

I Never Played the 'Girl Card': Experiences and Identity Intersections of Women Student Veterans in Engineering

Rebecca C. Atkinson, Clemson University

Rebecca works full time in new student orientation at Clemson University. She is in her fourth year of her doctoral degree in educational leadership. Her research interests include women student veterans and competency development from military experience. She has 15 years of higher education experience including a stint working at the U.S. Naval Academy. Rebecca is also the daughter of a U.S. Military Academy graduate.

Dr. Catherine Mobley, Clemson University

Catherine Mobley, Ph.D., is a Professor of Sociology at Clemson University. She has over 30 years experience in project and program evaluation and has worked for a variety of consulting firms, non-profit agencies, and government organizations, including the Rand Corporation, the American Association of Retired Persons, the U.S. Department of Education, and the Walter Reed Army Institute of Research. Since 2004, she has been a member of the NSF-funded MIDFIELD research project on engineering education; she has served as a Co-PI on three research projects, including one on transfer students and another on student veterans in engineering.

Dr. Catherine E. Brawner, Research Triangle Educational Consultants

Catherine E. Brawner is President of Research Triangle Educational Consultants. She received her Ph.D. in Educational Research and Policy Analysis from NC State University in 1996. She also has an MBA from Indiana University (Bloomington) and a bachelor's degree from Duke University. She specializes in evaluation and research in engineering education, computer science education, teacher education, and technology education. Dr. Brawner is a founding member and former treasurer of Research Triangle Park Evaluators, an American Evaluation Association affiliate organization and is a member of the American Educational Research Association and American Evaluation Association, in addition to ASEE. Dr. Brawner is also an Extension Services Consultant for the National Center for Women in Information Technology (NCWIT) and, in that role, advises computer science and engineering departments on diversifying their undergraduate student population. She remains an active researcher, including studying academic policies, gender and ethnicity issues, transfers, and matriculation models with MIDFIELD as well as student veterans in engineering. Her evaluation work includes evaluating teamwork models, statewide pre-college math initiatives, teacher and faculty professional development programs, and S-STEM programs.

Dr. Susan M. Lord, University of San Diego

Susan M. Lord received a B.S. from Cornell University and the M.S. and Ph.D. from Stanford University. She is currently Professor and Chair of Electrical Engineering at the University of San Diego. Her teaching and research interests include electronics, optoelectronics, materials science, first year engineering courses, feminist and liberative pedagogies, engineering student persistence, and student autonomy. Her research has been sponsored by the National Science Foundation (NSF). Dr. Lord is a fellow of the ASEE and IEEE and is active in the engineering education community including serving as General Co-Chair of the 2006 Frontiers in Education (FIE) Conference, on the FIE Steering Committee, and as President of the IEEE Education Society for 2009-2010. She is an Associate Editor of the IEEE Transactions on Education. She and her coauthors were awarded the 2011 Wickenden Award for the best paper in the Journal of Engineering Education and the 2011 Best Paper Award for the IEEE Transactions on Education. In Spring 2012, Dr. Lord spent a sabbatical at Southeast University in Nanjing, China.

Michelle M. Camacho, University of San Diego

Michelle Madsen Camacho is Professor in the Department of Sociology & Faculty Administrator at the University of San Diego and is a former Fellow of the American Council on Education. Her research



focuses on inequities in STEM education using quantitative and qualitative research methodologies and theories from interdisciplinary sources including cultural studies, critical race, gender and feminist theories. Her book, *the Borderlands of Education*, is co-authored with Susan Lord, Professor of Electrical Engineering. Camacho is affiliated faculty with the Department of Ethnic Studies, Women's and Gender Studies, and the School of Peace and Justice.

Dr. Joyce B. Main, Purdue University, West Lafayette

Joyce B. Main is Assistant Professor of Engineering Education at Purdue University. She holds a Ph.D. in Learning, Teaching, and Social Policy from Cornell University, and an Ed.M. in Administration, Planning, and Social Policy from the Harvard Graduate School of Education.

I Never Played the “Girl Card”: Experiences and Identity Intersections of Women Student Veterans in Engineering

Abstract

To improve opportunities for women student veterans in engineering (WSVE), our qualitative study contributes to the body of knowledge about women SVEs and female gender identity in engineering. Our exploratory research presents information about WSVEs’ pathways into engineering and begins to unpack the factors related to WSVEs’ gender, military and engineering identities.

The research was guided by three main questions:

1. Why do WSVEs pursue a Bachelor’s degree in engineering?
2. How do military experiences shape WSVEs’ educational experiences?
3. To what extent are the WSVEs’ current engineering education experiences shaped by their gender, veteran, and engineering identities?

We interviewed seven WSVEs about their transition out of the military and into engineering programs at four institutions. Participants also completed an identity exercise articulating the extent to which various components of their identity were most central to their core self (e.g., woman, engineering student, socioeconomic status, veteran or military status, etc.).

The analysis of the participants’ narratives reveals several themes: (1) there is often a connection between WSVEs’ military occupational specialty (MOS) and their decision to pursue an engineering degree program; (2) the participants’ military experiences served to support their academic experiences in engineering; (3) the participants do not directly indicate that gender identity is particularly salient to their military experience or in engineering; however, their narratives illuminate how they conceptualize engineering identity as central to their experiences; and (4) although participants did not indicate that gender was central to their identities and experiences, nearly all of them discussed relational elements, including the significance of relationships and caregiving to their educational experiences. That is, family roles (e.g., daughter, wife, sister) were central to their identity, even if the women did not say that gender, per se, was salient.

Our initial results offer insights into the unique experiences of women who served in the military and who then chose to advance their careers and education in engineering. Policies and programs for WSVEs should account for previous military experience related to engineering, the similar male-dominated cultures both the military and engineering fields possess, and the importance of family- and relationship-oriented responsibilities to WSVEs.

Introduction

Since Congress adopted an all-volunteer force in the late 1970’s, there has been a steady increase in the number of women serving in the United States (US) military. Active duty women currently

comprise approximately 15% of the military, compared to 2% in 1973. Further, women comprise 19% of National Guard and Reserve forces [1]. Just as the number of active service women has increased, so has the number of women veterans. In 2015, women veterans represented 9.4% of all veterans and are “the fastest growing cohort within the veteran community” [1, p. 10].

