

CAREER: ‘Support our Troops’: Re-storying Student Veteran and Service Member Deficit in Engineering through Professional Formation and Community Advocacy: YEAR 1

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Introduction

There is an urgent need to recruit, train, and sustain a diverse engineering workforce able to meet the socio-technical challenges of 21st century society. Together, student veterans and service members (SVSM) are a unique yet understudied student group that comprises substantial numbers of those historically underrepresented in engineering (i.e., due to race, ethnicity, gender, ability, orientation, etc.). That, in combination with technical interests and skills, maturity, life experience, and self-discipline, makes SVSM ideal candidates for helping engineering education meet these demands [1,2]. This NSF CAREER project aims to advance full participation of SVSMs within higher engineering education and the engineering workforce by 1) *Research Plan*: developing deeper understandings about how SVSM participate, persist, and produce professional identities in engineering and 2) *Education Plan*: putting new assets based understandings of SVSM experiences into practice through collaborative development, implementation and broad dissemination of evidence-based military ally and mentorship programs in engineering and awareness/support trainings for engineering faculty, staff, and administrators.

Research Plan

The research plan of this CAREER project is guided by two research questions (RQ) and sub-questions:

1. How do SVSM participate and persist in undergraduate engineering education?
 - a. How do personal and professional assets combine to create SVSM community cultural wealth in engineering?
 - b. How do SVSM negotiate educational structures to participate and persist in engineering?
2. During their undergraduate engineering education, how do SVSM produce engineering identities?
 - a. How do SVSM experience transitions between military, civilian, academic, professional, and engineering related contexts?
 - b. How do SVSM engage in engineering professional identity development?

The project’s ongoing research on the state of SVSM literature in engineering shows that this body of work remains heavily focused on SVSM transition into higher education, including SVSM military and academic roles changes, the relative salience of intersecting identities (e.g., military, race, ethnicity, gender, sexual orientation, first generation), and transitional support needs [3]. This CAREER project builds from previous work documented in the research literature using a longitudinal, narrative inquiry research approach and an innovative, two-strand (interpretive and

critically focused) theoretical framework to develop understanding SVSM experience in civilian institutions while engaging in engineering programs.

The project employs narrative inquiry, as developed by Jean Clandinin and colleagues, to longitudinally and collaboratively explore SVSM lived experiences through shared storytelling [4]. Within the critical strand (RQ 1), the project adopts a critical perspective and employs Critical Theories [5-6] (i.e., Veteran Critical Theory and Community Cultural Wealth) to synthesize the institutional effects within participants' narratives by questioning the knowns and moving the focus of critique toward the institutions, policies, and practices that shape SVSM experiences in higher engineering education and away from a deficit perspective SVSM themselves. The goal of this strand is to add to an emerging Veteran Critical Theory in higher education by characterizing the community cultural wealth that SVSM use, as assets, to operate within and resist systematic anti-military bias and oppression that manifests within civilian institutions of higher education and post-secondary programs of engineering [5]. Within the interpretive strand (RQ 2), the project adopts an interpretivist perspective, employing social, multi/intersectional, and professional identity theory tenets to reveal SVSM professional identity development processes within the SVSM narratives [7]. The goal of this strand is to derive a conceptual model of SVSM professional identity development in engineering.

Narrative inquiry is used to generate data that is examined in both analytical strands. Narrative inquiry will engage diverse SVSM across partner institutional sites. SVSM volunteers participate in weekly journaling exercises, bi-monthly in-depth interviews, and quarterly networking focus groups. Ideally, SVSM participants will continue with the project for 2-3+ years, although durations may vary based on the amount of time participants have left in their undergraduate engineering education and their own personal timetables.

Recruitment of SVSM participants is currently ongoing. Using a combination of purposive and snowball sampling [8], the project team strives to engage a diverse group of participants. For those participants that have already volunteered, initial interviews and journal entries are ongoing.

Education Plan

The education plan of this NSF CAREER Project will integrate research findings from both theoretical strands within multi-institutional, collaborative research to practice efforts to develop inclusive, assets based SVSM programs and services to be made available nationally.

Institutional agents (e.g., veterans resource administrators and staff and engineering college level administrators and advisors) will participate in semi-structured interviews to discuss current best practices for SVSM (or lack thereof) and understand the current perceptions of institutional agents regarding SVSM in engineering education [9]. Once these interviews are completed, participating institutional agents will be invited to collaboratively engage in a virtual meeting to share insights and findings from these interviews and begin development of the assets based SVSM programs and services.

