Affirming Identity through Authentic Mentoring in a Safe Space: Supporting Military Veterans in an Engineering Graduate Program

Dr. Jae Hoon Lim, University of North Carolina at Charlotte

Jae Hoon Lim is an Associate Professor of Research Methods at the University of North Carolina at Charlotte. Her research explores the intersection of gender, race, and class in STEM education and highlights the dialogical process of identity construction across various groups of underrepresented minorities in STEM fields. She has served as a co-PI and qualitative evaluator for multiple federal grants supporting engineering program innovation and diverse STEM workforce development. Her recent research focuses on student veterans' civilian acculturation through higher education.

Ms. Rachel Saunders, UNC Charlotte

Rachel Saunders is a doctoral candidate at the University of North Carolina at Charlotte in the Counselor Education and Supervision Program. Her research focuses primarily on culturally responsive school counseling, college and career readiness, and experiences of student veterans in higher education. She serves as a Research Assistant at UNC Charlotte as part of a Office of Naval Research grant supporting student veterans and engineering curriculum innovation.

Dr. Peter Thomas Tkacik, University of North Carolina at Charlotte

Peter Tkacik is an Professor of mechanical engineering within the motorsports focus area. His largest area of research is in the engagement of military veterans and early career engineering college students through hands-on learning activities and exciting visual and experiential research programs. Other research activities are related to the details of the visual and experiential programs and relate to hypersonics, tire testing, color-Schlieren shock and compressible flow imaging, and flows around multiple bodies in tandem.

Dr. Jerry Lynn Dahlberg Jr, University of North Carolina at Charlotte

Jerry Dahlberg is an Assistant Teaching Professor and Chair of the College of Engineering Senior Design Committee at the University of North Carolina at Charlotte. He received a B.S. degree in Mechanical Engineering Science in 2014, M.S. in Mechanical Engineering in 2016 and PhD in Mechanical Engineering in 2018 from the University of North Carolina at Charlotte. Jerry retired from the Army in 2010 as a Sergeant First Class. .

Miss Madison Elizabeth Levan, Univeristy of North Carolina at Charlotte

Madison is a masters-level student in the counseling program at the University of North Carolina at Charlotte. She is currently completing the licensure process to become a Professional School Counselor and hopes to work at the elementary school level upon graduation. As a graduate research assistant, she examines the role of student veterans and their transition into higher education institutions.

Affirming Identity through Authentic Mentoring in a Safe Space: Supporting Military Veterans in an Engineering Graduate Program

Abstract

This qualitative study explored five graduate student veterans' experience in an engineering master's program that has implemented a double-layered mentoring structure for the students. By examining the synergistic confluence between mentoring relationships and student veterans' cultural identities in the graduate program environment, five major themes emerged from the thematic analysis. These themes include (1) understanding veterans' struggles and advocating for the students' academic pursuit, (2) establishing a military-safe environment, (3) authentic mentoring experiences, (4) appreciation and utilization of military assets for academic success, and (5) spearheading research endeavors while being in good hands. The results from this study provide important insight into the experiences of graduate engineering student veterans and how various units of higher education (e.g., institutions, programs) can develop an effective and culturally-relevant support system for student veterans in graduate programs.

Introduction

This study is part of a larger mixed-methods evaluation research that assessed the implementation of and outcomes from an externally funded grant project at a large public urban university in the Southeast. The grant project targeted military veterans in an attempt to increase the enrollment and number of advanced degree recipients in science, technology, engineering, and mathematics (STEM) while facilitating non-veteran students' exposure to and interest in military technology applications and related career opportunities. One of the major components in the grant project was a veteran-specific-mentoring program implemented in Mechanical Engineering graduate programs. Based on the first year's assessment data, we examined student veterans' scholarly and professional development in the engineering graduate program to assess the quality and impact of the veteran-specific mentoring program and mentoring relationships afforded through the new initiative. This paper presents the outcome of a qualitative study which used the narratives of five graduate student veterans and four faculty mentors as the primary data source.

For the more than two million service members who enlisted after 2001, the passage of the Post-9/11 Veterans Educational Assistance Act, better known as the Post-9/11 GI Bill, provided them with substantial higher education benefits [1]. The Post-9/11 GI Bill represented the largest expansion of education benefits since the World War II-era GI Bill [1]. As a result, student veterans are among a proliferate population of diverse students on American college campuses today, with over 700,000 beneficiaries receiving education benefits in 2018 [2].

Over the past decade, research on student veterans in higher education made significant progress illuminating the multi-faceted nature of their psychological and social adaptation as well as a cultural transition within higher education [3]. Consensus drawn from the current body of literature indicates that although higher education is an effective pathway for veterans to earn a civilian professional career, student veterans are non-traditional students who face a variety of

challenges entering higher education [4, 5]. Upon leaving the military, individuals go through a re-acculturation period, adjusting to the societal norms and expectations that are often different from the norms within the military context. The cultural context of higher education may pose a significant challenge for these military students, especially those who spent their most critical time of adult identity development—ages of 18 through 22—in the military. Higher education as a civilian institution is devoted to academic goals—upholding cultural values and expectations (e.g., critical thinking, individualism) which is vastly different from those of the military community (loyalty, collectivism) [3].The military is a highly structured, team-based environment, whereas academia traditionally values independent functioning, creativity, and competition [3]. Considering the significant cultural gap between the two social institutions, scholars highlight the importance of providing multi-faceted support for student veterans through various institutional services, culturally relevant mentoring, and positive interactions with advisors, instructors, and other non-veteran peers [3, 4].

