

Using Focus Groups to Understand Military Veteran Students' Pathways in Engineering Education

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Abstract

This study examines the experiences of military veterans pursuing bachelor's degrees in engineering. Given the diverse backgrounds of veterans, their increasing numbers, and the growing national demand for engineering professionals, the timing is ideal to study the conditions under which student veterans pursue engineering education and the factors that offer them the greatest support for success. Using a comparative case study approach across three institutions, University of San Diego, North Carolina State University, and Purdue University, student veterans are interviewed in focus groups to gain insights on the following research questions:

1. Why do veterans pursue a Bachelor's degree in engineering?
2. How do military experiences shape student veterans' educational experiences?
3. What are the experiences of student veterans in engineering education?

The thematic analysis indicates that military veterans pursue engineering based on (1) previous experiences with engineering-related activities while in the military, (2) recommendations from family and friends, (3) the challenging nature of the engineering discipline, and/or (4) the positive job outlook (including prestige and salary) associated with the engineering profession. Other themes that emerged include: differences between student veterans and traditional students and balancing academic and family lives. Most of the student veterans interviewed in the focus groups reported positive academic experiences with sufficient to ample support from faculty and student services. Some noted that the discipline, work ethic, teaming skills, and the mindset that they gained from the military facilitated their progress through the engineering curriculum. Some indicated being more vocal than other traditional students in asking questions and in seeking help from faculty in regard to learning course materials, while others relied on study groups. Findings will provide context and information for various applications, such as: identifying ways in which the military can help separating service members transition into engineering education, development of new strategies to support student veterans' success, identification of overlooked areas to promote student veterans' participation in engineering, and generation of critical information for development of larger-scale studies for investigating student veterans in engineering.

Introduction

According to the National Science Foundation (NSF) Workshop on Enhancing Post-9/11 Veterans Educational Benefit,¹ the veteran population holds tremendous promise for expanding and diversifying the engineering workforce. Given the diversity of student veterans and their increasing numbers, and the growing national demand for engineering professionals, the timing is ideal to study the conditions under which student veterans pursue engineering education, and the factors that offer them the greatest support for success. As of 2011, nearly a million veterans, most from conflicts in Iraq and Afghanistan, have used the benefits offered through the Post-9/11 GI bill, and many campuses are seeing significant increases in the numbers of veterans.^{2,3} This group is expected to grow by 30% per year, with increasing percentages of Black and Latina

women, particularly given the expanded benefits of the Post-9/11 GI Bill and the Yellow Ribbon Program, under which the federal government matches, dollar for dollar, any financial aid that participating schools commit. This makes select institutions more affordable and covers the full cost of attendance at state schools.^{4,5} Despite these growing numbers, little is known about the educational pathways of student veterans in engineering education.

We therefore examined the experiences of military veterans pursuing bachelor's degrees in engineering. Using a comparative case study approach across three institutions, University of San Diego, North Carolina State University, and Purdue University, we interviewed student veterans to gain insights on the following research questions:

1. Why do veterans pursue a Bachelor's degree in engineering?
2. How do military experiences shape student veterans' educational experiences?
3. What are the experiences of student veterans in engineering education?

We conducted 5 focus groups with a total of 21 participants. We used thematic analysis to analyze our interview data and also provide descriptive statistics of our participants. Our findings will provide context and information for various applications, such as: identifying ways in which the military can help separating service members transition into engineering education, development of new strategies to support student veterans' success, identification of overlooked areas to promote student veterans' participation in engineering, and generation of critical information for development of larger-scale studies for investigating student veterans in engineering.

Literature Review

Within the next few years, more than 2 million service members will be returning from Iraq and Afghanistan; many of these individuals desire to pursue their college education. Since 2008, nearly 500,000 have used GI Bill Benefits to fund their education; many college campuses across the nation are considering how best to serve the needs of this unique population.⁶ Universities have increased the services offered to student veterans, built student veteran centers, and augmented campus counseling and advising services to better address veteran needs. In doing so, universities are often hoping to increase their stature as "military-friendly."