Preliminary Findings

Data is being generated with institutional agents using one-on-one semi-structured interviews. Data generation with institutional agents and associated analysis are ongoing and will continue through project Year 2. Emerging themes from interviews with institutional agents are described in relation to the project's developing educational outcomes. These themes are currently described as: Awareness vs Action, Ground Up vs Top Down, and Time and Resources.

Awareness vs. Action. Emerging findings show that there is a low level of awareness of SVSM as learners among engineering college level administrators and advisors. This lack of awareness not only includes a deficit of knowledge on SVSM's engagement within the college, but also highlights a disconnect in understandings that SVSM study engineering and are present within the college. As one college level institutional agent stated, "I'm assuming we have a significant number of military students [in engineering] or otherwise you wouldn't be doing a study, right?"

At a university level, awareness of SVSM as post-secondary learners seems to reside most strongly within veteran support offices. One member of a veteran support office described the efforts the office had made to help military students and veterans be "fully realized" on campus by "educat[ing] the campus community about what veterans really look like and what they [are]". Through these efforts, this institutional agent described a belief that, although there is currently overall acceptance of veterans on campus, the support ends there. Our early data show there may be a disconnect between high level university acceptance and actionable behavior at all levels, particularly at the level of engineering colleges and departments that includes "putting funding towards making sure veterans have what they need."

Ground-Up vs. Top-Down Support. Current interviews with engineering college level institutional agents suggest that college level support for student groups is mostly ground-up rather than top-down. This means that student organizations, such as clubs, must be organized and led by students. This emerging finding has implications for students from underrepresented groups that have limited numbers of students in engineering or whose members tend to hide their identities as members of that group. We are interested to see if this "ground up" support structure is a trend among the colleges of engineering we engage with as we continue institutional agent interviews.

In contrast to these college level findings, much of the support provided for SVSM at the university level appears to be top-down. This support, provided through veteran support offices, can include help with GI Bill and Post-9/11 GI Bill funding [8], tutoring, and voluntary ally training for university faculty, staff and administrators. However, top-down support is typically generalized (not tailored to the context of a specific discipline or major) since veteran support offices are responsible for supporting all SVSM at a university.

Time and Resources. Institutional agents from both university level veteran support offices and colleges of engineering have expressed how difficult it is to support all underrepresented student groups given time and resource constraints. However, they both also describe their desire and willingness to work collaboratively to support SVSM in pursuing their (engineering) education. Time and resources, or the lack thereof, is an issue that is not easily rectified and is likely to be common across institutions. Through this NSF CAREER project, we are focusing on working collaboratively with, among, and between institutional agents at the university level (veteran

support offices) and engineering college (administrators, advisors) level to develop resources and programs that can help bridge this gap for SVSM in engineering at multiple institutions.

Envisioning Educational Outcomes

Findings thus far suggest that, while there is little to no connection between university level support structures (i.e., veteran support offices) and colleges of engineering on issues of SVSM, interviewees from both groups have expressed willingness to work with the project team to develop SVSM support programs through participation in this project. There is also willingness from the veteran support office at the research team's home university to involve the college of engineering in their ongoing projects. We see that by integrating research and educational efforts, we can engage SVSM, colleges of engineering, institutions, and local communities in the development, implementation, and sustainment of educational and support resources for SVSM in ways that would be unachievable by the research team alone.

