ASEE 2022 ANNUAL CONFERENCE
Excellence Through Diversity
MINNEAPOLIS, MINNESOTA, JUNE 26TH-29TH, 2022 ASEE
Paper ID #38152

Understanding National Guard Engineers Enlistment Motivations and Propensity to Seek Construction Engineering Education

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Abstract
Military training programs, such as the Security Cooperation Humanitarian Assistance (HA) program for international engagements and the Innovative Readiness Training (IRT) program for domestic community support, involve cultural immersion, community-centered design, civil military partnerships, and project management for engineer officers and the construction trades specialists who serve with them building roads, emergency operations centers, clinics, schools, and other infrastructure in complex environments. Despite this extensive experience and the passage of the Post 9-11 GI Bill in 2006 to support undergraduate and graduate education, a limited number of veterans have considered engineering education programs.

This research explored the drives and perceptions of Army and Air Force National Guard engineers regarding their military service. Thirty-six volunteers from seven states were interviewed during an IRT mission where each crew spent two weeks building homes for Native American veterans. Twenty had deployment experience and the ranks ranged from Private First Class to Lieutenant Colonel.

The semi-structured interviews addressed participants' motivation for National Guard service as an engineer or engineer trades specialist, as well as their inspiration for continued military service beyond an initial contract. The transcripts were analyzed using Grounded Theory to find common themes across the interviews. Four two-week training cycles were observed for the study. Preliminary findings indicate that military members serving in construction engineering units working in the construction trades find purpose when working with their hands on projects that support a community in need, and despite being initially motivated to attend college utilizing the Post 9-11 GI Bill, the majority did not obtain a degree. The engineer officers, soldiers and airmen who did complete a degree often did not choose a construction engineering related field.

This research will provide critical information for construction industry leaders, STEM program and university administrators on Army and Air Force military engineers' culture. Understanding their motivations for military service and their choices regarding construction related engineering education is crucial to the successful recruitment and retention of veterans.

Introduction

The Army Engineer regiment consists of approximately 80,000 Soldiers across the active Army, Army Reserve and Army National Guard according to Brigadier General Peter Deluca, the Army Engineer School Commandant in April 2013[1]. Roughly 80% or 64,000 serve in the Army Reserve and National Guard making these service members high value targets for recruitment into engineering and engineering technology programs. The Air Force Reserve and National Guard have similar statistics worth considering as well. An important aspect of recruiting is a keen understanding of the motivations of the prospective pool of applicants.

The reasons for enlisting in the military have been studied often since the establishment of the All-Volunteer Force in 1973. Charles Moskos, a well-respected military sociologist, viewed people's motivations for joining the military as either "institutional" related to values and a sense

of service, or “occupational” where individuals considered the military in the same way they would any civilian job, for its salary, promotion opportunities, and benefits [2]. Historically, research showed enlistment into the active military was based on a rite of passage and family tradition [3]. The Montgomery GI Bill education benefits, a steady reliable income, healthcare, and fairer promotion opportunities have inspired women and minorities to enlist as a better way to make a living and provide for their family [4].

Over the past 20 years, the United States has been engaged in combat operations in Iraq and Afghanistan and has engaged the National Guard and the Reserve components in greater numbers. There are fewer studies related to National Guard and Reserve service motivations, however those that exist align with the institutional and occupational themes for enlistment despite the high likelihood of at least one combat deployment [2, 3]. This study is unique because it specifically focuses on interviews with service members who have chosen civil engineering or the construction trades. These officers, soldiers, and airmen shared their reasons for initially joining Active or Reserve military service, and their reasons for selecting an engineering trade such as heavy equipment operator (i.e., dozer, crane, or grader), plumber, carpenter, or electrician. Those who left active service shared their reasons and their motivations for returning to uniform service in the National Guard or Reserve afterward.

Background

Numerous studies exist regarding the motivations of women and men for joining the military since the establishment of the All-Volunteer Force in the early 1970s [6]. However, to date, this author has not found any studies on construction engineer service members who prioritized education benefits as a reason for joining the military and whether they utilized the benefit.

Further, if they used the education benefit, did they choose an engineering degree or construction related trade? This study focuses on Army and Air Force engineer units with the primary mission of construction in complex environments. This group of service members has the potential to transfer their military skills and experiences to the construction industry outside of their National Guard duties and are experienced construction professionals who have proven themselves in the most challenging environments.