It is important to note that student veterans' civilian transition through higher education requires not only some behavioral adaptations but also a deeper level of social integration and identity reconfiguration [6, 7]. While adapting to the social norms and cultural expectations of higher education student veterans inevitably go through an exploratory, often trying period to enact and develop a new cultural identity in civilian society [8]. It is commonly believed that student veterans successfully complete this identity transition over the first few years in higher education and their military identity have little impact on their academic pursuit afterward. However, most recent studies suggest that student veterans' military identity remains personally significant during and after their successful civilian transition [9], suggesting a need for further research on student veterans beyond an undergraduate education. Despite the growing evidence for student veterans' enduring military identity after their successful civilian cultural transition, the existing literature is largely based on undergraduate samples creating a clear void in our understanding of those enrolled in graduate school or advanced programs. In an attempt to fill in the scholarly void, this qualitative study explores graduate student veterans' experience in an engineering master's program that has implemented a double-layered mentoring structure for the students.

Literature Review

Student veterans in engineering

Although veterans' transition to higher education is an arduous process plagued with multiple challenges and a need for identity re-configuration, the unique set of skills and dispositions they possess are known to contribute to their academic resilience and perseverance. For student veterans in engineering programs, many of their former military experiences prepare them to develop clear and effective communication skills and teamwork capacity, which are highly valued in engineering fields [10]. Based on their prior military experiences, student veterans are also likely to possess a strong work ethic and a keen interest in practical problem-solving. Their strong communication skills, emphasis on team teamwork, and pragmatic interest and strong work ethic all help make veterans assets to the engineering profession [10].

What student veterans bring into the engineering classroom and engineering field is not limited to their professional dispositions and skills at just an individual level, which impacts only their

academic resilience and professional success. Veterans also bring unique experiences from the military with them into the engineering classroom and industry. Based on their prior military experiences student veterans naturally have deep knowledge of real-life issues and pragmatic insights to understand the impact of engineering decisions in a global, economic, environmental, and societal context [10].

Student veterans can play a pivotal role in enriching non-veteran students' learning experiences and outcomes in engineering programs. Student veterans possess real-life experiences, as well as the practical knowledge and insights of how to evaluate and apply certain technical information to the engineering field, which is rarely developed among traditional engineering students recently graduated from high school [10]. Their military training and life experiences that many other engineering students do not possess give these student veterans the ability to develop a unique method of process thinking [10]. Considering the exclusive experience, knowledge, and skillsets that student veterans have acquired from the military [11], they must be offered an appropriate type of support from college programs to continue to bring value to their military experiences.

Graduate engineering programs

Engineering programs are regarded as a selective and demanding discipline thriving on individualism, competition, and male-dominated discourse [12]. After completing a undergraduate degree, students seek out a graduate engineering degree for a variety of reasons, which include furthering their specialization, learning to manage the workforce in the field, or to shift their academic focus [13]. However, the competitive and demanding nature of engineering programs does not disappear after undergraduate training. Research indicates that a heavy workload and intense competition are a normalized everyday reality in most engineering graduate programs riveted by the idea of meritocracy. Therefore, it is not surprising that engineering graduate students experience immense pressure to succeed and that puts them at risk for mental health issues [14]. Because graduate students often have a variety of needs and life situations, it can be harder for them to take time off when they are feeling overwhelmed and are sometimes unable to step away from research projects [14].

In general, many graduate engineering programs, especially those running experimental labs for research and innovation, are built upon an apprenticeship model. The apprenticeship model emphasizes student learning through a more experienced tradesperson who models the appropriate skill and behavior for that apprentice to repeat [15]. Research labs typically have leading faculty members, managed by post-doctoral fellows and graduate students providing intellectual labor while gaining credential and experience toward the next stage of their career. It is a traditional model assuming the graduate students as those willing to make a total commitment to their training and relatively free from real-life responsibilities. However, research has indicated that student veterans do not fit into the model of a traditional student [10], as they are older adults with real-life responsibilities and possibly handling other physical and/or invisible disabilities. Unlike traditional engineering graduate students, graduate student veterans also bring their military experiences and skills with them into the graduate program environment. This means that student veterans may not benefit from the faculty's blind application of the typical apprenticeship model typically found in many graduate engineering programs.

Entering the graduate program, student veterans already have a clear direction for their professional path as well as a strong sense of identity—grounded in their military identity [9]. It is important to consider how faculty members can provide relevant support to student veterans who come into the graduate program with an established sense of self, unique life experiences, and technical skills that go beyond that of a traditional student. Due to their enduring military identity and unique cultural and professional profiles, there is a need to better understand how graduate student veterans in engineering develop and incorporate their military identity through their program of study. For example, graduate student veterans may find team-based work in engineering research labs familiar and consider it as a similar cultural context as that of the military. They, however, may not be aware of some deep-seated cultural differences between the two social institutions, the military's command-and-control organizational system that sets clear directives and creates structure [16], and the decentralized organizational structure of higher education that still expects students' initiatives to set proper professional boundaries. Therefore, faculty working with graduate student veterans need to consider how they approach student veterans to maximize benefits from their military backgrounds while avoiding possible pitfalls in their professional development.