Student veterans may be experiencing simultaneous transitions: transition from military life to civilian life, and/or transition to college. Student veterans experience challenges when transitioning out of the military [2], [3], [4], [5], [6], [7], that are distinctly different than the challenges faced by traditional students transitioning to college. Women student veterans, in particular, may face unique hurdles in higher education compared to men. Although the student veteran literature is expanding, and despite the growing number of women veterans attending college, little is known about women veterans’ college experiences. For example, several frequently cited papers on student veterans generally focus exclusively on the experiences of male student veterans [2], [3], [8], [9]. This is a glaring gap in the literature, especially considering that women veterans use their veteran educational benefits at a higher rate than male veterans [10][11]. According to the U.S. Department of Veterans Affairs, female veterans were more likely to have earned a Bachelor’s degree than non-veteran females [12, p. 21]; also, since 2002, a higher proportion of female veterans than male veterans had earned a bachelor’s degree [10, p. 6]. Research also documents differences in women veterans’ help-seeking behaviors [13] and indicates that women student veterans juggle many personal responsibilities [14].

As research suggests that women veterans use military service as a strategic access point to further their education [15], it is important to better understand their experiences. Our study contributes to the body of knowledge about women student veterans in engineering (WSVE) and female gender identity in engineering. Our qualitative analysis begins to unpack the factors related to women veterans’ female identity, veteran identity and engineering identity. Drawing from in-depth interviews with seven WSVEs pursuing their engineering education at our four study institutions, the research was guided by three main questions:

1. Why do WSVEs pursue a Bachelor’s degree in engineering?
2. How do military experiences shape WSVEs’ educational experiences?
3. To what extent are the WSVEs’ current engineering education experiences shaped by their gender, veteran, and engineering identities?

As women are underrepresented in both engineering and the military, our research begins to consider the intersectionality of this “multiple minority” status and how it affects these students in their lives and educational careers, providing a foundation for future research in this area.

Literature Review

Women Veterans

Women’s roles have shifted greatly throughout military history. While women served in the medical corps beginning in 1901, it was not until the Women’s Armed Services Integration Act of 1948 that women were permitted to assume officer rank [1]. Policy changes, such as the 1992 Defense Authorization Act and other initiatives in the Army and Navy, have afforded women

service members more opportunities in the military [1]. Women are now eligible for the highly respected Army Ranger School, can be deployed to combat zones, and can serve on submarines. As of 2017, active duty women represent 15% of enlisted service members and 17% of officers [15]. Women service members' representation is highest in the Air Force (19%), followed by the Navy (18%), Army (14%), and Marine Corps (8%) [16]. Women's expanded representation in the military over time:

...demonstrates the persistence of generations of women who fought against a traditionally male-dominated institution and paved the way so today's military women have the privilege of serving their country, not as women, but as Soldiers, Sailors, Airmen, Marines, and Coast Guardsmen [1], p. 5.

Increased participation in the military has yielded a subsequent growth in the population of women veterans. In 2015, women comprised approximately 9% of the living U.S. veteran population; by 2043, women are predicted to comprise approximately 16% of living veterans [1].

A 2009 survey of women veterans in California noted that more than half (55%) of respondents indicated they had different needs than their male counterparts [17], because, among other factors, they are more likely to be divorced, widowed, or never married [1] and to be single parents [18], [19]. In addition, women veterans must often be strategic in the way they demonstrate their feminine identity in order to be accepted and respected; as noted by Iverson et al., "women...must walk a precarious line between masculinity (being tough enough) and femininity (being a real woman)" [19, p. 159]. Further, women service members often operate under an intense microscope of their capabilities, and often have little support or mentorship from senior female leaders [19], [20]. Nonetheless, women veterans are noted for their resilience and even found to have a heightened commitment to goal achievement, including academic persistence. Women student veterans juggling multiple roles, including motherhood, are more likely to academically persist [11].

Student Veteran Transitions

While the Post-9/11 GI Bill has afforded veterans greater access to higher education [21], transitioning out of the military to civilian life poses challenges for most veterans; such challenges are often compounded by the concurrent transition into higher education [3], [22], [23]. Many veterans face the challenge of readjusting to civilian life, and many may also be suffering from physical wounds, mental health issues, and/or post traumatic stress disorder (PTSD) [5]. College-related transition challenges include adjusting to post-secondary education and campus life [24], [25], [26]; adjusting back to a civilian identity from their military identity [27]; and dealing with financial hardships, even though tuition, fees, and books are mostly covered through GI Bill benefits [5].

The literature also documents several positive factors associated with successful transitions, including the availability of institutional support; drawing on academic support mechanisms [6]; drawing on parallels between military and academic experiences [28]; and social support from family and friends, including current veteran friends [5]. In the context of our study, women demonstrate stronger help-seeking behaviors compared to male students among the general

college population [29]. Among student veterans, however, women demonstrate the same help-seeking behaviors as men suggesting their military background influences their attitudes towards asking for help [14]. Researchers have pointed to campus climate, institutional structures and policies, support programs and staff as ways to increase help-seeking behaviors and ultimately successful transitions into higher education [3], [14], [30], [31].

In terms of career development, Gravely [32] found that student veterans had stronger confidence in their career decision and their major when the major was aligned to their military occupation. Further, women student veterans have a stronger intention to persist when their major or field of study was aligned with their military duties [11]. However, enlisted women are less likely to get promotions or desired assignments to advance their military careers [33]. Further, enlisted women experienced lower self-confidence in their ability to enter a successful career after the military [34]. Low self-confidence, combined with the challenge of translating military skills into the civilian sector, can be overwhelming [35]. On a positive note, however, when a woman veteran transitions from the male-dominated military environment to a male-dominated career field, such as engineering, she may find her survival and coping abilities to be an asset in the civilian workforce [7].

Student Veterans in Engineering

Recent research suggests that they may be well-suited to pursue degrees in engineering [36]. Veteran students are more mature and motivated than the average first-year college student, with unique experiences that are highly relevant engineering education. Student veterans often recognize a connection between their military training and STEM career fields [41]. For example, Zoli et al. [42] reported that two-thirds of respondents to their survey felt that their MOS nurtured their interest in STEM careers. However, our prior research indicates that engineering education is not structurally presented by the military as complementary to their active-duty skills [37] or perhaps veterans do not perceive it to be a good match.

