BOARD # 333: CAREER: 'Support our Troops': Re-storying Student Veteran and Service Member Deficit in Engineering through Professional Formation and Community Advocacy: YEAR 4

Dr. Angela Minichiello, Utah State University

Angela (Angie) Minichiello, PhD is a military veteran, licensed mechanical engineer, and Associate Professor of Engineering Education at Utah State University.

Hannah Wilkinson, Utah State University

Hannah Wilkinson is a graduate student in Engineering Education at Utah State University. She received a B.S. in Chemical Engineering in from the University of Utah.

Samuel Shaw, Utah State University

Samuel Shaw is an undergraduate student in Mechanical Engineering at Utah State University.

Allison Miles, Utah State University

Allison Miles is an undergraduate student in Mathematics Education at Utah State University, minoring in Mechanical Engineering.

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Introduction

There is an urgent need to recruit, retain, train, and sustain a diverse engineering workforce able to meet the socio-technical and environmental challenges of 21st century society. Together, student veterans and service members (SVSM) are a unique yet understudied group that comprises substantial numbers of those historically underrepresented in engineering based on their race, ethnicity, gender, ability, or sex [1-2]. Notably, approximately 62% of veterans are first generation students [3]. This diversity of backgrounds and experiences, in combination with technical interests and skills, maturity and life experience, and leadership and teamwork training, make SVSM ideal candidates for supporting engineering education in meeting workforce demands well into the 21st century [4].

Project Goals and Work Plan

This National Science Foundation (NSF) Faculty Early Career Development Program (CAREER)aims to advance full participation of SVSM within engineering education and the engineering workforce. The project plan comprises a 1) **Research Plan** to develop deeper understandings about how SVSM participate, persist, and produce professional identities in engineering education, and an 2) **Education Plan** to place new understandings into practice through collaborative development, implementation, and broad dissemination of an evidence-based onboarding, community building and mentorship workshop for SVSM in engineering, and a set of modularized awareness/support training materials to introduce engineering faculty, staff, and administrators, and the general engineering student populace to military student issues.

Research Plan. The Research Plan builds from ongoing work using a longitudinal, narrative inquiry research approach and an innovative, two-strand theoretical framework comprised of social theories of identity [6], [7], [8], [9] in one strand and critical theories, including Veteran Critical Theory [10] and Community Cultural Wealth [11], in the second strand.. In doing so, it aims to critically examine higher engineering education structures and interpretively explore SVSM professional identity development in engineering programs at 2- and 4- year public institutions in the western United States. The research plan is guided by two research 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?

Education Plan. The Education Plan draws from design-based research approaches and grounded theory methods. Conducted concurrently with the Research Plan, the Education Plan works to connect local theory to practice by characterizing the current support structures available for SVSM in engineering and higher education, and developing and implementing new supports based on SVSM identities and required and preferred resources.

Year 4 Major Activities

This paper reports on project activities conducted during project YEAR 4. Specifically, these activities include:

1) *Research Plan:* **Recruiting and hiring two additional undegraduate researchers** to support Research Plan activities;

2) *Research Plan:* **Generating narrative data** with undergraduate veterans and service members enrolled in engineering degree programs using longitudinal narrative interviews and journal entries;

3) *Research Plan:* **Developing a theory-informed process for analyzing narrative data** generated with undergraduate veterans and service members enrolled in engineering degree programs;

4) *Research Plan:* **Conducting scoping and systematic literature reviews** related to student veterans and service members in undergraduate STEM education;

5) *Education Plan:* **Completing first draft and presenting** the military student awareness training to Veteran Resource Office (VRO), Veterans Affairs (VA), and College of Engineering stakeholders;

6) *Education Plan:* **Generating STEM undergraduate participant data** using design-based research activities and methods (Likert scale surveys and written field notes) toward development of an engineering/STEM onboarding seminar series for SVSM and other post-traditional students in engineering.

Year 4 Outcomes

This paper reports on project outcomes achieved during project YEAR 4. Specifically, these outcomes include:

1) *Research Plan:* **A documented analytic process** for examining narrative data (i.e., emplotted prosaic text) generated from longitudinal narrative interviews and journal entries with undergraduate veterans and service members enrolled in engineering degree programs;

2) *Research Plan:* **Preliminary narrative findings** centered on veteran community cultural wealth and professional identity development and constructed from SVSM personal narrative journal entries and one-on-one narrative interviews;

3) *Research Plan*: **A final search set of literature** determined and **scoping results** complete.

4) *Education Plan:* **Stakeholder feedback** as outcomes from presenting our military student awareness training for institutional agents (i.e., faculty, students, and staff) that is being collaboratively developed VRO and Veterans Affairs employees; and

5) *Education Plan:* **Preliminary findings** from first year design-based research activities toward developing an engineering/STEM onboarding seminar series for SVSM and other post-traditional students in engineering.

6) *Project:* Two journal articles submitted, two book chapters published (one in press); one book chapter submitted, four conference papers published, four conference papers submitted, and three conference presentations (no paper).

Significant Results:

1) An **Active Awareness Model** (i.e., awareness, allyship, advocacy, and accompliceship) [12] for student veteran and support by institutional agents (i.e., faculty, students, and staf) was developed and piloted with the USU VRO. The model met with very favorable support and will be included in the developing materials.