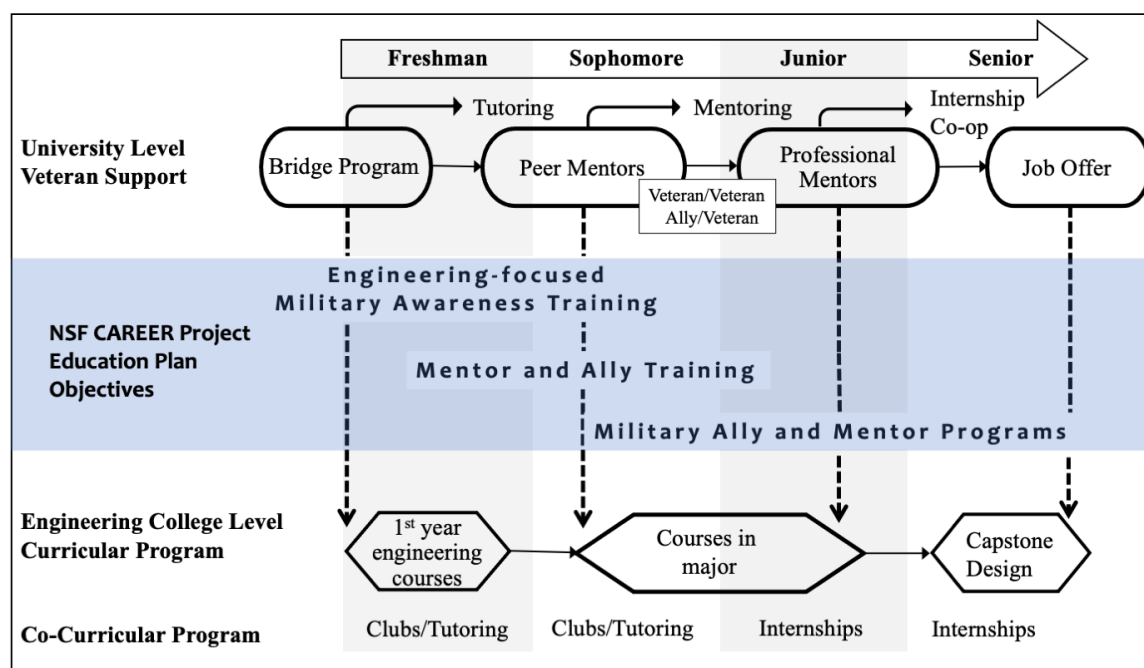


Figure 1. Integration of NSF CAREER Project Education Plan Objectives with University Level SVSM Support Goals and Engineering Undergraduate Curricular and Co-Curricular Programs

The inclusive, assets-based SVSM programs and services that this CAREER project aims to develop can be divided into three main categories: *engineering-focused military awareness training*, *mentor/ally training*, and *military ally and mentor programs*. Figure 1 provides a visual representation of the emerging ways we are beginning to see the synergy between university level goals for providing SVSM support (as expressed by the veteran support office at our home university), minimum 4-year progression of engineering degree programs, and the Education Plan Objectives of this CAREER project. Our emerging vision, as shown in Figure 1, is an extended (four-year) support structure for SVSM in engineering that begins with the transition from the military and ends with an engineering job offer.

Engineering-focused awareness training, made available to administrators, faculty, staff, and students in a college of engineering, can increase awareness of SVSMs in engineering. Bridging awareness of SVSM from a general university level to a college level has the potential of increasing collaboration of veteran support offices and colleges of engineering to enable targeted bridge programs, disciplinary peer/institutional mentorship, SVSM tutoring in engineering courses, and SVSM clubs related to engineering interest. As peer and institutional mentorship develops, in depth *mentor/ally focused training* can provide an avenue for engineering students, faculty, and veterans and community members to develop effective mentorships skills. Likewise, formalized *engineering military ally and mentor programs* can be built from peer/institutional mentoring activities to help engage community partners, opening doors for engineering internship opportunities and job offers as SVSM approach graduation.

Project Outcomes

Comprehensive evaluation and dissemination plans ensure that project outcomes are high quality and reach a variety of stakeholders interested in SVSM in engineering. Research plan efforts and the dissemination of research findings benefit from the mentorship of a research advisory board that includes scholars with expertise in narrative inquiry methodology, critical qualitative research in engineering education contexts, and instructing SVSM engineering undergraduates, and the from PI's own experience as a military veteran and professional engineer. Education plan efforts and the dissemination of research-to-practice products benefit from the expertise of an external project evaluation team and partnership with the veteran resource offices of five regional partner institutions of higher education and local student and community veteran organizations including the university chapter of the Student Veterans of America and the Cache Valley Veterans Association.

Dissemination

Dissemination of research products for a variety of audiences interested in SVSM issues has already begun. Early project research publications and presentations toward the research plan goals have focused on post-secondary education, student affairs, human resource development, and engineering education audiences:

1. Developing a conceptual model of SVSM professional engineering identity development:

Minichiello, A. and Kirchner, M. (April 2022). Theorizing military student transitions in U.S. higher education. American Education Research Association (AERA) Annual Meeting, San Diego, CA (hybrid).