Nonetheless, a large number of military veterans are interested in pursuing an engineering degree. For example, for students using their Post 9/11 GI Bill between August 2009 and December 2013, slightly more than 18,000 earned engineering or engineering-related degrees [38]. Many student veterans attracted to engineering majors describe their technical training in the military as the impetus for furthering their studies through higher education. Veterans possess unique skill sets that help them succeed in engineering, including practical experience with electronics, maturity, and teamwork, gained while in the military. Their leadership experiences intersect well with engineering curriculum, and the teamwork required for successful project completion. The National Science Foundation continues to recognize the importance of the military pipeline for diversifying the STEM pathway [39], and many grassroots organizations, such as Student Veterans of America, offer support for veterans pursuing these careers through higher education. In November 2017, leaders in the US government introduced legislation specifically designed to encourage veterans to consider STEM careers [40].

Women in Engineering

The military and engineering professions are similar in that women represent a small proportion of each, relative to the overall population. Women represent approximately 20% of undergraduate engineering majors, a higher proportion than their representation in the military [43]. Similar to men veterans, women veterans may be attracted to engineering because of the technical skills gained while serving in the military [44]. Some MOS's provide opportunities for hands-on practical work (e.g., fixing aircraft systems or engines) and create pathways that would support engineering [45]. That is, the technical training and military occupations women hold may help them to enter and succeed in engineering, as it does for men [46].

Recent studies, including our own, have begun to more deeply examine engineering education from an intersectional approach, taking into account the varying, and intersectional, influences of identities on engineering student experiences. Intersectionality suggests that veterans are not a monolithic group and that their experiences must be considered within a wider prism of difference that accounts for gender, race, social class, sexual orientation, and ability. This theory has been used effectively in modern engineering education research to elucidate stories that would otherwise remain hidden, such as our research on majority measurement bias in studies of persistence [47], Riley and Pawley's [48] work critiquing myths of gender and race in engineering education, and Foor, Walden, and Trytten's [49] ethnography of one female multi-minority student which provides "a microphone for the voices of the marginalized to be heard" (p. 113). The powerful lens of intersectionality contributes to the growing field of engineering studies, which considers how social categories (such as age, race/ethnicity, class, gender, ability and sexual identity) are enacted in engineering [50]. Our other work on SVEs examined the intersection between first-generation, engineering, and military identities [51]. The current study extends other research on the identity intersectionality of women student veterans [15].

In terms of identity, women student veterans may have different experiences in college compared to men. Smith [52] found that while females may have struggled with their gender identity during the military, this struggle somewhat dissipated upon entering college. That is, women may experience less pressure to conform to a masculine-centric culture that was indicative of their military experiences, as this may no longer be pertinent during their college pursuits [53]. However, Zeller's [4] research indicates that women veterans' experience a stronger identity crisis when reintegrating into civilian life and transitioning to college than they do during their transition to military service. Our research aims to provide clarity to these seemingly contradictory findings on the identity of women student veterans.

Our study represents one of the first to examine the intersection between gender, military, and engineering identities. For example, a review of publications listed in Google Scholar revealed several studies on women veteran student identity (e.g., Hullender's [54] study of the intersection of sex, veteran, and student), but none specifically on experiences in engineering education (e.g., woman+veteran+student+engineering, to follow Hullender's conceptualization). A review of the proceedings for the 2016 and 2017 Military Veterans Constituent Committee of the American Society for Engineering Education revealed no studies specifically on women SVEs. Studies on women veterans' success in college and beyond are critical given evidence that women veterans experience slightly higher rates of unemployment than male veterans [55].

Methods

The women veterans in this study were part of a larger qualitative study of student veterans in engineering programs at four institutions. The interview transcripts of women veterans who participated in the larger study were specifically reviewed and coded for this particular study. We used several methods to recruit participants to our study, including contacting campus staff that work with student veterans, posting flyers in engineering departments, and emailing student veterans themselves. Interested students were asked to complete a qualification survey that asked about their military service, educational history, demographic characteristics, and scheduling.

Interviews were audio-recorded and lasted between 60 and 90 minutes. We used a common interview protocol, developed in consultation with the project's external advisory board, which includes military veterans and researchers who study veterans in higher education. The protocol included questions about: (1) reasons for entering the military; (2) reasons for selecting their engineering major; (3) role of the military in selecting engineering studies; (4) centrality (or otherwise) of the veteran identity to their engineering experiences; (5) influence of the military on current engineering education experiences; and (6) university-based efforts to serve student veterans. The study was approved by the relevant Institutional Review Boards at our partner campuses. Participants received a cash incentive for being a part of our study.

This paper focuses on seven women student veterans who were enrolled in engineering education programs on their respective campuses. After being accepted to the study, and prior to the interview, students were asked to complete a "life history" survey that included information about various key events in their lives since the age of 18, such as being deployed or getting married. During the interview, participants also completed an identity exercise articulating the extent to which various components of their identity were most central to their core self (e.g., woman, engineering student, socioeconomic status, veteran or military status, etc.).

Sample Selection and Participant Characteristics

Five women identified as White and two identified as Asian. The age range was 23-37 years, with an average age of 27.5. Four participants served for five or fewer years and two participants served for 6-7 years; one served for 12 years. All participants indicated they did not have a service-related disability and all participants either completed their service and were honorably discharged or were still on active duty. Four of the participants did not deploy or engage in combat, three participants were deployed, one of which included a combat deployment. Two participants were married at the time, two were divorced. Table 1 provides additional participant information, using a pseudonym for each participant.