Mentoring in engineering

Undergraduate students enrolled in a STEM program face a multitude of challenges including social and academic integration, high workload, and curriculum difficulty [17, 18, 19]. In an attempt to support these students, universities often integrate peer mentoring programs [20]. Peer mentoring programs are known to have positive effects on mentored students' academic performance [21], as well as retention and social integration [22]. However, graduate students, especially those in science and engineering, engage in laboratory intensive research and are likely to be part of a research team led by the faculty members who also serve as their advisor and mentor. Their graduate program experience and academic/professional success heavily depend on the lead faculty member (or a few collaborating faculty members), post-doctoral researchers, and other graduate students who together manage laboratory intensive research projects. As a result, mentoring and guidance provided by faculty and other more experienced researchers on the team play a significant role in graduate students' professional development.

While mentoring in the context of a research laboratory seems to be an integral part of engineering graduate education, the relevance of the current mentoring model in STEM disciplines has been in question. Based on the heavy focus on research productivity, mentoring in most graduate engineering programs aim at molding students to become the next generation of engineering faculty. Yet, recent data have shown that as few as one-fourth of individuals with a Ph.D. get a job in academia and only a third of those jobs are on a tenure track [23]. Instead, graduate students are more likely to earn an industry or government job. Given the reality of the career trajectory of engineering students, the type of mentoring currently offered to students in a graduate engineering program is misaligned.

Graduate student veterans are a unique group of students whose academic profiles and professional goals are significantly different from those of more traditional engineering graduate students. They possess a distinctive set of strengths and areas for further development to rise as

successful graduate students in an engineering program. They are more likely to pursue a non-academic career after graduation. Unlike younger peers in their graduate programs, graduate student veterans are not a tabula rasa waiting to be molded by faculty members, but highly mature professionals who have accumulated significant knowledge and insights from their prior military experience. Therefore, graduate student veterans' mentoring needs may be different from those of traditional graduate students. Considering the enduring nature of their military identity, graduate student veterans may face another unexpected adjustment challenges in their graduate program ranging from personal (e.g., developing and maintaining relationships) to educational (e.g., institutional support, infrastructure, and policies) [24]. Given the characteristics of graduate student veterans and unique academic environment of engineering graduate programs, faculty interaction and relationships with student veterans can play a critical role in facilitating or hindering the successful academic or career advancement of these students [3]. Therefore, in this qualitative study, we explored the major characteristics of mentors' and mentees' relationships and experiences in a newly-implemented mentoring program that aimed to support student veterans in an engineering graduate program.

Method

Research design

This study is part of greater mixed-methods evaluation research that aims to support student veterans' scholarly and professional development in an engineering graduate program. The entire evaluation research includes multiple types of data such as student veteran recruitment and enrollment statistics, observations in target engineering classes, student learning outcome surveys, and interviews with faculty, staff, and student veterans and non-veteran students. As part of the larger evaluation research, this qualitative study examined the veteran-specific-mentoring program newly implemented in Mechanical Engineering graduate programs. This study utilized a qualitative, phenomenological approach through in-depth individual interviews, which aims to generate themes inductively drawn from data with minimal theoretical interpolation. The primary goal of this qualitative study was to assess the quality and impact of mentoring relationships through in-depth interviews with both graduate student veteran mentees and their faculty mentors. To gather rich and meaningful data, the researchers relied on two broad research questions to guide the interview process:

- What are the overall academic and social experiences of graduate student veterans in a newly implemented veteran-friendly mentoring initiative in the College of Engineering?
- What are the key internal and external factors that contributed to graduate student veterans' successful academic integration in the engineering program?

Both the student veterans and faculty/staff interviews lasted approximately 30-60 minutes. Student veteran participants were given a college-affiliated t-shirt as an incentive for their participation.

Participants

This study is based on five engineering students enrolled in an engineering graduate program in fall 2018 and four faculty members serving as mentors for engineering graduate students. The participants were recruited at a public university located in the Southeast that has approximately

1,000 students utilizing GI benefits. The total sample size consisted of nine participants (n = 9). Out of the five engineering students, all were male student veterans. Four of the student participants identified as Caucasian and one participant identified as African American. All four faculty members were males, with only one faculty member having former military experience. Three out of the four faculty members identified as Caucasian and one identified as Indian. Pseudonyms are used for all participants listed below.

In terms of military-related experience, these student veterans had over 44 years of combined service. Alex joined the Air Force out of high school and started his undergraduate degree after he served. However, he received orders during his time as an undergrad student and completed an additional three more years before turning to school to complete his undergraduate degree and begin his graduate studies in engineering. Dave has over 20 years of military service. He joined the Army after he completed two years in community college and unsure of what to do next. He received additional education at the time but completed his undergraduate degree upon returning from the Army. Scott was born outside of the United States and came to America with his family when he was a child. He completed some community college, but joined the Marines and received his U.S. citizenship. He was medically separated from the Marines after two years. Jamie joined the Army upon graduating high school. He did not earn any type of additional education while enlisted and began his undergraduate program after his 10 years of service. Caleb joined the Army with no prior college experience. Although he earned some college credits throughout his five years of service, none of those transferred to his undergraduate institution after he left the Army. All of these students attended the same institution for their undergraduate degree where they were recruited to a graduate engineering program at the same university.

Table 1
Participant Demographics

Name	Role	Race/Ethnicity	Gender	Branch	Years of Service
*Jamie	Student	African American	Male	Army	10 years
*Caleb	Student	Caucasian	Male	Army	5 years
*Scott	Student	Caucasian	Male	Marines	2.5 years
*Alex	Student	Caucasian	Male	Air Force	6 years
*Dave	Student	Caucasian	Male	Army	21 years
Dr. Tahil	Faculty	Indian	Male		
Dr. Eastwood	Faculty	Caucasian	Male		
Dr. Tulbert	Faculty	Caucasian	Male		
*Dr. Donlick	Faculty	Caucasian	Male	Army	21 years

Denotes someone with veteran status.