Such educational efforts have also been initiated by a variety of academic units. For example, several researchers have recognized that military veterans may be especially well qualified for degrees in engineering and science.^{7,8} According to the Million Records project, which examined post-secondary completion rates of student veterans from 2002-2012, nearly one-third of student veterans who completed a bachelor's degree earned their degree in a Science, Technology, Engineering, and Math (STEM) field. This completion rate is comparable to the STEM completion rate of these student veterans' civilian counterparts. The data also indicate that student-veteran STEM students complete their degrees faster than student veterans in non-STEM fields.⁹

Previous literature on student veterans has examined the transition from active duty to enrollment in college,^{10,11} and how disabilities may influence the transition experience.¹² Other

researchers studied how academic institutions can better support the academic success of student veterans.^{13,14,15,16} Despite the growing literature on student veterans, scholarship in this area is still greatly needed.¹⁷ We contribute to developing this area of scholarship by examining the experiences of student veterans in engineering.

Theoretical Framework

Schlossberg's Transition Theory is useful for gaining a better understanding of the experiences of student veterans as they "move in, move through, and move out" of the university in general, and their major in particular. The "4S" transition model stipulates that students' transition experiences depend on four factors (1) the characteristics of the particular situation (in this case the transition from the military to school) – timing, duration, role change, and previous educational experiences; the self – the personal characteristics and resources that a student brings to the transition (such as age, sex, and personality); support – those systems and programs that aid in the transition – such as family and friendship networks; and strategies used to cope with the stresses associated with transitioning from the military to college.^{18, 19}

Applied to student veterans, in terms of situation, we are interested in learning more about how student veterans in engineering chose their major and whether previous experiences were influential in selecting this educational pathway. It is also important to understand perceived role changes that our study population may experience (e.g., transitioning from being a "soldier" to a "student"). Additionally, personal characteristics that were strengthened in the military (e.g., discipline, leadership skills, etc.) may be an aspect of "self" that student veteran engineers enact to be successful in their undergraduate studies in engineering. And, we wanted to understand whether specific support systems (e.g., support from family members and even the military itself) and strategies (e.g., study groups with other student veterans) may be unique to the student veteran population. Much like the Million Records project, we hope to determine whether student veterans are a unique population with assets and needs that distinguish them from other non-traditional students.

Methods

The focus groups enable us to obtain information about a wide variety of factors, processes, and experiences that aid or hinder veteran engineering student experiences and shape their educational pathways. We conducted five focus groups: two at University of San Diego, two at North Carolina State University, and one at Purdue University. Across all institutions, 21 student veterans participated in the focus groups. We used a common interview protocol to ensure that the same basic questions are asked of each focus group across our sample institutions, contributing to the integrity and reliability of our study. However, our interview protocol also provided the opportunity to explore emergent themes. Below are sample questions from our semi-structured interview protocol:

1. What attracted you to engineering? How did you select engineering as a major?
2. What sorts of guidance did you receive from the military about pursuing an engineering (or any other) degree?
3. How did your military experiences influence your choice of engineering major?

4. Describe how your military experience has shaped your educational experiences in general, and your experiences in engineering specifically.

Data Analysis

Qualitative data analysis is an iterative process that takes place both in the field and after the completion of data collection. We audio recorded each focus group, and a professional transcriptionist transcribed the audio to text. We reviewed each transcript and compared it to the original recording to validate the accuracy of the transcription. This also allowed us to remain close to the data and to identify the initial themes. For the coding process, we used the method of constant comparison²⁰ and thematic analysis to develop categories, compare concepts, and develop models for explaining the student experiences. We created episode profiles that summarized the salient elements of each transcript with respect to our research questions.

