different educational initiatives.

The objectives of this research are as follows:

- Examine the typical level of education attainment within the construction industry
- Examine the education necessary to enter the construction workforce
- Highlight the goals of the implementation of STEM education
- Review the effectiveness of STEM education in meeting its goals
- Review the limitations of STEM education in meeting its goals

**Research Results**

*Educational Attainment in Construction*

In his 2017 “Profile Of The Labor Force By Educational Attainment,” Vernon Brundage Jr., an economist for the U.S. Bureau of Labor Statistics, compiled data from the BLS and highlighted significant relationships between educations levels and labor force employment. The results of the study show that “only about one-fourth of the labor force had some college (16 percent) or an associate’s degree (11 percent)” (Brundage, 2017).

![Figure 5. Percentage of labor force by educational attainment, 25 years and over, 2016 annual averages](image)

Most people working in the construction industry fall into the majority of the labor force, having little experience with higher education. The Center for Construction Research and Training (funded by the National Institute of Environmental Health Sciences), found that in 2005, “educational attainment of employees in construction is lower when compared with the level of educational attainment of all other industries combined” (2007). As shown in figure 5, this statement remains true, even when comparing educational attainment in only good-producing industries (i.e. mining and manufacturing). Furthermore, nearly three-quarters of all employees in construction have less than a high school diploma (27%) or only a high school diploma (45%).
The Center for Construction Research and Training states affirm apprenticeships are crucial in construction because they offer both formal classroom and on-the-job training, all while being supervised by a skilled craftworker. Furthermore, it is through the apprenticeship programs that most people enter the construction industry (CPWR, 2007). The United States Department of Labor found that in 2018, the construction industry had 166,629 active apprentices, a significantly greater amount than any other industry.

**The Goal of STEM**

Since the early 2000s, the United States has championed the study of science, technology, engineering and math (abbreviated as STEM) to meet the demands of an increasingly complex world. In an article published by the U.S. Department of Education, the goal of STEM education is described as, “A future where all Americans will have lifelong access to high quality STEM education and the United States will be the global leader in STEM literacy, innovation, and employment.” (USDE, 2018) Meaning that the intention of the prioritization of STEM education is to maintain economic prosperity by cultivating the technological ingenuity demanded by a world driven by advanced technology.

**Effectiveness of STEM**

There is evidence indicating that the United States education system is successfully supplying a strong STEM workforce. Beryl Lieff Benderly, journalist and author who has produced prize-winning writing on science policy, and Hal Salzman, a renowned Professor of Public Policy at the E.J. Bloustein School of Planning and Public Policy and the John J. Heldrich Center for Workforce Development, have provided evidence that suggests there is a sufficient supply of labor in the STEM market. In their paper on the STEM worker supply, Salzman and Benderly write “the U.S. education
system has produced ample supplies of students to respond to STEM labor market demand. The “pipeline” of STEM-potential students is similarly strong and expanding.” (Salzman, H. & Benderly, 2019). There appears to be an adequate number of STEM-focused students to fill current and future STEM job openings.

**Limitations of STEM**

STEM makes up a small portion of the total workforce. In the same article that Hal Salzman and Beryl Lieff Benderly analyze indications that the U.S. education system is producing a sufficient supply of STEM workers, they also examine what portion of students actually end up working in STEM fields. According to their research, “The college graduate STEM workforce draws from a very small segment of the general student population, about 5% of K-12 student cohorts and 8 to 10% of the annual supply of college graduates.” (Salzman, H. & Benderly, 2019). Over 90% of U.S. students in compulsory education will work in fields other than STEM.

It has been shown that STEM education in college requires a strong foundation in calculus, physics, and chemistry. Oklahoma State University professors Adrienne Redmond-Sanogo, Julie Angle, and Evan Davis conducted a study on predictors of the successful completion of a STEM degree in which they found evidence that “students who performed well in calculus, pre-calculus/trigonometry, physics, and chemistry in high school were more likely to be successful in college STEM gatekeeper courses.” And juxtaposed these findings with the statement that “Less than one-third of U.S. eight-graders show proficiency in mathematics and science on the National Assessment of Educational Progress (NAEP) assessment.” (Redmond-Sanogo, Angle, Davis, 2016). Meaning that success in STEM is reliant on an educational foundation that most students don’t have.

**Conclusions and Future Research**

**Conclusions**

There is a growing shortage of skilled labor in the United States construction industry. People employed in the construction industry typically do not have a background in higher education, instead they receive their training and education through apprenticeships with skilled craftspeople. Thus, the education necessary to enter the construction workforce takes the form of an apprenticeship.

The U.S. Department of Education’s implementation of STEM education has been successful at supplying a strong STEM workforce. The limit of this success is that most U.S. students do not have the foundation necessary to succeed in the completion of a STEM degree. Furthermore, STEM occupations make up less than 10% of the U.S. workforce.

To assuage the skilled labor shortage in the United States construction industry, apprenticeships in construction must be championed by the U.S. Department of Education the same way STEM education is. The lack of proficiency in mathematics and science displayed by most students in the U.S. would not be a limitation nor would a limited number of jobs, since construction makes up a substantially larger part of the U.S. workforce than STEM occupations.
Future Research

As these matters are further researched, it may be beneficial to examine why occupations in construction fell out of favor in the first place. Examining attitudes towards careers in construction would provide valuable insight on this matter. Upon researching these factors, strategies for implementation must also be hypothesized.
References