Data analysis

All interviews were transcribed verbatim through an online service and checked by the interviewers for accuracy. The research team conducted a preliminary thematic analysis [25] elicited the five themes that are listed below. Thematic analysis is a search for themes that emerge as being important to the description of the phenomenon. The researchers followed the

six-phase framework proposed by Braun and Clark [26], which is appropriate for this type of analysis. The research team employed several strategies throughout the entire research process to ensure the quality and trustworthiness of the findings. After interview transcripts were transcribed verbatim, the research team first began by becoming familiar with the data and generating initial codes. From there, they started to search for themes. The research team identified preliminary themes through careful reading and re-reading of the data [27]. After reviewing the emerging themes and their empirical evidence, the research team created an analytic table listing the themes and key codes that supported each of the themes. The research team also examined the logical alignment across the emerging themes and their sub-codes and interrogated them against the two research questions. The initial themes and related codes were repeatedly revised and refined through multiple discussions and re-analyses until the researchers were able to recognize clear patterns within the data and conclude on the final five themes reported below. Therefore, the data analysis was a collaborative and reiterative process by the entire research team consisting of five individuals with diverse professional/disciplinary backgrounds and racial/ethnic and cultural identities. The lack of research on graduate engineering student veterans mentoring experience supports the need and value of this type of exploratory thematic approach to inquiry that allows an in-depth examination of human experiences under investigation.

Research team

The research team consisted of five members, three faculty members, and two graduate students. The lead researcher was an Asian American female faculty member in the College of Education serving as a program evaluator. The two other faculty members were Caucasian males in the College of Engineering working with student veterans including the five graduate students who participated in this study. Only one out of the three faculty members is a military veteran. Both the graduate students are Caucasian females within the College of Education. One graduate student is a doctoral student and the other is a master's student.

Findings

The results of this evaluation research illustrate the importance of safe-space and authentic mentorship in supporting graduate student veterans. Five themes drawn from the data are: (1) Understanding veterans' struggles and advocating for the students' academic pursuit, (2) Establishing a military-safe environment, (3) Authentic mentoring experiences, (4) Appreciation and utilization of military assets for academic success, and (5) Spearheading research endeavors while being in good hands. The findings illuminate the enduring nature of graduate student veterans' military identities as well as the dynamic confluence between their former military training and current engineering environment that featured unique cultural similarities.

Understanding veterans' struggles and advocating for the students' academic pursuit

The first theme, understanding veteran's struggles and advocating for the students' academic pursuits is two-fold. When faculty members were able to demonstrate their appreciation and acknowledgment of the student veterans, in return, student veterans felt affirmed in their military identity and ultimately more accepted within the classroom and campus environment. One

faculty member shared his understanding of student veterans, expressing the realization that "There are a lot of these veterans out there trying to get degrees and financially struggling and they're kind of lost." By offering not just financial assistance to these student veterans, he wanted to extend his acceptance of their military identity, allowing them to share their transition struggles with him, despite his lack of military experience and knowledge.

When asked about his experiences in the program, one student veteran shared his positive interactions with faculty members who have acknowledged his military identity. He explained that what made his education possible were faculty members. "The faculty members… they have been very helpful with guiding me and telling me what I need to do. [Faculty member] has been an integral role in helping me transition from Undergrad to graduate cause he's gone through this before." Knowing that his identity and experiences as a veteran were affirmed and celebrated by faculty members was influential in his transition experiences. When faculty members were able to demonstrate an appreciation of military assets and affirm their military identity, a sense of safety was established within the classroom.

One faculty member, a veteran, expressed how important it is to value these student veterans, but also protect them from being used without compensation. He shared: "I try to be sure that they're (student veterans) funded and that other faculty aren't taking advantage of their skills without paying for them. I talk with a lot of veterans and try to provide services that they need or information that they may not be aware of. Specifically, for funding and job opportunities."

Part of the success between mentors and mentees is the understanding of the mentee's transition and experiences. One faculty member shared "One of the ways that I try to encourage them is that I know you're sacrificing your own personal life, your family, but after you get PhD, you're going to have much, much bigger opportunities with much, much better salaries." This participant who served as a faculty mentor understood the dedication and sacrifice his student veterans were making every day to be in a graduate program, especially those with families or who still might be active duty. By being able to demonstrate that understanding and acceptance, student veterans feel supported and are better able to thrive in an environment that cultivates their growth.

Establishing a military-safe environment

Theme two, establishing a military-safe environment was seen within the classroom and college level. One student veteran shared with us that "The grant lets veterans know that the campus recognizes and values us as students." Because faculty members put in the time and energy to receive a grant to financially assist student veterans to complete their graduate engineering degree, student veterans feel like they matter. By having faculty members actively seek out and obtain external grants to support military veterans, it showcases the college's and institution's commitment supporting this group of students.

At the classroom level, it is important for student veterans to feel accepted by their peers and faculty members. Part of this can be accomplished through the curriculum provided to the students. The development of an engineering class at this university focused on the application of military technology, covering a broad spectrum of experimental engineering methods, key

learning contents, and related lab experience were grounded in the integration of engineering and military technology experiences. Through active engagement and participation in the ENGR 3999 course, both veteran and non-veteran students received the opportunity to increase their knowledge and awareness of military-related technology and tools. In further attempts to create a military-safe environment, the instructor of the military technology course hired a student veteran as a teaching assistant for the class. With the support of the teaching assistant, students were able to contribute to the class discussion using their personal and professional knowledge from their service.