We have developed several strategies to enhance transferability of our findings. We have engaged research partners and key informants, some of whom are veterans, to provide the military perspective. We have taken steps to provide a broad and comprehensive examination of student veterans in engineering by incorporating three institutions and using multiple sources of evidence for triangulation. Our protocol is designed to elicit richness and depth toward the understanding of student veterans’ academic pathways and experiences in engineering to provide context and information. While our results highlight findings from the five focus groups of 21 participants, our data collection is ongoing and we will include additional focus groups from North Carolina State University (NCSU) and Clemson University.

Sample Description: Focus Group Participants

Table 1 provides a description of our sample. Of our 21 participants, 20 are male and 18 indicated that they are White/Caucasian. The student veterans are also older than traditional students: 62% are between 23 and 29 years of age, whereas 33% are 30 years or older. A little over 42% indicated that they have family responsibilities. Our study participants represent a wide range of military service: Navy, Air Force, Army, Marine Corps, and Coast Guard with a range of number of years of service from less than 5 years through more than 20 years. While the majority of participants declared mechanical engineering (42%) as a major, there is a wide range of disciplines represented, such as chemical, electrical, agricultural and biological, and nuclear engineering.

Table 1. Description of Sample

<i>Military Branch</i>	#	Percent
Air Force	2	10%
Army	2	10%
Coast Guard	1	5%
Marine Corps	5	24%
Navy	9	43%
Multiple	2	10%
<i>Total Years of Service</i>		
5 or fewer	6	29%
6 to 10	12	57%
11 to 15	2	10%

More than 20	1	5%
<i>Engineering Major</i>		
Aerospace	1	5%
Agricultural and Biological	2	10%
Chemical	3	14%
Electrical	3	14%
Industrial/Systems	1	5%
Mechanical	9	43%
Multidisciplinary	1	5%
Nuclear	1	5%
<i>Total Participants</i>	21	

Results

We analyzed our transcripts with the following research questions in mind:

1. Why do veterans pursue a Bachelor's degree in engineering?
2. How do military experiences shape student veterans' educational experiences?
3. What are the experiences of student veterans in engineering education?

Our thematic analysis indicates that military veterans pursue engineering based on (1) previous experiences with engineering-related activities while in the military, (2) recommendations from family and friends, (3) the intellectual challenge they perceive to be associated with pursuing engineering, and (4) the positive job outlook (including prestige and salary) associated with the engineering profession. In regard to how military experiences shape student veterans' educational experiences, we found that the student veterans attribute their academic success to the discipline, work ethic, teaming skills, persistence and resilience, and strong mindset that they gained from serving in the military. Many described how being in the military taught them to set and achieve goals, and that they transferred these skills to the engineering classroom. Importantly, their engineering-related military experiences provided context for learning and understanding engineering course material. Overall, our study participants described positive experiences in engineering education with sufficient to ample support from faculty and student services. Other themes that emerged include: differences between student veterans and traditional students and balancing academic and family lives, which were both primarily attributed to the age gap rather than veteran status.

Why do veterans pursue a Bachelor's degree in engineering?

The majority of our study participants indicated previous experiences with engineering in the military as a strong influence in their decision to major in engineering. For example, one participant fabricated pouches for gear while in the military and discovered that he enjoyed designing and generating applications to improve processes, whereas another participant who served as a bomb technician collaborated with engineers during service and discovered that he wanted to learn more about theory. He said, "*when I was on active duty, I was doing a training course at Sandia National Labs and they had us working hand-in-hand with some engineers. When we were doing the training I thought that that seemed like the job I really wanted to do was to do something along those lines.*" Overall, however, the challenge associated with

pursuing and completing an engineering degree attracted the interest of many student veterans, as well as the positive job outlook. For example, one of our participants summarized it as *“I just like the challenge and the rigor of the studies. And also I kind of like ... the kind of high demand low supply [that] puts you in a good economic position for employment.”*

How do military experiences shape student veterans’ educational experiences?