Table 1. Characteristics of Women Student Veterans Interviewees

<i>Name</i>	<i>Military Branch</i>	<i>Path into Military</i>	<i>Military Status</i>	<i>Military Occupation</i>	<i>Engineering Program</i>
Mary	Navy	Enlisted	Honorable Discharge	Corpsman	Environmental
Serena	Marine Corps	Service Academy	Active Duty	Naval Flight Officer	Mechanical (undergrad)/ Interdisciplinary (grad)
Meghan	Navy	Enlisted	Active Duty	Electronics Technician	Materials Science
Leah	Navy	Enlisted	Active Duty	Nuclear Electronics Technician	Electrical
Keiona	Navy	Enlisted	Honorable Discharge	Nuclear Machinist Mate	Nuclear
Julia	Marine Corps	Enlisted	Honorable Discharge	Ammo Technician	Mechanical
Barbara	Navy Reserves	Enlisted	Honorable Discharge	Electrician	Electrical

Each woman’s story was considered a case study through which we identified themes consistent with women student veterans enrolled in engineering. To analyze our data, we engaged in the method of constant comparison and thematic analysis to develop our initial categories as they emerged and were pertinent to our research goals. We also created episode profiles that summarized the salient elements of each transcript with respect to our research questions. Although the sample size is small, their narratives provided an opportunity to illustrate themes across their experiences, thus beginning to fill a gap in studies on student veteran in general and WSVEs in particular.

Results

Research Question # 1: Why do WSVEs pursue a Bachelor’s degree in engineering?

When asked why they selected engineering, several participants noted that they had been successful in their high school math and science courses. Serena and Keiona noted that their enjoyment of math and science steered them towards engineering. Julia had considered engineering prior to her time in the military because of her interest in problem solving, and engineering “*seemed like a very respectable career choice.*” Interestingly, several of the women noted their initial perceptions of potential engineering pathways were narrowly focused on options in mechanical engineering. They did not consider other types of engineering (e.g., nuclear or electrical) until their military assignments.

The most prominent path to engineering for these women was through their military assignments. That is, the women indicated they had not considered engineering prior to their military jobs, even if they were interested in science and math when they were younger. Almost all the women interviewed asserted that their military job provided them knowledge, skills and exposure to engineering. These influences motivated them to further investigate engineering programs.

Keiona, Leah, and Meghan identified their military job as the key experience that influenced their decision to pursue an engineering degree. Keiona's role as a Nuclear Machinist Mate in the Navy directly introduced her to the field of engineering: "*[Because of] the [military] training and then actual hands-on work experience, I thought that engineering would be a good field to keep going in.*" Her time in the Navy expanded her perceptions of the diversity of options available in the field of engineering:

When you think of engineering you think, "Oh, just mechanical, or you're flying airplanes, or you're designing some neat electrical motor or whatnot." But, the Navy showed me that, "Oh, well there's this other branch called nuclear, and this is what nuclear technology can do. It's like not just building bombs and blowing things up."

Leah echoed these sentiments, saying her military training during A-School (specialty training) broadened her perspectives about electrical engineering. Specifically, during a military course in basic electricity, she recalled:

I had never been exposed to electricity, or a knowledge about it.... That was when my eyes opened and I [thought] "I can actually do this." I had never even considered a science or technology degree before that because it just wasn't available [at my prior school]... and I'd never even encountered it.

Thus, her military training exposed her to the different skill set that solidified her interest in engineering. Keiona validated her choice to go into engineering by stating "*why not go into a degree program that is in the industry that you were working at?*"

Leah's and Meghan's involvement with the Seaman-to-Admiral for the 21st Century (STA-21) program allowed them to formalize their engineering education and advance their military careers simultaneously. The program provides them the time and funding to complete their degree after which they will be commissioned in the Navy. Leah indicated that she likely would not have pursued a Bachelor's degree in engineering if she was not in the STA-21 program. When asked to describe important events and decision points, she said:

Definitely the nuclear training [and] just being in the nuclear field...pretty much the only reason I'm back [in school] is because I got picked for STA-21. Otherwise, I would definitely not be at [this school] specifically...I don't know if I even would've gone back to college.

Meghan, a former biology major, chose engineering because she wanted "*to feel like I'm actually contributing something...[and] I want to understand why things behave the way they are, why they fail...it feels closer, more of a personal thing.*"

Barbara said that her work as an electrician in the Navy inspired her to major in engineering. Prior to joining the military, she was studying finance and investments, a field she described as "*boring.*" She was drawn to engineering during her time in the military, as this technical work generated a sense of pride for her, provided a sense of purpose and competence, and enabled her to make a difference:

I was never bored with engineering and I found that it was really like a sense of pride working on equipment, fixing things for a bigger mission which was, you know, get the ship underway. So, I kind of felt a sense of purpose, and I belonged there, and I was good at my job, and I really enjoyed it.

During her first attempt at college, Julia majored in plant biology. However, she decided to leave college before she finished her degree and subsequently joined the military. She was then inspired to major in engineering due to the boost in confidence she experienced in the military. Prior to her military service, she thought that engineering was “for brainiacs.” However, being in the military “gave me the confidence to go for it and pursue it” as well as the “discipline” and “maturity” to embark on the engineering pathway. Thus, her military experience instilled self-confidence and discipline, which re-affirmed her decision to pursue engineering. She stated:

Before the military, I considered engineering, but then again, I didn't have the self-confidence, or the discipline, or any of those qualities to pursue it at the time. So, I definitely feel like my military experience helped me [and] pushed [me] further to actually want to pursue it.

Some respondents were motivated to choose engineering due to the influence of their families. For example, several of the women indicated that family members were engineers. Serena, Keiona, Meghan, and Barbara had immediate family members (e.g., fathers and grandparents) who were in the engineering profession. Meghan noted both her grandfather and her mother were engineer; she was the only WSVE who said her mother held an engineering degree. This theme of family role models emerged organically during the interview.

Research Question # 2: How do military experiences shape the WSVEs' educational experiences?

The military training prepared some of the women for the demand of engineering education programs. Leah noted that her military role strengthened her ability to work within time constraints, so transitioning to her demanding engineering coursework was not an issue. She stated “we're used to going to school for 18 hours a day sometimes. So, it's pretty natural I guess.” Keiona noted that she faced greater demands in the military than she was facing in college: “it was a lot easier [in the military] since there wasn't as much of a workload as in the Navy.” She noted the parallels between the training schools that she attended for her military job and her college classes; she said the training schools: “helped in going through some of the engineering classes.”