All branches of the military have construction engineering positions as an option for enlistment for both officers and enlisted service members. While the officers in the Army do not require an engineering degree, the Departments of the Air Force and Navy require a degree in Architecture, Civil, Electrical, or Mechanical Engineering before they can be assigned to the construction engineering field. In the case of Air Force officers, as degreed engineers they can choose a career in the Civil Engineering service or some other specialty. Therefore, there may be degreed engineers in the Air Force and the Navy who do not choose a career in a construction field. Enlisted personnel who choose a construction trade skill first attend basic training for the specific service. After successful completion of basic training soldiers and airmen who have contracted for a construction trade skill -- electrician, carpentry-masonry specialist, plumber, engineer technician, or heavy equipment operator -- will attend additional training related specific to that skill. The shortest school is 7 weeks (Army Electrician and Plumber) and the longest is 17 weeks

(Army Engineer Technicians). The Air Force has similar trade skills however their training is aligned with the national public sector construction trades apprenticeship programs. Air Force Professional Military Education also provides credits towards an associate degree.

A 1990 study applied factor analysis to enlistment motivations to determine the issues that interested new recruits. It found job skills, self-improvement, educational opportunities, and broader opportunities for women were the top reasons which is similar to those expressed by the engineer participants in this study [3].

Previous studies have mapped military training to college coursework [7] Within engineering, construction engineering, civil engineering, electrical engineering, mechanical engineering and construction management are closely aligned with the Air Force, Army, and Navy officer basic and advanced training. Engineering technology and engineering technician degrees in civil, construction, carpentry-masonry, plumbing, and electrical are similar to the specific military occupational specialities (MOS) taught soldiers, airmen, and sailers upon initial entry. In general, each service uses their construction units for different missions thus requiring different degree's of experiences.military training appears to map more closely to engineering technology and construction management than typical civil, electrical, mechanical, or environmental engineering. The results of this study are drawn from a larger study which included a broader spectrum of questions related to trade skill selection, perception of IRT training value, and overall service experience.

Methods

Data for this research came from semi-structured interviews with 36 individuals who participated in Innovative Readiness Training for their annual training, building homes for Cherokee veterans in partnership with the Housing Authority of the Cherokee Nation. This human subjects research was reviewed and approved by an Institutional Review Board (Protocol # 21-0218).

Participant recruitment took place through the Sunday "Right Start" unit briefings held by the Innovative Readiness Training summer duration staff every two weeks, jobsite walk-about impromptu volunteer interactions, and phone calls with higher level planning personnel. Volunteer interviews were conducted from May through July 2021. The first author conducted the interviews.

Discussing individual motivations for joining the military and selecting a construction engineering trade along with perceptions of past and current training requires a degree of vulnerability especially since this discussion took place on or near their annual training site with unit leadership of all levels. I hesitated to discuss my positionality due to the length of my career and the rank I achieved as an engineer officer, thinking it would prevent a candid response. However, my status and experience seemed to establish a level of trust from the participants causing some to share more than originally expected. Interviews were conducted in person on the housing construction site or in the dormitory area for units participating in IRT training.

Recruitment was voluntary after the research project was presented to each of the military group's training during the two-week cycle. An effort was made to get volunteers from a variety of ranks, gender, and military roles. Most interviews were conducted on site in a private office or my vehicle on site. At other times the interviews were held in the dormitory area in a private room. The duration of most interviews was about 30 minutes. All data collected stemmed from the semi-structured interviews and IRT planning conferences.

The semi-structured interviews addressed participants' motivation for initial military service and selecting an engineering or construction related skill and continued military service. The audio recordings were transcribed and imported into NVivo, a qualitative coding software. The transcripts were analyzed using Grounded Theory to find common themes across the 36 participants. Four two-week training cycles were observed for the study.

Findings and Discussion

The group was diverse in geographic residence, ranks, years of service, and nationality (Table 1). Among the 36 participants, 25 were in the Army, 10 in the Air Force, and 1 in the Navy. There were four females in the study with ranks spanning E3 - O3.

