



6-2020

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## **Investigating the experiences of military professionals who return to engineering graduate school**

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# **Investigating the Experiences of Military Professionals who Return to Engineering Graduate School**

## **Abstract**

Those graduate students known as returners, who have a gap of at least five years between their undergraduate degree conferral and their return to school for a graduate degree, have a wide variety of different experiences. While many of them spend those gap years in employment at an industrial employer, some of them serve in the military in various capacities. As military experience is different from working at an industrial employer, one might expect that these returners will be different in their outlook, skills, or approach to learning. In this study, the differences between military returners and returners from industry are examined. Twenty-one returners were interviewed, of whom seven had either served in or worked directly for the military as a civilian. The interview protocol covered the participants' decision-making process, challenges they experienced in the program, and whether and how their past experiences interacted with or had an influence on their education. The transcripts of these interviews are analyzed, and the two groups are compared, with key differences and similarities, such as their approach to leadership, noted. In addition, the findings from this analysis are compared to military personnel entering an undergraduate program, as reported in the literature.

## **Introduction**

Those students known as "returners," who work for a period of time and then return to school for a graduate degree, have not been extensively studied. While there is some recent work describing the population as a whole, sub-populations within this group, including those whose experience was in the military, have not been examined. Military experience, whether as a civilian employee of the military or as an officer or enlisted service member, can be expected to differ in some ways from industry experiences, and the impact of those differences may be seen in the experiences of returners from those backgrounds. Understanding these differences could be of value in providing guidance to returners or potential returners with a military background. In this paper, the experiences of returners in master's programs with military work experience are studied.

## **Background**

As there is no existing literature specifically on military returners, the background for this paper is drawn from two distinct areas: the nascent literature on engineering returners in general, and literature on veterans as students, particularly within engineering.

### *Returns*

While the first work on returners was primarily anecdotal [1], there is a growing body of more recent work that systematically examined this population of graduate students. One such study, conducted by Strutz et al. in 2011 [2], focused on engineering returners within engineering education; this study focused on the “experience capital” that these students had, and could apply to their studies. Another study in 2011, conducted by Peters & Daly [3, 4, 5], focused on returners in a broad array of engineering and science graduate programs. This study found that there was a shift in identity as professionals prepared to return to school, and further examined the returning experience through the framework of Expectancy Value Theory (EVT). This initial study found that the primary value driving returners back to school was utility value, with a lesser emphasis on interest and attainment, and examined the various costs and cost mitigation strategies that returners experience and utilize. Further work, utilizing EVT, was conducted in a nationwide study of engineering returners in doctoral programs [6-13]. This work found similar results for cost categories, compared to earlier work, and provided more insight into the needs of returners in these programs. Additional work specifically looked at the writing experiences of returners in doctoral programs, and compared the writing they carried out in academia to that which they had conducted in industry [14].

Returners within master’s programs have also been studied in a nationwide study. It has been found that, while they have been away from school for a substantial period of time, they experience similar self-efficacy to direct pathway students. They also do not appear to be at a disadvantage in the area of modern technology, even if it has been some time since they were in school [15]. It was also found that there were synergies between their previous work experience and their schoolwork [16], and that there was a greater likelihood that they would go through “disciplinary migration”, or a change in major between their undergraduate and graduate studies [17].

### *Veteran students*

The experiences of military veterans in higher education, including within engineering, are different from the experiences of the general student body, and there are a number of studies that have been conducted on this population, as well as various programs that have been developed to support their success. These focus almost exclusively on undergraduate education; however, some of the findings are relevant to the graduate student population.

In [18], programs at different universities that aim to support veterans in STEM were examined. With one exception, these programs focused exclusively on undergraduate students. Similarly, in [19] there was a focus on policies and support services for veterans in STEM. This work did delve somewhat into the assets that veterans have as students, including persistence or “grit”, adaptability, and levels of motivation and maturity. The authors found that these students were successful particularly in teamwork-based class projects. The examination of assets of military

service was further examined in [20], where it was found that while age itself did not appear to be an asset, veteran status was; it was associated with professionalism, leadership, and teamwork skills, which were positive traits for students.

The transition from military service to undergraduate studies was studied in [21]. Further studies focused on adult students as a whole, including those who are veterans [22], and on veterans' pathways and choice of major [23-25].

## Methodology

### *Study Participants*

In this study, 21 interviews were conducted with returners in master's programs; of those interviewed, 7 had military work experience, whether as a civilian employee of the military, an officer, or an enlisted service member. One of those with military ties was female, and the remaining six were male. Over half were officers, with several graduating from United States Military Academies. The study participants are summarized in Table 1.

Table 1: Study Participants

<i>Pseudonym</i>	<i>Gap Years</i>	<i>Service Branch</i>	<i>Type of Status</i>
Sam	5	Navy	Officer
Daniel	5	Army	Officer
Donny	6	Navy	Civilian Employee
Marty	10	Navy	Officer
Maryanne	5	Navy	Civilian Employee
Ralph	7	Army	Officer
Chuck	6	Air Force	Enlisted Personnel

### *Data Collection*

Data collection was carried out through a semi-structured interview, which was done in person at a location mutually convenient to the interviewer and the participant. Interviews were recorded and transcribed. The interview protocol focused on participants' work experiences, educational experiences in their master's program, and how their work and education interacted. The interview protocol is given in Appendix A.