Because the transition from military to higher education can pose particular challenges, faculty members need to demonstrate a military-safe environment and student veterans need to help them construct it. Although non-student veterans may also require accommodations, one faculty member shared his experiences working with a student veteran with a physical disability. "So, the first disabled vet …. He had left part of his leg in Iraq. There are obvious accommodations we have to think about. He doesn't want to stand at a machine tool eight hours a day. It's okay." It would have been easy to provide an alternative assignment that didn't require the need to run a machine. However, this faculty mentor wanted the student to still be actively engaged and part of the research project. Instead, he found ways the student veteran could use tools and assessment instruments while sitting down. This faculty mentor devised a way to engage this student veteran in a meaningful learning process rather than simply exempting the student from the activity. The student veteran was still able to receive the hands-on experiential learning that was required of the assignment.

Authentic mentoring experiences

When interviewing the student veterans about their successes, all five of the participants shared the importance of authentic mentoring experiences and strong faculty relationships. One student shared his relationship with faculty members and expressed "He's not only helped me with just transitioning to graduate school as an undergraduate student, but he has also helped tutor me and helped me with the goal of presenting at engineering conferences." Given the transition process from military to civilian life can be difficult for veterans, having a mentor who understands the possible challenges and discomfort was essential for his growth and development. Another student expressed the passion that radiated from one faculty member. He shared in his interview "He is invested in this project. I am not sure if that is normal or not, because he is so passionate about it." This student was part of an engineering project led by the faculty member and the participant felt supported and valued throughout the experience.

A humorous yet revealing story shared by a different student veteran demonstrates the authenticity and friendly relationship he has with his faculty mentor. He described the faculty members' ability to provide answers and support without giving him direct answers and how the faculty member always seemed to know the students' needs before he did. He shared how "Like sometimes he won't tell you what you need to do. I'll be in his office and he'll say something about these books over here. Oh Wow. I was putting some up on this bookshelf one day. I wish it needs to be clean." It was obvious the faculty member didn't expect the student to clean the book, but instead, lightly nudged him to use that book to help get answers to classroom or research questions he has. By doing this, the faculty member is putting the student veteran in the

driver seat of his learning, providing the participant with the opportunity to demonstrate his knowledge and ability to problem-solve.

All graduate students are expected to learn and embody self-thinking skills. This is a critical transition for student veterans who are used to being told to do given tasks. Although there were necessary and appropriate moments when instructors would directly tell student veterans what to do and what not do, the mentorship between faculty and student veterans was the catalyst that encouraged them to go beyond listening to orders and becoming independent thinkers. When it comes to their research skills and capacity for development, mentors would use a less direct approach so that they would develop a new disposition to lead their learning. Although these two strategies seem contradictory, they are complementary. Mentoring is a complex process, and the mentors supported the mentees appropriately while also challenging them at the same time.

Appreciation and utilization of military assets for academic success.

The fourth theme highlights the appreciation and utilization of military assets for academic success, understanding that some of the assets and skills required to be successful in the military are similar to the learning environment within engineering programs and higher education. The culture of the military necessitates service members to adopt a collective identity with total commitment to comrades, chains of command, and the mission [6, 28, 29]. Royalty, team-based mindset, shared leadership responsibilities, strong work ethic, and punctuality have been identified as key cultural prerogatives in military contexts [3]. Given the structured and rigorous nature of graduate engineering programs that requires leadership and teamwork, both faculty and student veterans themselves found one's previous military skill sets are highly transferable to the classroom and research lab environments. One faculty member with extensive experience working with student veterans expressed the connection between military experience and skills required to be successful in the classrooms. He shared "They have that leadership experience and that drive to get the job done and get it done to standard. People tend to divert them into leadership positions to ensure the project is completed. And then the faculty will recruit them for graduate school to put them on projects that are failing or are questionable to push it to get completed."

Because the student veterans know firsthand the importance of teamwork, leadership, timelines, and getting a job done efficiently and effectively, they become an asset on research projects, especially research teams that are in desperate need of someone to take charge and direct others appropriately. This testament to military culture and success as a graduate student was expressed by another faculty member as well.

> "They are much more responsible and they are very good with leadership. So, one of the reasons I like hiring veteran students is that I can offload my own responsibilities to them. Sometimes they just really help me a lot beyond just research or just managing my research lab."

Spearheading research endeavors while being in good hands

Given the transferable skills from their experiences in the military into their success in an engineering graduate program, student veterans often become the leaders on research projects, spearheading research endeavors while being supported by their faculty. One student shared how his mentoring connected well to his research interests. "So, our mentoring relates to our senior design project…I've done work with Dr. XX, he's my faculty mentor. I did some research with him last year as a junior and then he works with Duke Energy and he helped to get a senior design project going with me." For this student, his mentor not only supported his research efforts but used his industrial experiences and connections to help the student create a senior design that was meaningful and relatable. Another student expressed how grateful he was that his mentor had mutual shared research interests. While detailing the success of his research projects, he described the importance of his mentor: "Yeah, especially because the other departments are broad, and research needs to be so specific, and you need someone who at least knows what you want to do. You need to find someone who needs to be a good advisor for you and your goals." By having a mentor whose interests matched his, he felt like he was in good hands.