Kirchner, M. and **Minichiello, A.** (April 2022). Socialization to support civilian professional identity development among student veterans. Academy of Human Resource Development (AHRD) Annual Conference, Arlington, VA (hybrid).

In this work, which we presented to higher education, student affairs, and human resource development audiences this spring 2022, we began our initial theorizing about the unique processes by which military students develop new civilian career-focused identities, such as in engineering. Narratively engaging with our own experiences as full-time military service

personnel who later transformed ourselves into civilian professionals, we developed our focus on understanding the process by which military students “hybridize” [10] deeply embedded military identities as they turn toward civilian career paths.

Concurrent with reflections about our own experiences, we engaged with the existing literature on social and professional identity, including the growing body of work related to student veteran identity. We theorized that service members necessarily develop *military identities* which become central to their core identities (personal and professional) due to the all-encompassing personal and professional commitments of military service. We then conceptualized how military service members must “hybridize” [10] their military identities as they pursue professional careers set in civilian contexts. Ultimately, a “hybrid identity” will consist of distinct yet supporting veteran (personal) and civilian professional identities wherein military students retain essential personal elements of their military identity within a veteran identity. Concurrently, military students transform military professional skills, abilities, attributes, and dispositions into civilian professional identities, using the values and norms of their chosen career field as a guiding framework.

In conceptualizing the Military Identity Hybridization Process [10] to explain how military students move from military service to civilian professional careers, we developed a new concept called *military identity*, which we see is different than, and a precursor to, veteran identity development. We used Veteran Critical Theory (VCT) [11], an emerging form of critical theory aimed at critiquing (civilian) education structures from the perspective of military veterans, to help us distinguish our concept of *military identity* (i.e., the deeply ingrained personal/professional core identity that one develops during military service) from *veteran identity*. VCT theorizes veteran identity as another of the more stable forms of identity — like class, race/ethnicity, gender, and sexuality — that is apt to draw oppression from dominant societal groups.

We then combined these identity constructs with existing conceptual models of professional adaption, provisional selves, and professional role transitions [12-13]. Through the resultant Military Identity Hybridization process [10], military students iteratively and recursively evaluate their existing knowledge, skills, interests, abilities, and dispositions while experimenting with provisional selves as part of defining a civilian professional identity. The process of negotiating and constructing a hybridized (i.e., veteran and civilian professional) identity requires military students to discard incongruent elements of military identity and adopt new elements from provisional selves.

Future plans for this work include vetting the Military Identity Hybridization Process model via ongoing collaboration with student affairs personnel, VCT theorists, and continuing engagement with emerging literature on veteran identity and other veteran concepts including *veteranness* [14-15].

2. Synthesizing the research literature related to SVSM in engineering to date:

Wilkinson, H., & **Minichiello, A.** (2022). A narrative review of the empirical literature on U.S. military students in engineering education. *Proceedings of the 129th Annual ASEE Conference & Exposition*, Minneapolis, MN.

In this work, we synthesized existing literature related to U.S. military student outcomes and experience in undergraduate engineering education. Our purpose was to describe the current state of this body of research and to provide insights into important new directions for future research. While conducting the review, we found that the U.S. higher education research literature categorizes students as “military” in varying ways and based on varying experiences (i.e., veterans, military-connected and/or military-affiliated which often includes military dependents, Reserve Officer Training Corps or ROTC cadets, service academy cadets, current or former military officers attending graduate school, etc.). Thus, we became cognizant of the need to be extremely clear in the way we defined the term “military students” and, subsequently, included/excluded literature within the review. While our review methodology was not *systematic*, it was necessarily *systematized* [16] to ensure that the research that was synthesized directly pertained to the types of military students and military student experiences we are studying.