### *Data Analysis*

Data analysis was carried out through open coding, in order to allow themes to emerge from the data. All coding was carried out by a single researcher, with review by another member of the research team.

### **Findings**

Four major areas of interest were identified in the analysis, two in which substantial variation was present, and two in which there were common themes among participants. The areas of variation were the use of undergraduate engineering material in the participant's military work and the influence of their military experience on the decision to return. Common themes were seen in the areas of teamwork and leadership skills.

#### *Use of Undergraduate Engineering Material*

When asked if they had used their undergraduate engineering knowledge in their military work, participants' answers covered a wide range. One participant indicated that he had used his undergraduate knowledge extensively; others used it to some extent, with two participants stating that they did not use it at all. On one end of the spectrum, Marty, an officer in the Navy, stated that

A lot of that I used immediately, the physics, the thermodynamics, the electrical side... The engineering background was fundamental to what I was doing every day. I think you need to understand the theory to know why you shouldn't turn that pump on when the outlet valve is shut... I think because I went into a very hands-on pump kicking, technical field, I think that was more applicable than I think most people probably get initially coming out. I think I used it all the time.

Another participant, Maryanne, worked for the Navy as a civilian, due to her receipt of the SMART scholarship. She felt that she used some of what she learned, but not all of it, and not nearly as regularly. She stated that

... a lot of the technical thermodynamics, math, heat transfer or vibration, all those technical things, I don't really use on a day-to-day basis. It gives me a good appreciation for those technical disciplines so I can review work... A lot of what I've learned that I've used... was kind of that technical processes and development process.

Similarly, Sam, who served in the Navy, felt that he had used his undergraduate knowledge to some degree, both in his job and in his preparations for the professional engineer exam.

I did my best to use as much of the knowledge as I could in my job in the Navy, even though it wasn't a design job, and last but not the least, I had to study for my professional engineering exam, and that forces you to go back.

At the far end of the spectrum, Daniel, an officer in the Army, did not feel that he had used his engineering knowledge at all. When asked about whether he had used his technical knowledge from undergraduate education, he said

To be completely frank, no. Next to nothing... I unfortunately didn't apply any of my knowledge. I wish I had...

#### *Influence of Military Experience on Decision to Return*

Participants' responses also varied when asked about the influence of their work experience on the decision to return. For some, their experience had a significant influence, while others felt it had no influence at all. On one end of the spectrum, Daniel did not see a significant influence of his military experience on his decision to go back, beyond perhaps confirming an earlier decision. He stated that

I always knew I wanted to get a graduate degree... I knew I was going to get a graduate degree eventually... I knew I wanted to continue education. If anything it probably hastened my decision to realize I didn't want a career in the Army.

In contrast, Maryanne felt that her work as a civilian Navy employee did have an impact on her decision to go to graduate school. As she described it,

Through my work, it's one of those things where the more you learn the more you realize you don't know anything. The more I learned at work I was like, "I need to learn more, because I don't know a lot of this stuff." I considered going back to grad school for a few years... I think as those years progressed I realized there was this need... that wasn't being met. I realized if I went back to school I could better meet that need, that gap that I think that the Navy lacked.

#### *Teamwork and Reliance on Others*

One common theme in the interviews was the participants' strengths at projects involving teamwork, and their ability to acknowledge the need to sometimes rely on others. This thread was seen most strongly in those who were officers or enlisted personnel in the armed forces, although it also was apparent to some degree in the civilian employees of the military.

Daniel spoke about how he worked with other people, both in his military service and in graduate school.

I think it goes back to what I said about soft skills. I focus more on to people, the peers.

Chuck, who served in the Air Force, expressed similar sentiments:

I guess also in the military you have to rely on help of others in the jobs that you're doing... And so that helped me a lot in being able to reach out to the people who are around me and helping to get back up to speed.

### *Leadership*

In a similar sense, there was an extremely strong theme of leadership, particularly among the officers and enlisted personnel; although, again, it was seen to an extent in civilian employees of the military. Participants, in many cases, explicitly discussed leadership as something they learned in their military service. As Marty stated, when asked about topics he had retained,

Probably leadership and management skills. Naval Academy pushes that really hard, obviously.

When he discussed his past experience, he also referred to management, as part of his leadership experience

And then the management techniques on top of that, managing the guys who do all that kind of stuff...

Similarly, Daniel spoke of his leadership skills that he had learned, and which he had taken into his master's degree.

... it was leadership development. I mean this was the United States Military Academy so they focused heavily in leadership development. I learned a lot about interacting with other people, I learned about myself, I learned about kind of what I'm capable of.

Ralph referred to management and leadership in both his education and in his military deployment, and contrasted it to his undergraduate degree.