Student veterans' growing confidence and sense of belonging in the engineering program and faculty's research lab environments led them to be proactive and strategic, even doing something that had never been tried by anyone else. One participant, a student veteran with 21 years of military experience, shared his ability to go office door to office door asking if faculty members needed help with any research projects. He stated "There's an entire row of professors right there. Let's start going down the road, knocking on the doors and going, hey, do you have any ideas? And so, we started doing that. We've never had anyone do this [in the program]. How about this? And it was like, I don't have any ideas, but go talk to him. Go talk to him." It turned out to be that even when a faculty member didn't have an idea, the student veterans were directed towards someone else who might need help or have an idea to engage them in meaningful research. The audacity of the student veteran to go door to door was made possible because of the military-inclusive environment that had been established by faculty members and the mentor-mentee relationships.

Discussion

This study provided valuable information about the academic and social integration of graduate student veterans in engineering programs at a southeastern university and essential institutional support for those students. In particular, this study examined the synergistic confluence between mentoring relationships and student veterans' cultural identities in the specific program environment. The results from this study provide important insight into the experiences of graduate engineering student veterans and how various units of higher education (e.g., institution, programs) can develop an effective and culturally-relevant support system for student veterans in graduate programs. This study confirms existing literature that student veterans' experience in the military is deeply intertwined with their identity, and they need a supportive environment and holistic mentoring to advance their professional development. The findings of this study add to the much-needed literature elucidating the program and mentoring experiences of student veterans beyond undergraduate programs, especially those aspiring to become leading professionals in engineering fields.

Faculty and institution's advocacy position was instrumental to all veteran-friendly program development initiatives and positive mentoring relationships observed at the individual level. There is a need for holistic mentoring, not just for academic mentoring only. Given the academic demands of being a graduate engineering student [30] and the quality of skills student veterans bring into the classroom, it is important to value these student veterans, but also protect them from being used without compensation. Through effective mentorship, mentors can help progress their academic development and pursuits while making sure their mission-driven and team-first mindset[24] are not taken advantage of by other faculty members and researchers.

While we can celebrate the successful implementation of graduate student veterans' mentoring initiative at our institution, there is a need to critically examine how the military-friendly lab environment affects other minoritized groups of students in their program. Student veterans are claimed to be an invisible minority in higher education [31], yet they are male and mostly Caucasian, a privileged group of individuals in current American society and engineering fields. While providing relevant support for student veterans facing added challenges, engineering advisors and professors also need to be made aware of the norms that define their disciplinary culture and how it impacts diverse groups of students in their programs [32], especially historically underrepresented racial/ethnic minorities and female students.

Study Limitations and Recommendations for Future Research

Like many other empirical studies, our study had several limitations. One of the major limitations of this study was its small sample size. Due to the labor-intensive nature of qualitative data collection and analysis, as well as the nature of the specific mentoring program established at the university, our sample size consisted of the participants enrolled in the program. With the continuation of grant support, we hope to further increase our qualitative sample size by interviewing more student veterans in a graduate engineering program as they complete their program of study and receive mentorship support. Although generalizability is not a goal of qualitative research, it is important to note that all of the student veterans who participated were students at the same university in the Southeast area of the United States. Both the mentor and mentee participants identified as males and it would benefit the engineering and graduate veteran community if research continued to seek out the experiences of female engineering student veterans. As a result, we strongly recommend that future studies create a sample with significant gender, racial, and cultural diversity to produce a more inclusive and holistic account of student veterans' experience of mentorship in graduate engineering programs.

Acknowledgement

References

[1]   J. L. Steele, N. Salcedo, N, and J. Coley, "Service members in school: Military veteran's experiences using the Post-9/11 GI Bill and pursuing secondary education," *A report prepared for the American Council on Education*, 2010. [Online]. Available: http://www.rand.org/content/dam/rand/pubs/monographs/2011/RAND_MG1083.pdf [Accessed: Oct. 15, 2019].

[2]   U.S. Department of Veteran Benefits, "Benefits for Veterans Education," *Department of Veteran Benefits,* 2018. [Online]. Available: https://www.benefits.va.gov/REPORTS/abr/docs/2018-education.pdf. [Accessed Oct. 1, 2019].

[3]   J. H. Lim, C. Interiano, C. E. Nowell, P. T. Tkacik, and J. L. Dahlberg, "Invisible cultural barriers: Contrasting perspectives on student veterans' transition," *Journal of College Student Development,* vol. 59, no. 3, June 2018. [08975264]. Available: https://search-proquest-com.librarylink.uncc.edu/docviwe/2150691034?accountid=14605. [Accessed Sept. 20, 2019].

[4]   T. Bonar, "Mental health and militry-connected students on campus: culture, challenges, and success,". *New Directions for Student Services,* vol. 156, Dec. 2016. [0164-7970]. Available: https://onlinelibrary.wiley.com [Accessed Oct. 20, 2019].

[5]   V. Schiavone, and D. Gentry, "Veteran-students in transition at a midwestern University," *The Journal of Continuing Higher Education,* vol. 26, Jan. 2014. [0737-7363]. Available: https://tandfonline.com [Accessed Oct. 1, 2019].

[6]   D. DiRamio, and K. Jarvis, "Veterans in higher education: When Johnny and Jane come marching to campus," *ASHE higher education report,* vol. 37, no. 3, 2011. [1551-6970]. Available: https://onlinelibrary.wiley.com. [Accessed Sept. 2, 2019].