Several women indicated that their military experiences exposed them to very specific knowledge and skills that were useful in academic settings. As Keiona was comparing herself to her civilian peers, she noted that for “a lot of people, this is the first time seeing what the neutrons do, or what is this decay, and what's thermal hydraulics.” However, she became familiar with those concepts while serving as a Nuclear Machinist Mate in the Navy. Similarly, Leah's military job put her in the engineering mindset as her position was highly technical and required intense training. This provided a foundation for her to succeed in engineering education.

The military also provided general transferable professional skills that were helpful in the academic setting. Keiona said she used the communication, organization, and time management skills learned in the military that they called upon in the classroom. Meghan appreciated her military experience because its focus on real-world problems proved useful in the classroom. Keiona noted that her professor asked her to make a special presentation about the Nuclear Navy as her military experiences were connected to her nuclear engineering course.

Military service also provided engagement experiences, which subsequently influenced academic pursuits. For example, as a result of being stationed in Japan, Keiona developed an interest in learning the native language: *“I enjoyed living in ... Japan. And then [decided], I might as well learn the language too.”* As a result, she pursued a double major in nuclear engineering and Japanese. Aside from *“wanting to communicate with people”* while she was overseas, Keiona felt this double major, and ultimately learning to speak Japanese, would advance her engineering career goals, allowing her to *“climb the ladder”* in a multinational company and *“use my Japanese skills to converse with the employees from Japan.”*

Several of the women referenced the relationship between help-seeking behaviors in the military and in college; however, their comments offer varying views on this relationship. For example, Julia described how the lack of emphasis on “help-seeking” in the military manifests in a college setting:

I could see some people [thinking], “Oh, well that’s another whole side of the military.” You’re not allowed to really [express] weakness.” ...They’re getting better about that, but you don’t want to let your weakness be known, so you try to figure things out yourself. And, you are definitely not as inclined to ask for help [in college] when you really need it. So, you struggle through and then if something happens - I failed two tests...I probably should go to office hours and talk to my professor. Or, maybe I should attend a study group.

Like Julia, Mary and others articulated a level of self-reliance during and after the transition from military to college. For example, when transitioning from the military to her current institution, Mary stated she did not really have any to ask for help; so, she took the initiative to resolve her issues by herself:

I didn’t know how to use the GI bill, but I’ve always been a researcher. When I know I wanna do something, I’ll usually find the means to figure it out myself, so I’ll get on the computer and find as much information as I can.

Leah simply expressed her comfort with asking for help stating, *“I don’t have a problem with it.”* Barbara suggested that fellow student veterans ask for assistance when they need it: *“I would tell them that there is nothing wrong with seeking help.”*

Three women described how the Navy nuclear program seemed to support a culture of help seeking. Meghan and Leah were both enrolled in the STA-21 program (similar to being enrolled in college courses), while Keiona trained in the Navy’s nuclear program for her military occupation. In the words of Keiona:

The instructors did have the equivalent of office hours afterward so like there would always be one person from each class around, so like after the work day you could go up to them, during your study hours you could go up to them and ask for more help they can like show us how to do problems and whatnot.

Leah echoed Keiona’s statements on seeking help, affirming that:

I think that’s part of...the Nuclear field, with our schools. The Officers, or the instructors whoever they are, are required to hold office hours...so I think we get used to doing that.

Research Question # 3: To what extent are the WSVEs’ current engineering education experiences shaped by their gender, veteran and engineering identities?

An identity circle exercise allowed us to learn whether and how gender was salient for our participants. Participants completed an Identity Circle and reflected upon the interaction between their identities and their engineering education pursuits. They selected from a list of roles and identities that we provided, and were encouraged to add additional ones, if desired (see Figure 1). They then placed the identities on the three rings of the Identity Circle diagram (Levels 1 through 3) to illustrate the centrality of a particular identity to their current experiences; respondents could also place a particular label just outside the diagram (Level 4). For example, if the most important part of her identity was being a woman, the participant would place the “gender” label in the inner concentric circle. Participants limited their feedback to only include those roles that were personally relevant. For the current analysis, we are focusing on responses related to gender, military, and engineering identities. Table 2 provides a summary of the respondents’ placement of these identities on their Identity Circle.

Table 2. Number of Times an Identity Was Placed on the Identity Circle

	Gender	Spouse/Partner	Military	Engineering
Placed on Level 1 (inner circle): Primary identity	1	2	5	5
Placed on Level 2 (middle circle): Secondary identity	1	2	1	2
Placed on Level 3 (outer circle): Tertiary identity	0	0	2	0
Placed on Level 4 (outside the circle)	0	1	1	0
Total times identity placed on Identity Circle	2	5	9*	7

* Participants could select more than one military-related identity, e.g., “Veteran in general,” “Navy veteran,” “Reserves,” “combat veteran,” etc.

Overall, the participants did not view gender as central to their experiences in engineering education, as only two of the seven placed this identity on their circle. However, every participant placed their engineering identity in the Identity Circle, either as central (n=5) or secondary in importance (n=2) as compared to the other identities. The participants’ military identities also seemed to be important, with six of the seven placing one of the military identities on her Identity Circle. Spouse/partner relationships were also important for these participants, with five of the seven participants who indicated they were married or had a partner placing this

identity somewhere on the circle or just outside the circle. Below, we present some examples from the WSVE narratives that illustrate the intersectional nature of these identities and the resulting influence on their engineering studies.

Saliency of veteran and engineering identities. The participants primarily emphasized the relevance of their engineering student and veteran statuses as most central to their identities. Leah indicated her status as an engineering student was at the core. Serena and Mary listed their engineering student status as secondary. While veteran identity was reported in the identity circle activity, several participants noted they often did not disclose their veteran status to faculty. If the participants chose to disclose or not disclose this aspect of identity, it seemed to be related to asking for assistance or to *normalize* that aspect of their identity. For example, Serena stated that “*last semester [my professors] did [know my veteran status]. This semester I haven’t had to ask for anything because of the military, so they don’t know yet.*” When probed further about whether Serena’s instructors should know about her military status, she affirmed, “*not really because I feel like I want to be as normal as possible. You wanna blend in, you don’t wanna stick out all the time.*” Thus, their identities as student veterans, though listed as central to their persona on the identity circle, were deemphasized in communication with faculty.