Our participants cited discipline, work ethic, and commitment to accomplishing goals as central to their approach in succeeding in engineering. Many described focusing on a goal and doing all that they need to accomplish that goal be it doing homework as soon as possible, asking faculty questions, forming study groups with other students, or encouraging teammates to contribute to group projects. As one student veteran described, their mindsets shifted after serving in the military: *“[military experience] made time management easier—just more discipline, not procrastinating; I can’t stand to procrastinate whereas like my senior year of high school I procrastinated a lot.”* Another participant remarked, *“I think that being in the Army has just helped me to sit down and focus. I don’t think I could have done this immediately after high school.”* Many described how military experience has been particularly important for their ability to work in teams, a critical skill for engineers. *“A lot of us veterans, we’re used to working out of our comfort zone and we can work with, you know, just about anyone, you know, we would have to work with people from different backgrounds, from other countries, so for us when it comes into group work like I’ve always noticed that we can just get right into this stuff and getting to work.”*

What are the experiences of student veterans in engineering education?

While many veterans found that while their outlook and mindsets were useful toward their own success, it was quite different from some of their traditional-aged engineering classmates. *“It’s made me expect more of other people ... like the first few weeks after I got out of infantry school I hated it when people were late ... like I just didn’t like how lax they were and how little things seemed to matter to them.”* Many of our study participants note this difference in relation to teamwork—*“sometimes being in groups where there’s a lot of procrastinators and non-procrastinators can cause some anguish and friction.”* Among those who described experiences working in teams, many of them took it upon themselves to encourage their teammates to “pull their weight” to complete the assignment. Our study participants reported relatively positive experiences with faculty indicating that faculty have been very supportive and accommodating. In regard to any perceived differences, many of our participants attribute this to differences in age and family responsibilities, rather than veteran status. For example, *“I feel like for me, being older has more so to do with the family and balance thing, cause I mean, studying is awesome, but at the end of the day, I still need to be a parent, and make sure I’m making time to teach him, and spend time with my son.”*

Discussion and Conclusion

In this paper, we provide an overview of the early results of our research on student veterans in engineering. We have identified some important dimensions of how students enter the major and the quality of their engineering education experiences once they initiate their studies. To succeed in college, student veterans must negotiate a series of transitions, several of which may happen simultaneously. Our early study results indicate that such transitions are shaped by a variety of

factors including participants' specific military experiences, personal characteristics, and age, factors that align with Schlossberg's situation and self dimensions of the transition experience. In terms of situation, only a few of the students indicated that the military had a direct influence on their choice of engineering major. While several students indicated that their military jobs were directly related to their major, a more common pattern was that military experiences shaped intangible personality characteristics (i.e., the "self" dimension of transition theory) that are important for succeeding in college in general and in engineering in particular (e.g., leadership skills, a high level of motivation, organizational skills, and team-work skills).

In terms of other dimensions of self, participants felt strongly that, while their veteran status was very important for establishing a foundation for their college experience, their age and non-traditional student status seemed to shape their experiences the most. This finding supports previous research that indicates similarities between student veterans and non-traditional students.^{21, 22} Along with age, having significant family responsibilities impacted our participants' experiences, a factor reinforced in Radford's study on veterans in higher education.²³ The student veterans who participated in our focus group provided mixed responses regarding the type of support received from the university and engineering departments and the strategies that they used to succeed in engineering. For example, while several students reported frequently visiting their campus student veteran center, others indicated that either they were unfamiliar with the services offered or they purposefully chose not to visit the student veteran center or join the student veteran organization. Instead, they preferred to "hide" their veteran status, or at least relegate it to secondary status, as compared to their other statuses (e.g., parent, engineering major, etc.).

While Schlossberg's theory is useful for understanding the rather linear progression of student veterans through their degree programs, it falls short in explaining the dynamic and widely varying nature of these transitions. Vaccaro's research on student veterans emphasizes the great diversity of experiences within the student veteran population, based on a number of factors including sociodemographic characteristics (e.g., race, gender, sexual orientation, and class) and military branch.²⁴ Our future analysis will analyze differences among and between student veterans more closely to arrive at a deeper understanding of the factors that facilitate student veteran success in engineering.

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