My undergrad was in math. I wasn't necessarily out working in a math based field, it was more a people management type of field... I think that West Point tailors its undergrad education to be broad... philosophy, ethics and psychology, people motivation, things like that...



Chuck also spoke of leadership, with a reference to what he had learned in the military including “leadership development and sort of management class.”

## **Discussion**

In some ways, military returners’ experiences match those of non-military returners; as with the general population of returners, the degree to which they used their undergraduate knowledge in their employment differs, and the influence of their job on the decision to return to school varies. This can be compared in some ways to the literature on undergraduate students who are veterans. The aspect of returning to school is not relevant, as those working on an undergraduate degree do not typically have previous college experience to return to. However, the influence of military experience on a student’s pathway and decision to enroll in school differs in both cases, with some students feeling their experience was a significant influence and others indicating that other factors were more important.

Compared to the general population of returners, veteran returners are distinct in the strong emphasis on the two areas of leadership and teamwork; this corresponds closely to the literature that describes and characterizes undergraduate student veterans.

Teamwork has been seen as an important skill that returners bring to their education, as discussed in [3]. However, the emphasis on it among military personnel is particularly high. It was strongly and explicitly emphasized in the military, and the participants perceived it as something that was essential to their service, and consciously cultivated. As it was a part of the overall military culture, it did appear, to some extent, even among the civilian employees of the military. Furthermore, as one might expect from this cultural aspect, it has been reported in the literature as a feature of undergraduate student veterans [19].

The emphasis on leadership, and its contrast to the general population of returners, is even stronger. Participants perceived that their military service consciously cultivated their leadership skills, and felt that those leadership skills were an advantage to them in their education. This corresponds, as well, to the literature on undergraduate students who are veterans. While they felt that their age was a possible disadvantage, e.g. [19], they perceived their experiences as a positive influence on their performance as students.

## **Limitations**

One of the limitations of this study is the small number of military returners. While they constitute a relatively large proportion of the returners interviewed, the small number of military returners dictates caution in drawing general conclusions. Furthermore, given the wide range of

different services and roles represented, there is no ability to draw meaningful conclusions about sub-groups within military returners, such as distinctions between officers, enlisted personnel, and civilian employees. Furthermore, there is insufficient data to distinguish between the experiences of those transitioning out of the military as they return to school, and those who are remaining in their position. A more extensive study, with a larger sample size, could provide useful data to determine the general applicability of these results and answer further questions about military returners.

## **Conclusion**

In this paper, we have examined the experiences of military returners, based on personal interviews with them, and compared them to the experiences of a larger population of returners, and to the population of undergraduate student veterans. It was found that veteran returners varied in some ways, but that there were some strong commonalities; these commonalities, the teamwork and leadership aspects, align well with results from studies of undergraduate returners. Further study is warranted to answer additional questions and to address the limitations imposed by the small sample size in this study.

## **Acknowledgement**

This work was supported by a grant from the National Science Foundation, #1463825. The authors gratefully acknowledge this support. The authors also would like to acknowledge the contributions of Dr. Shanna Daly, University of Michigan, to this project.

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## **Appendix A: Interview Protocol**

### **Prior Experiences**

1. Tell me about your experiences in between your undergraduate and graduate programs.
2. Do you feel you used what you learned from your undergraduate education in those experiences? In what way?
3. Did your experiences in between your undergraduate and graduate programs affect your decision to go to graduate school?
4. Thinking back on the courses you took as an undergraduate, how well do you feel they prepared you for your graduate degree?
5. How well do you think you retained the material you learned as an undergraduate?
6. In what topics do you think you retained the most knowledge? The least?

### **Background Knowledge, Retention and Recovery**

7. Thinking of a course in which you felt you were well-prepared in your master's program, what kind of knowledge did you find useful?
8. Thinking of a course in which you felt you were not well-prepared, what kind of knowledge did you feel was missing?
9. Were there concepts you encountered in your master's courses that you learned, but had forgotten?
10. Were there new concepts you had never heard of before? If yes: describe what you did in this case.

### **New Knowledge**

11. When you encounter a new concept in class, what is the first thing you try to understand about it? Can you give an example of a new concept you learned recently, and how you went about learning it?
12. Which classes and topics do you feel are most relevant to your future career path?
13. Have you seen any examples of concepts or techniques in your coursework that would have assisted you with problems or tasks you've faced in the past?

14. In what ways do you feel the different classes in your program are related? Do these relations have an effect on how you approach the material?

### **Reflection**

15. Thinking back over your work experience and your coursework, what relations do you see between your work experience and your coursework?
16. How do you feel your work experience has influenced the way you approach your coursework?
17. If you worked in industry, did your studies adequately prepare you for your job?
18. Why did you choose the program you did?
19. Describe your study habits.
20. Describe the skills you need in your courses.

### **Returners**

21. Did you want to go directly to graduate school from your undergraduate work? Why did you choose to wait instead?
22. At work do you know the disciplines of people with whom you work?
23. Was there a time when coursework and employed work came together? Describe.

### **Perceived preparation for work**

24. Was your first engineering job what you thought it was going to be?
25. How well do you think your academic experience prepared you for an industry job?