Mary indicated her veteran identity and engineering identity were “*most representative of my personality,*” but qualified the statement indicating “*I don’t really like to greatly self-identify myself as a veteran solely because I think I’m not a combat veteran.*” (Men interviewed for this study similarly minimized their veteran status when they had not been engaged in combat.) Mary did not indicate whether she would reveal her veteran status to faculty.

Keiona’s veteran identity has been validated in her engineering coursework in that she utilized her real-world experience in the classroom setting. She indicated,

I think it will also help in the hands-on portions; like some of our nuclear classes have labs associated with them, and one of the labs I know has to deal with using RADIAC source, or equipment that measures radiation contamination, and so using those equipment in the Navy, I can help out my classmates on the labs when that comes up.

This quote indicates the utility of her military experience in the classroom, as it directly relates to coursework, yet stands in contrast to the former quotes that suggest women minimize their veteran status.

Influence of gender in the military and engineering education. While the WSVEs did not indicate that gender was central to their identity and experiences, they still referred to the gendered nature of military and engineering subcultures. Mary indicated that gender was more of an influence while she was serving in the military than in her engineering education:

[Gender is] not really something that I have to consider a lot in my day-to-day [as an engineering student]...definitely in the military, when you’re in a leadership position as a female, [gender] would be very salient for me ‘cause I’d be like “wow, being a female here trying to take charge of these men” But, I think for right now, [gender is] not really something that’s greatly affecting me.

Similarly, Leah did not directly connect her gender identity to her engineering experiences:

I've never really found that being a woman in engineering affected me any different than obviously a man in engineering had it. I think I've never been discriminated against, so I can't really say that that affects me.

Leah said that gender was not an issue for in the military for her either. She indicated that she may have been one of two women in her nuclear unit, but she stated “it’s just how it is.” Later in the interview, Leah says that she is not “bothered” by being one of a few females in electrical engineering, paralleling her statement about being one of a few women in her military unit. In other words, she is used to being the only female in a variety of settings:

I always grew up with a lot of males around. My family’s really full of males. My sisters and I are the only females in my extended family. So, I guess just growing up in that way made it so it doesn’t bother me.

Julia, who placed gender in the second concentric circle, explained that she had the ability to put gender aside when reflecting on the centrality (or, rather lack of centrality) of gender for her military and educational experiences:

I never felt like I was treated differently because I was a woman, but it was definitely noticeable, when you are in class and there are only three girls in the class...I felt lucky in the military... [I] never gave them the opportunity... I never played the girl card. [I thought] “I’m here just like you are, let’s get the job done.”

Julia further identified that in the college setting her gender identity could obscure her veteran identity, unlike her male counterparts. She stated,

I don’t think a lot of people....well, especially being a woman...would never suspect that I’m a veteran unless I tell them. So, I guess just more awareness; it’s probably more challenging for the males.

Keiona said she was not affected by being the only female in her engineering program, “even though it’s mostly males.” While a friend of hers, who is majoring in bioengineering, told Keiona that “there’s a pretty good ratio of males to females” in her field, Keiona speculated as to why women were generally not inclined to major in nuclear engineering:

I don’t know if it’s because in the past women haven’t been pushed forward getting an engineering degree, or if it’s because they personally would rather go into a different section of engineering. Or...maybe it’s because nuclear is not as attractive to women. But it doesn’t really bother me...at all [that I’m one of a few women in my classes]. As long as we’re not targeted out and specifically being...harassed or singled out for being women, there’s no problem.

Meghan, who did not place gender on her identity circle, shared contradictory ideas. On the one hand, she tied her feelings of gender differences to feminism stating *“I don’t have gender issues; I’m not a feminist at all.... I think people overreact sometimes., I feel like guys have, you know, rights, too.”* However, she did acknowledge some men in class and in the military may not have called upon her for assistance because she was a woman. Thus, as a woman, Meghan perceives her actions validate her skills and knowledge to men: *“I do know that there are issues. I experienced them myself, but probably not as bad as the women before.”* When asked how she felt when men did not ask for her help in certain situations, due to stereotypes about how women contribute, she said *“It’s not fun because I value my intellect. It’s kind of semi-insulting for me for somebody [to treat me like that].”* Interestingly, though, she then goes on to describe her feelings of confidence versus competence in engineering education:

There is also a confidence aspect, it’s not just a woman/not woman aspect, I’m also relatively less confident than other people...I feel like the level of knowledge that I need and experience [in order to feel confident] is a lot higher than [for] other people.

Meghan then attributes this “lack of confidence” to her Asian ethnicity, that *“has a reserved side to it”* in which one shouldn’t appear *“boastful,”* thus minimizing the gendered component of her under-representation. At the same time, this is an indication of the intersectionality of race/ethnicity and gender.

This theme of intersectionality is evident in Serena’s narrative. She was the only interviewee who identified gender as core to her identity; she directly related that identity to her time in the military. Serena also identified as Asian American in combination with her gender identity, describing herself as *“a female minority working in engineering as a Marine officer.”* Serena then said she is *“one of one and I’ve been one of one everywhere I’ve been...I feel the pressure to perform because of that.”* Subsequently, she placed race and ethnicity on Level 2 of the Identity Circle. Despite her statement of being *“one of one,”* she said that her gender and racial identities were important to her *“because I made them that way for myself, not because my work force fit into that.”* Serena stated that she interacts with fewer Asian American service members than female service members; thus, her ethnic identity is still not as salient as gender. She said she never felt she was *“treated any different because of my race, but I remember having to work harder because I was a woman.”*

Gendered identities and roles within relationships. Even though the WSVEs did not indicate that gender per se was central to their experiences in engineering, they did allude to societal expectations and cultural mores that are gendered in nature. For example, nearly all of the interviewees indicated that their spousal or partner identities, and relationship issues, were salient to their current educational experiences.

When asked what factors were salient to her engineering education, Leah said: *“It’s hard to narrow down what makes me make my decisions. But, I think for me it’s like family and career oriented just because that’s what I’m focusing on right now.”* When asked about the most pressing issues facing veterans, Keiona replied:

I think that veterans who have families...have a lot of stress...because they have to take a lot of time out to do what seems like, maybe to a spouse, as meaningless or less meaningful, like homework and preparing for projects and exams. I feel like they would be stressed out a lot more than like single veterans.