Specifically, we focused our review on literature related to the outcomes and experiences of military students who are undergraduate student veterans and service members (SVSM) in engineering. This definition includes those who are 1) prior service members (i.e., veterans of active-duty service) and/or current service members (i.e., service members currently serving in the U.S. Reserves or National Guard) while also 2) enrolled as undergraduates in pre-engineering or engineering degree programs offered by civilian institutions of higher education. Therefore, studies that engaged with engineering students who were service academy cadets, ROTC cadets, veteran undergraduates attending school at a military institution (e.g., The Citadel), or graduate students were not included. Moreover, due to the nature of the military rank structure and the typical requirement for military officers to earn undergraduate degrees prior to being commissioned, student veterans and servicemembers enrolled in undergraduate degree programs at civilian institutions of higher education are likely to have served or serve as *enlisted* servicemembers. While the GI Bill [17] provides educational benefits for military veterans, current service members, and dependents (all of whom are considered “military students” in the literature) to take undergraduate or graduate courses leading to a degree, the literature included in our review includes only those studies wherein military students used GI Bill benefits to fund their undergraduate (engineering) education. Overall, this focus ensured that we synthesized literature related to the experiences of military students who are being trained as engineers within civilian institutions to ultimately join a diverse engineering workforce that operates within professional, civilian contexts.

In total, we selected, reviewed, and synthesized 22 articles that examined the educational outcomes and/or experiences of undergraduate student veterans and service members enrolled in civilian undergraduate engineering programs. While still nascent, this literature often presents multifaceted or even competing findings and, thus, provides potential directions for future investigation. For example, four studies noted the salience of military and engineering identities, even over those of gender and race (except for Black males), among military students in enrolled in engineering. Three others, however, reported the 1) lack of use of institutional military and veteran support service either due to ease of access and the preference of some military students to hide their military identities and 2) persistence of deficit perspectives and negative stereotypes of military students among faculty, staff, and administrators working to provide engineering degree programs within civilian institutions. Taken together, these findings suggest that more efforts are needed to understand how to develop and sustain visible and accessible communities of support for military

undergraduates within colleges of engineering, which may also empower them to be their true and authentic selves during their engineering education.

In another example, three studies suggested that by using military technology applications within their engineering courses, engineering instructors were able to engage military and non-military engineering students together. Two other studies reported that, while military experience is often considered as excellent preparation for success in engineering careers by faculty and administrators, military students may not see connections between their service and engineering careers until they enroll in an engineering education program. Thus, using military applications during engineering instruction can provide opportunities for military students to connect their military service experience with their developing engineering skills and attitudes while also providing military students opportunities for dialog and experience-sharing with their fellow non-military engineering student peers.

Future plans for this work include expanding this systematized narrative review into a systematic literature review to synthesize outcomes and experiences of military students in engineering across all possible literatures.

3. Examining the experiences of SVSM in engineering from a critical perspective:

Minichiello, A. (2022). Thinking critically about critical research with military undergraduates in engineering education. *Proceedings of the 129th Annual ASEE Conference & Exposition*, Minneapolis, MN.

In this work, we considered how a critical research approach can be employed with military student populations in undergraduate engineering education. Critical approaches uniquely focus on transformative praxis using knowledge developed during the research process. This paper begins our work of identifying, combining, and tailoring critical social theoretical frameworks for the purpose of reframing perceptions of deficit that can inhibit military student success in engineering (research plan). This work also helps us begin the process of identifying oppressive policies, procedures, and structures that work against military student “success” (e.g., participation, persistence, and thriving) in undergraduate engineering programs (research plan) for the ultimate purpose of working to dismantle them in practice (education plan Figure 1). This work adds to the growing body of literature that employ asset-based approaches to understand military student experience and outcomes in engineering education [e.g., 18-21]. This work further adds to an increasing use of liberative approaches to research and practice in engineering education more generally for the ultimate purpose of transformation in engineering education for all oppressed groups [e.g., 22-24].

Future plans for this work include continuing to develop and refine a critical theoretical framework for researching military student experience in undergraduate engineering education.

ONGOING WORK

As the CAREER project enters Year 2, recruitment of SVSM from participating institutions through purposive and snowball sampling will continue. Recruitment may be opened to SVSM at

other institutions as needed to meet participation and diversity goals. As more in-depth narrative interviews, journal entries, and networking focus groups are conducted, the project team will use the longitudinal narrative inquiry process to draw insights and understandings of the experiences of diverse SVSM as they progress through their engineering education.

Interviews with institutional agents will continue into Year 2, with a plan for these interviews and data analysis to be complete by the beginning of Year 3. Once these interviews have been completed, participants will be invited to attend a virtual collaborative meeting, where interview findings, including best practices for current SVSM support, will be discussed and development will begin for the engineering SVSM awareness, mentor/ally training, and military ally/mentor programs.

ACKNOWLEDGEMENTS

This material is based upon work supported by the National Science Foundation under Grant No. 2045634. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of National Science foundation.

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