Table 1: Participant Demographics and Military Characteristics (n =36)

	Gender		**# Rank**	**Ethnicity**		**Deployed**	
Ranks	**F**	**M**		***Indian / Alaskan Native**	**Other**	**Yes**	**No**
E3 – E4 (e.g., Airman First Class, Corporal)	1	11	12	6	6	2	10
E5-E6 (e.g., Sergeant)	0	10	10	4	6	9	1
WO2-WO5 (Warrant Officer)	1	1	2	0	2	2	0
O2-O3 (First Lieutenant, Captain)	2	4	6	2	4	5	1
O4-O5 (Major, Lieutenant Colonel)	0	4	4	3	1	4	0

*Tribal Nations individuals mentioned as part of their race/ethnicity identity included: Alaskan Native, Cherokee, Choctaw, Creek, Kickapoo, Osage, Seminole, Taino, and Taos.

Forty-two percent of the subjects identified as Native American or Indian which was high considering the population in the U.S. is approximately 1.4% according to the U.S Census and the Army overall has 1.7 % Native American service members across all skill sets [8]. This high percentage may be explained by the location of the training and the state National Guard units that participated in this study. Native people have the highest per capita involvement in the military of any other group, which aligns with this study of Air and Army National Guard engineer service members from primarily Oklahoma, Tennessee, Arizona, Pennsylvania, and Maryland.

Among the female participants, only 1 of the 4 had an engineering degree and she had joined specifically to pay for college and had first started her career in carpentry prior to being selected to attend Officer Candidate School (OCS). Two enlisted out of high school stated, "I had always thought of it" [12], and the other enlisted after having children, "I needed a change" [12].

Table 2. Motivation for Military Service and Construction Engineer Trade Skill

Rank	Reason for Joining Military	Reason for Engineer Construction Skill Selection	College Degree
Enlisted (25)	College-13 Purpose/Service-7 Health Benefits-4 New Adventure-1	- Civilian Skill - High Bonus	1-Electrical Engineer 1-Construction Science 1-Finance 1-IT 9- Drop Out/Pending
Prior Enlisted to Officer (9)	College-5 Purpose/Service-3	Military Selected	3- Environmental, Construction Technology, Industrial 6 - Other
Officer (3)	College- 1 Purpose/Service-2	-Family -Military Selected	2-Mechanical, Electrical 1-Switched from Civil Psychology

Thoughts of IRT participation -

Preliminary findings indicate that military engineers both enlisted and officers find purpose when working with their hands on projects that support a community in need regardless of alignment with individual military construction skills. All 36 service members, expressed high regard for the type of community-based training they received in the IRT program. "Real world" experience and a sense of purpose giving back to a community in need, ranked high in personal satisfaction and training value. Every interview expressed a sense of pride in the opportunity to build homes for fellow veterans, individuals who had sacrificed like they have. One soldier said, "I feel like being able to spend time and help out the community is something everyone here loves to do"..

Many expressed a desire to meet with the future homeowners however, the housing authority selection process will not take place until after the homes are completed.

Hands on training is vital for construction trade and project management proficiency. Unit leaders expressed the value of construction projects, such as IRT, that supported a real need in a community. The added value is that community-centered construction projects inspire a sense of purpose and continued service. The location does not matter nor the conditions if leadership is enduring the hardships along with the soldiers and airmen working on the project, as well. As one soldier put it, "We all embrace 'the suck' together" [12].

Reasons for Joining the Military and Selecting Construction Skills/Program

The reasons that interviewees gave for joining the military and construction trade skill program more specifically are summarized in Table 2 above and Figures 1-3 below. While 13 of the 24 enlisted participants joined the military for college tuition, only one had earned his degree in Electrical Engineering and one was currently enrolled in Construction Technology program. Three others were in non-engineering programs, and the remaining nine had either dropped out of college or have yet to take advantage of the GI Bill funding. Seven of the 24 (29%) enlisted participants are using their construction trade skill in a civilian job despite the initial motivation of learning a transferable skill.