Thus, although Keiona was single at the time of the interview, she was nonetheless aware of the challenges that veterans face in balancing family responsibilities.

When Julia was asked to describe the biggest issues that student veterans face in college, she immediately referred to the challenges of balancing the competing demands of family and college, particularly majoring in engineering:

I used to think that [college] would be costly and...[it would be] hard to balance a family. But, the GI Bill's really great and the Yellow Ribbon [supplemental funding program] really helps out...but veterans tend to have families, so it's probably more of that work/school/life balance.

She then refers to her academic responsibilities when describing that balance:

It's been somewhat of a challenge to adjust and then also I may have homework to do on the weekends, it's not, you know, I can't just have a 9:00 to 5:00. I try to make it a 9:00 to 5:00, but that's difficult. So that balance [is] challenging for me.

Barbara, who did not place gender in her identity circle but placed “spouse” in the inner circle, spoke at length about the impact of engineering education on her marriage, saying that: “*being an engineering student made me an absentee spouse.*” She specifically attributes the demands of her coursework and the time required to pursue the engineering degree as a contributing factor to her eventual divorce. Meghan said that her current relationship was “*not a short-term thing*”, so her boyfriend “*does matter,*” as illustrated in her placing the partner status in Level 2 of the Identity Circle. It was also important to Meghan that she be able to support her mother: “*I factor her in my decisions, too. I've got to make sure I have enough financial reserves to support just in case...she needs something regularly.*”

Discussion

Our qualitative study offer insights into the experiences of women who served in the military and who have chosen to advance their careers and education in engineering. The results illuminate how the participants' military experiences shaped their educational paths. The findings regarding choice of engineering major mirror the results of our study of men SVEs in that military experiences provided the impetus to major in engineering [46]. However, the military experiences were much more important for these WSVEs: six of the seven participants indicated that their military experiences were a primary motivator for majoring in engineering, whereas the men included in our previous study of SVEs described a greater variety of motivators for majoring in engineering. Regarding the influence of their military position on their decision to pursue an engineering degree, our participants each held a very technical role while in the

military, which is in contrast to previous research showing that most women in the military hold administrative roles [18].

In engineering courses, the WSVEs described a pattern of self-reliance when searching for answers on their own, and were not afraid to admit when they needed help. That is, our participants found a generally supportive environment when they asked for help, confirming Iverson et al.'s study [13] that indicated that women student veterans often took the initiative to advocate for themselves. This finding may be unique to engineering education, as it contrasts with previous studies citing WSVs' lower help-seeking behaviors compared to the general population of college women [14]. Finally, the WSVE's noted several instances where their own military training and experience supported positive academic behaviors. The WSVE's described how a structured work environment and an emphasis on timeliness, as learned in the military, are now important to their academic success [28].

The narratives also illustrate the intersectional nature of the WSVEs' gender, veteran, and engineering student identities. At face value, the WSVEs minimized the saliency of their femininities when discussing gender identity. This finding is consistent with previous studies supporting a theme of 'masking' gender identity among WSVs [19], [20]. Even when pressed during the interviews, it was a challenge to elicit responses from the women about what it was like to be a woman in the military and in engineering. While none of the participants indicated that gender was particularly relevant to their military and engineering experiences, this could be related to the fact that minorities tend to underestimate, or may not be willing to talk about, any negative impact of their minority status. Qualitative research has shown, for example, that women often must be prompted to discuss the salience of gender identity when reflecting on their experiences [56]. This could be because these women did not experience extensive stereotyping or discrimination; either that, or they could have normalized these experiences. Similar to Kouzoukas' [57] study of first-generation students, gender was a "muted identity" for these women and was tied to other dimensions of their lives.

It could also be the case that women veterans are used to transcending roles and responsibilities outside the cultural expectations for women [58]. As Greer found in her study of women veterans, these WSVEs have already been successful in a male-dominated hierarchical work environment and "their ability to survive in these environments is a characteristic that follows them back into the civilian workforce" [7, p. 59], and we contend, into engineering education.

Despite recognizing their stereotypical gender roles (e.g., wife, daughter, sister, etc.), they downplayed their femininity. Similar to other research suggesting that women are fluent in using a gender script that highlights their relational capacities [58], WSVEs were likely to mention their relationships as integral to their identities. This theme merits further investigation as research shows that the amount and types of stress that women veterans face as they transition from the military into the civilian workforce are often intensified if they must also support their family members, emotionally or financially [59]. These dynamics ultimately may "defer or negate service-based advantages" [60, p. 61] that women gain in the military, thus reducing the possibility for drawing on those very sources of "military capital" they acquired while serving. This may be especially the case as these women must successfully traverse two environments that are traditionally male-dominated: the military and engineering education.

Limitations and Future Research

Our analysis is exploratory and produces qualitative data to add voices and experiences of women student veterans to our understanding of their positions in engineering education. The value of the interviews resides in the stories the women shared regarding their military and engineering experiences. While the qualitative data may not be generalizable to the population or in an experimental sense, it certainly adds to the theoretical or analytical generalization to the phenomenon of women student veterans and women in engineering [61]. The results can be used to conduct additional in-depth interviews in other settings and at other universities. The emergent themes can also be used to develop a survey that can be administered to a broader population of WSVEs.

Each of the WSVEs came from diverse backgrounds, therefore, the themes may not be consistent with all female student veteran engineers. Our future research will include a formal comparison between the women and men SVE interviewees to better understand whether the results we reported here are different for men SVEs. Also, it may seem obvious that engineering would be the most salient identity for these participants, given that they are currently pursuing their engineering degrees. However, it is important to note that not all of our participants (among the 60 total participants) included engineering in their identity circle or as a part of their core identity. And, the identity circle allowed us to determine the relative salience of the various identities in comparison to one another and relative importance for the WSVEs' current engineering education experiences.

Our study includes only those students who persisted in engineering education and who were willing to be interviewed. Future research on WSVEs who left engineering or who dropped out of college altogether would deepen our understanding of this population. Given these WSVEs' experiences are in male-dominated environments (e.g., the military and engineering), future research about their experiences can strengthen our knowledge about women in other sex-segregated contexts.