[7]   K. Mangan, "Colleges help veterans advance combat to classroom," *The Chronicle of Higher Education,* Oct. 2009. [Online]. Available: https://www.chronicle.com/article/Colleges-Help-Veterans-Advance/48846. [Accessed Sept. 12, 2019].

[8]   C. R. Rumann and F. A. Hamrick, "Student veterans in transition: Re-enrolling after war zone deployments," *Journal of Higher Education,* vol. 81, no. 4, 2010. [0022-1546]. Available: https://tandfonline.com. [Accessed Oct. 10, 2019].

[9]   C. Interiano-Shiverdecker, J. H. Lim, P. T. Tkacik, and J. L. Dahlberg, "From the barracks: A multi-dimensional model of student veterans' cultural transition," *The Journal of Military and Government Counseling*, vol. 7, 2019. [Online]. Available: http://mgcaonline.org/wp-content/uploads/2]019/11/JMGC-Vol-7-Is-3.pdf. [Accessed Sept. 15, 2019].

[10]   B. J. Novoselich, J. C. Bruhl, M. Scheidt, C. N. Willis, and M. S. Sheppard, "ASEE
         support to student veterans: Results of a 2018 leadership roundtable," *Paper presented at
         the 2019 ASEE Annual Conference & Exposition,* 2019. [Online]. Available:
         https://www.asee.org/public/conferences/140/papers/24661/view. [Accessed Sept. 12,
         2019].

[11]   M. Sheppard, N. Kellamn, S. Brunhaver, "Exploring the unique skills and challenges
         veterans with disabilities bring to college: A qualitative study in engineering,". *Paper
         presented at the 2019 ASEE Annual Conference & Exposition*, 2019. [Online]. Available:
         from https://peer.asee.org/exploring-the-unique-skills-and-challenges-that-veterans-with-
         disabilities-bring-to-college-a-qualitative-study-in-engineering.pdf. [Accessed Sept. 9.
         2019].

[12]   J. L. Paquin, "How service-learning can enhance the pedagogy and culture of engineering
         programs at institutions of higher education: A review of the literature," *Dissertation and
         Thesis*, vol. 19, 2006. [Online]. Available:
         https://digitalcommons.unomaha.edu/slcedt/19. [Accessed Oct. 5, 2019].

[13]   A. Belasco, "So you want to be an engineer?," *College Transition,* 2019. [Online].
         Available: https://www.collegetransitions.com/blog/so-you-want-to-be-an-engineer/.
         [Accessed Sept. 23, 2019].

[14]   C. Woolston, "A better future for graduate-student mental health," 2019. [Online].
         Available: https://www.nature.com/articles/d41586-019-02584-7. [Accessed Sep. 12,
         2019].

[15]   A. W. Bates, *Teaching in a digital age: Guidelines for teaching and learning*. Vancouver,
         BC: University of British Columbia Press, 2019.

[16]   Y. M, Kim and J. S. Cole, "Student veterans/services members' engagement in
         college and university life and education," *American Council on Education*, 2013.
         [Online]. Available:
         https://www.acenet.edu/Documents/Student-Veterans-Service-Members-
         Engagement.pdf. [Accessed Sept. 18, 2019].

[17]   L. Fleming, K. Engerman, and D. Williams, "Why students leave engineering: The
         unexpected bond," *Paper presented at the 2006 ASEE Annual Conference & Exposition*,
         2006. [Online]. Available: https://peer.asee.org/why-students-leave-engineering-the-
         unexpected-bond.pdf. [Accessed Sept. 2, 2019].

[18]   R. M. Marra, K. A. Rodgers, and B. Bogue, "Leaving engineering: A multi-year
         single institution study," *Journal of Engineering Education,* vol. 101, no. 1, Jan. 2012.
         [1069-4730]. Available: https://onlinelibrary.wiley.com. [Accessed Sept. 2, 2019].

[19]   J. H. Lim, B. P. MacLeod, P. T. Tkacik, and S. L. Dika, "Peer mentoring in

engineering: (un)shared experience of undergraduate peer mentors and mentees," M*entoring & Tutoring: Partnership in Learning*, vol. 25, no. 4, Aug. 2017. [1361-1267]. Available: https://tandfonline.com. [Accessed Oct. 8, 2019].

[20]   J. M. Holland, D. A. Major, and K. A Orvis, "Understanding how peer mentoring and capitalization link STEM students to their majors," *The Career Development Quarterly,* vol. 60, no. 4, Dec. 2012. [0889-4019]. Available: https://onlinelibrary.wiley.com. [Accessed Oct. 18, 2019].

[21]   B. Leidenfrost, B. Strassnig, M. Schütz, C. C. Carbon, and A. Schabmann, "Impact of peer mentoring on mentee academic performance: Is any mentoring style better than no mentoring at all?," *International Journal of Teaching and Learning in Higher Education,* vol. *26*, no. 1, 2014. [1812-9129]. Available: Retrieved http://www.isetl.org/ijtlhe/. [Accessed Sept. 7, 2019].

[22]   R. Collings, V. Swanson, and R. Watkins, "The impact of peer mentoring on levels of student wellbeing, integration, and retention: A controlled comparative evaluation of residential students in UK higher education," *The International Journal of Higher Education and Educational Planning,* vol. 68, no. 6, 2014. [0018-1560]. Available: https://link.springer.com. [Accessed Sept. 5, 2019].