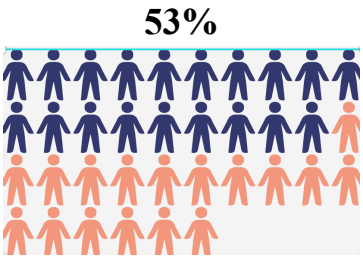

Figure 1: 19 of 36 stated college as a motivation for military service

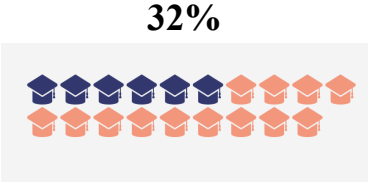

Figure 2: 6 of the 19 received a college degree

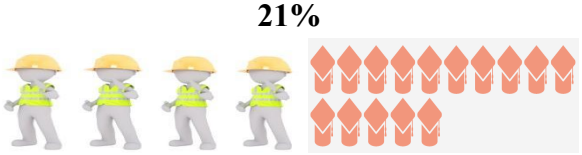

Figure 3: 4 of 19 chose construction related degrees

In some ways these findings align with Dr Kate Welfare's, 2021 paper, "Perceptions of Construction Work: Views to Consider to Improve Employee Recruitment and Retention" where over 200 skilled construction craft workers actively working on commercial projects in Colorado were interview about their jobs. She found that "that workers most enjoy seeing tangible results, social interaction with co-workers (camaraderie), problem-solving, challenging, and diverse work tasks and working with their hands" [5].

In this study, the interviews indicated that regardless of rank, the individual with experience or expertise in a particular skill set is trusted to teach and guide the others. The reality is that the National Guard and Reserve must rely heavily on previous deployment experience and civilian trade experience to bolster proficiency of other members with only military schooling and weekend training. For example, in one rotation a Private First Class (PFC) with less than 3 years in the Army was an apprentice plumber and he was tasked with training the others of his crew regardless.

This experience is unique to the military. Civilian construction firms rarely provide leadership training of this type even for its young degreed engineers. These challenges, along with the trust that leaders and team members have for these "junior" experts, motivates these individuals to push themselves out of their comfort zone. This group had over 42 deployments to Afghanistan, Egypt, Guam, Iraq, Kuwait, Syria, and other locations. Nine exceeded the minimum 20 years for retirement and indicated they would continue to serve until mandatory retirement. Twelve had more than 7 years of service meaning they were past their first enlistment contract.

Limitations and Implications

This paper is the first in using Groundedd Theory as a framework for understanding officer and enlisted service members pathways to a military construction engineering or technical career in the Air Force and Army National Guard. More work is needed to understand the personal choices related to choosing to seek a college degree from the numerous engineering education programs, factors related to drop-out, or to completely by-pass the original motivation of tuition support for college. Another gap is in the perceptions of military construction participation through the National Guard and working in the construction industry as a full-time career.

This research provides insight into military engineering unit members motivations for construction related military service from the Air Force and Army National Guard perspective. Despite the limitations, the findings are a stepping stone to greater understanding of this population which could inspire changes in military training, engineering education programs and the construction industry.

Conclusions

This qualitative study of military service members assigned to construction engineering units is the first of its kind making it a unique data set. Most studies are conducted via written or electronic surveys and target one service of the Active Component. The one study I found on the motivation for enlistment in the National Guard and Reserve focused on the Army National

Guard. This study interviewed civil construction engineer service members of the Air and Army National Guard over an eight-week period. This research has shown how much National Guard service members appreciate hands-on experiential learning on community-based projects that support a need that aligns with their values. These training projects are critical to training, military unit retention, and community service support.

We discovered that occupational benefits along with training in a civilian transferable trade make up most individuals reasons for joining the National Guard initially which aligns with Moskos "occupational" categorization [2]. However, the interviews conducted in this study indicate that people stayed in the National Guard construction engineering units for the community-service, real world mission, training in useful skills beyond their construction trade, and to be with their unit. It is not clear from this study when the transition to an "institutional' motivation took place but for many it did.

The 42% Indian or Native American and 11% female may indicate that this population has an interest in the construction industry while the graduation rates in STEM fields for Native Americans are 27%, for all females 36%, while white males receiving STEM bachelor's degrees remain at 64% rate [9,10]. Further analysis is required to determine the reasons for these gaps.

This research provides a greater understanding for military leaders on the importance of community-based construction projects for training and retention. In addition, it demonstrates to engineering educators that they have an opportunity to recruit military members who have a desire to work in the construction field but for some reason have not chosen or completed an engineering degree. Finally, the construction industry is missing the opportunity to recruit people who are interested in a construction career building structures that serve their community and provide them a sense of purpose beyond a paycheck [11]. Increased diversity efforts on the part of construction industry leaders and unions may help inspire these military veterans to seek employment in the industry, share their experiences, obtain construction engineering related degrees, and much needed apprenticeships in the trades.

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