2) An empirical conceptual framework (Figure 1) for institutional and college support for post-traditional students [13] was adapted from [14]. The updated conceptual model is used to underpin development of the onboarding seminar for post-traditional students, inclusive of military students, in STEM. The conceptual framework supports the onboarding seminar design-based research.

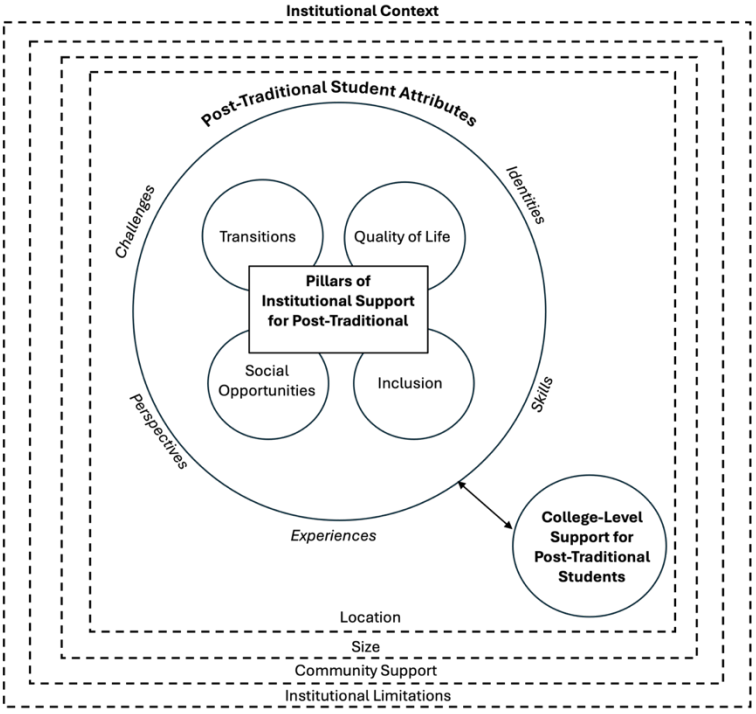

Figure 1.Conceptual framework for institutional and college-level support for post-traditional students (including veterans and service members). Adapted from [14].

3) Comparison of chosen topics for onboarding seminar based on student characteristics (i.e., military, STEM, and Post-traditional STEM.

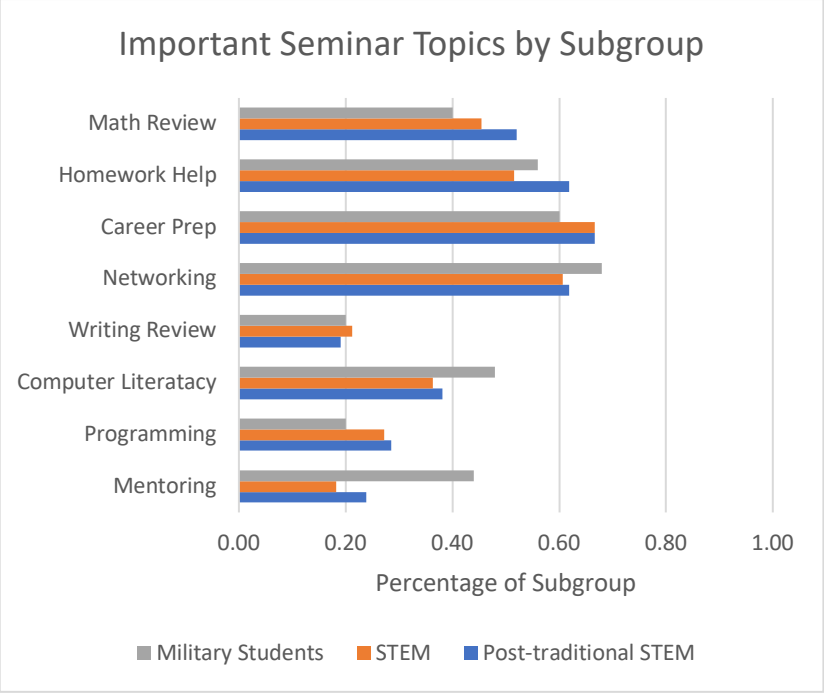

Figure 2. Chosen onboarding seminar topics based on student characteristics (i.e., military, STEM, and Post-traditional STEM.

We are using this data to build our final list of basic onboarding topics,

Ongoing Work

As this CAREER project concludes Year 4 during the summer of 2025, the team will continue to recruit and generate data with engineering SVSM participants, as well as analyze data through narrative inquiry methodology techniques developed as part of the research plan. The research team will also continue to advance the scoping review and systematic literature review. Two publications (one scoping one systematic review) are expected to be submitted in 2025.

Also, we will continue our education plan work by iteratively and collaboratively working with stakeholders to develop the assets based SVSM awareness training for faculty, staff, administration, and non-military students, and the onboarding seminar for SVSM and nontraditional undergraduate students in engineering. All these products will be piloted at the PI's institution and then shared with both the regional military student support community and nationally.

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