[23]   A. J. Cuff, "An academic lottery or a meritocracy?," *Inside Higher Ed*, 2017. [Online]. Available: https://www.insidehighered.com/advice/2017/05/03/phds-need-real-data-how-potential-employers-make-hiring-decisions-essay. [Accessed Oct. 14, 2019].

[24]   S. D. Whiteman, A. E. Barry, D. K. Mroczek, and S. MacDermid Wadsworth, "The development and implications of peer emotional support for student service members/veterans and civilian college students," *Journal of Counseling Psychology,* vol. 60*,* no. 2, April 2013. [0022-0167] Available: https://search.proquest.com/docview/1328226944/. [Accessed Sept. 4, 2019].

[25]   D. Ezzy, *Qualitative analysis: Practice and innovation*. New York: Routledge. 2002.

[26]   V. Braun and V. Clarke, "Using thematic analysis in psychology," *Qualitative Research in Psychology*, vol. 3, no. 2, Jan. 2006. [1478-0887]. Available: https://tandfonline.com. [Accessed Sept. 4, 2019].

[27]   P. Rice and D. Ezzy, *Qualitative research methods: A health focus*. Melbourne: Oxford University Press, 1999.

[28]   J. J. Collins, "The complex context of American military culture: A practitioner's View," *The Washington Quarterly,* vol. 21, no. 4, 1998. [0162660X]. Available: https://tandfonline.com. [Accessed Sept. 6, 2019].

[29]   L. K. Hall, "The important of understanding military culture," *Social Work in*

Health Care, vol. 50, no. 1, Jan. 2011. [0098-1389]. Available: https://tandfonline.com. [Accessed Sept. 2, 2019].

[30]   D. Moore-Russo, J. N. Wilsey, M. J. Parthrum, and K. Lewis, "Navigating transitions: Challenges for engineering students," *Theory Into Practice*, vol. 55, no. 4, Oct. 2017. [0040-5841]. Available: https://tandfonline.com. [Accessed Sept. 7, 2019].

[31]   K. C. Jones, "Understanding student veterans in transition," *The Qualitative Report,* vol. 18, 2013. [1052-0147]. Available: https://search.proquest.com/docview/1651850675/. [Accessed Sep. 2, 2019].

[32]   M. Elliot, "Predicting problems on campus: An analysis of college student Veterans," *Analyses of Social Issues and Public Policy,* vol. 15, no. 1, Dec. 2015. [1529-7489]. Available: https://onlinelibrary.wiley.com. [Accessed Sep. 18, 2019].

Appendix A
Graduate Student Veteran Mentee Interview Protocol

Ice Breaker
1. Please tell me a little bit about yourself.

School-related experiences before college
2. Tell me about your educational experiences prior to being admitted to XXX university.
3. Any college level courses taken before, during or after your years of service?
4. Tell me what factors motivated you to pursue the degree of your choice after leaving the military?
5. What factor(s) influenced you to choose XXX University to pursue this degree?
6. As a whole, do you think your initial expectations have been met in your program? In what ways?
7. Now that you look back, do you feel that XXX University was a good decision for you? In what way?

Overall transition experience on campus and in the program
8. From your perspective, what do you think are the common experiences that student veterans face as they transition from military life to student life?
9. Tell me about your transition from life as a soldier in the military to life as a student in the (Name of Program).
(If a minority participant) Do you believe your race and/or gender impacted your transition from the military to higher education? If so, how?
10. What are (were) the biggest challenges you face (*or* have faced) as a graduate student veteran on campus?
11. How do you deal with the challenges (mentioned above)?
12. As a student veteran, what has been most helpful to your transition process at UNCC as a graduate student? Your program?
13. What has your overall experience been like in your classes?

Satisfaction level (projection questions)
14. Would you encourage another student veteran to come to your graduate program? Why or why not?
15. Knowing what you know now, would you choose your major again? Why or why not?

Suggestions for improvement
16. What strategies or extra support would you recommend to better support graduate student veterans on campus? (Retention and Graduation)
17. What suggestions or advice would you give to a new student veteran preparing to pursue a graduate degree in engineering at XXX University?

Wrap Up
18. Is there anything that you would like to add or share with me today?

Appendix B
Faculty Mentor Interview Protocol

Warming-up Questions
1. Please tell me a little bit about yourself including your professional background.
2. Please tell me about your job current title/position and major responsibilities (in relation to student veterans).

Work with student veterans
3. Tell me about your daily or regular work with student veterans.
4. What is your major role or responsibility in working with student veterans?
5. How do you work with student veterans? (a typical work pattern or typical interaction with a student veteran)
6. Tell me about a few student veterans you worked with in the past (or still working with you). How has been your overall experience with student veterans?
7. Tell me about the kind of support that you think is essential to your successful work with student veterans, yet not available to you so far.

Identifying characteristic of student veterans
8. How do you describe the overall characteristics of student veterans as a whole?
9. Are there any peculiar characteristic of student veterans? If so, please explain what you think those characteristics are.
10. What do you think are the hardest challenges or problems that many student veterans are facing?
11. How do you think the identified problem/challenges should be properly addressed?

Institutional support
12. What programs and services does your office (or your department/college) offer to support student veterans?
13. Do you know any programs and services on campus that support student veterans? If so, please explain them.
14. How do you evaluate the effectiveness of those programs/services/departmental or college's initiatives?

Suggestions
15. What would be an ideal situation for student veterans when they come to XXX University for their degree?
16. How can the department, college, and university including all of its employees better support student veterans?
17. What kinds of recommendations would you give to a new student veteran on campus?
18. Anything to add?