Implications and Conclusion

Our exploratory study presents a unique opportunity to examine the intersection of two contexts - the military and engineering - in which women are in the minority. Our research offers a foundation for future research addressing women student veterans as they navigate STEM careers. The WSVE experiences that we share here offer opportunities for engineering educators and university staff interested in both women veterans and women in engineering. These include: the importance of recognizing variation among student veterans, considerations for recruiting to diversify the student body, and the utility of incorporating data analytics for understanding student retention for this population.

As WSVEs in technical military occupations begin to think about engineering degrees, engineering educators or recruiters may find value in recruiting service members who have held technical military occupations prior to their formal exit from the military. Most military installations have Educational Centers, which help service members learn about educational opportunities for themselves during or after their military service. Recruitment of WSVs into

engineering can ultimately initiate a subsequent cycle of female enrollment in engineering. That is, women may begin to see that other women are succeeding in engineering education after leaving the military and thus see this as a viable pathway for pursuing their own educational goals. Such a critical mass of WSVEs in the field could help increase their sense of belonging and sense of competence, as shown in previous research on women of color in STEM majors [62].

There is no “one size fits all” model for supporting student veterans, especially student veterans transitioning to the college setting. Faculty and staff should seek to listen and understand the students’ individual needs in order to respond with appropriate support, advice and options. If a student veteran discloses their military veteran status to faculty or non-military program affiliated campus leaders, it is important to have programming in place so that leaders will be prepared. This enhances their credibility in creating a military-friendly campus, and will be enhanced with basic knowledge about how student veterans are unique. University faculty and staff could be encouraged to complete trainings or webinars to learn more about student veterans and their assets. Like many non-traditional students, WSVEs may desire to participate in a faculty-student veteran mentor program as this type of program can create a military-friendly culture at the classroom level [11].

The WSVEs described how the practical experience gained in their military jobs provided them a good foundation for succeeding in engineering programs. They appeared to have a deeper understanding about situations they had seen in the real world, as they worked on class assignments. Instructors may find it valuable to integrate student veterans with technical engineering experience into lesson plans, helping to bring engineering topics and concepts to life for other students.

Women student veteran engineers bring diverse experiences and backgrounds to the engineering classroom. While not all of our WSVEs reported experiencing issues related to their gender or veteran identities, it is evident their military experience had positive influences on their engineering education. Engineering educators should explore, with veterans’ centers and other support services, how best to support these students rather than assume what they will need.

We provide information for student services personnel and other university staff about important role of family for these students and others who may be marginalized in engineering education. It is especially important to consider that WSVEs may be balancing competing and complex demands in more intense ways than men student veterans. Instructors may need to build flexibility into their courses or office hours, for example online course modules, hybrid courses or online office hours. Other considerations could include weekend or evening courses, faculty office hours, or advising support [11]. Evidence from our interviews suggests that the WSVEs are mindful of relationships, time, and finances when making decisions. Despite the balancing act, the women seek help when needed and demonstrate resilience and positive well-being to achieve the academic goals they have established for themselves.

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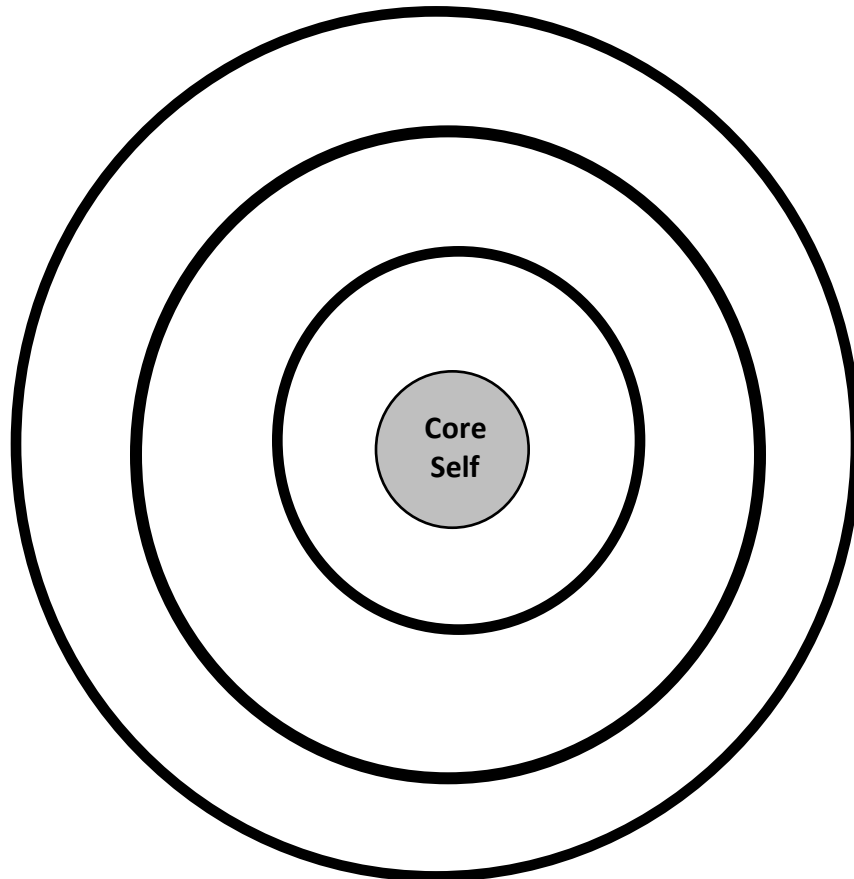
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Figure 1. Identity Circle

Place the identities below that apply to you [you may add others] on one of the rings to illustrate how “central” a particular part of your identity is to your current educational experiences. For example, if the most salient or important part of your identity is being a parent, you would place the dot on the first ring surrounding the inner core. You don’t necessarily need to add all of the identities listed below to the diagram, just those that are most central to your current educational experiences.



Self	At home	Student/worker	Service-related
Gender	Spouse/partner	Engineering student (general)	Veteran in general
Race/ethnicity	Parent	Engineering student (Specific major: _____)	Veteran: specific branch (Branch: _____)
Socioeconomic class	Caregiver	Transfer Student	Combat Veteran
Sexual orientation	Single	First-generation student	Reservist
Age	Family	Employee	Disability
Religion		Volunteer	