



Exploring Military Veteran Students' Pathways in Engineering Education

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

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

Dr. Catherine E. Brawner, Research Triangle Educational Consultants

Catherine E. Brawner is President of Research Triangle Educational Consultants. She received her Ph.D. in Educational Research and Policy Analysis from NC State University in 1996. She also has an MBA from Indiana University (Bloomington) and a bachelor's degree from Duke University. She specializes in evaluation and research in engineering education, computer science education, teacher education, and technology education. Dr. Brawner is a founding member and former treasurer of Research Triangle Park Evaluators, an American Evaluation Association affiliate organization and is a member of the American Educational Research Association and American Evaluation Association, in addition to ASEE. Dr. Brawner is also an Extension Services Consultant for the National Center for Women in Information Technology (NCWIT) and, in that role, advises computer science departments on diversifying their undergraduate student population. Dr. Brawner previously served as principal evaluator of the NSF-sponsored SUCCEED Coalition. She remains an active researcher with MIDFIELD, studying gender issues, transfers, and matriculation models in engineering.

Dr. Susan M Lord, University of San Diego

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

Dr. Catherine Mobley, Clemson University

Catherine Mobley, Ph.D., is a Professor of Sociology at Clemson University. She has over 20 years experience in project and program evaluation and has worked for a variety of consulting firms, non-profit agencies, and government organizations, including the Rand Corporation, the American Association of Retired Persons, the U.S. Department of Education, and the Walter Reed Army Institute of Research. Since 2004, she has been a member of the NSF-funded MIDFIELD research project on engineering education; she has served as a Co-PI on three research projects, including one on transfer students and another on student veterans in engineering.

Michelle M. Camacho, University of San Diego

Michelle Madsen Camacho is Chair and Professor in the Department of Sociology at the University of San Diego. She formerly held two postdoctoral fellowships at the University of California, San Diego, at the Center for U.S.-Mexican Studies and in the Department of Ethnic Studies. Fluent in both quantitative and qualitative research methodologies, her research uses theories from interdisciplinary sources including cultural studies, critical race, gender and feminist theories. Central to her work are questions of culture, power and inequality. She is affiliated faculty with the Department of Ethnic Studies, Women's and Gender Studies, and Latin American Studies.

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ABSTRACT

Military veterans hold tremendous promise for expanding and diversifying the engineering workforce. Yet, little is known regarding the educational pathways and experiences of student veterans into engineering. This project aims to address gaps in the literature on student veterans in engineering through a comparative case study across four institutions: University of San Diego, North Carolina State University, Purdue University, and Clemson University. The research plan incorporates content analysis of academic policies that student veterans encounter, interviews with key informants on each campus, focus group interviews with student veterans, and in-depth student interviews to elicit rich narratives. The theoretical framework builds on Tinto's student integration model and Schlossberg's adult transition theory. Data will be analyzed with the lens of intersectionality to elucidate differences stemming from the intersection of military status with race, gender, ability, sexual orientation, and socioeconomic status. Findings will provide context and information for various applications, such as: development of new strategies to support student veterans' success, identification of overlooked areas to promote student veterans' participation in engineering, and generation of critical information for development of larger-scale studies for investigating student veterans in engineering.

INTRODUCTION

In a post-9/11 world, there is tremendous opportunity to fulfill the potential of veteran students in higher education. As of 2011, nearly a million veterans had used the benefits offered through the Post-9/11 GI bill, and many campuses are seeing significant increases in the numbers of veterans.^{1,2} This group is expected to grow by 30% per year, with increasing percentages of Black and Latina women, particularly given the expanded benefits of the Post-9/11 GI Bill and the Yellow Ribbon Program, under which the federal government matches, dollar for dollar, any financial aid that participating schools commit—making private institutions more affordable and covering the full cost of attendance at state schools.^{3,4} Despite these growing numbers, little is known about the educational pathways of student veterans/service members, particularly those who migrate into engineering.

According to the NSF Workshop on Enhancing Post-9/11 Veterans Educational Benefit, the veteran population holds great promise for expanding and diversifying the engineering and sciences workforce.⁵ Student veterans are generally more mature and motivated than the typical first year college student, with unique experiences that are highly relevant to engineering education. Veterans have often developed abilities to handle complex tasks and technical skills that may be applicable to engineering practice, such as work with electronics and other mechanical skills, teamwork, leadership, and communication skills.

Transition and social integration

Burnett and Segoria⁶ suggest that student veterans are often not given academic credit, or do not receive appropriate evaluation of academic transcripts, resulting in difficulty transitioning to college and contributing to greater attrition from higher education.⁷ As a result of years away from formal education, veterans often struggle with math difficulties and a lack of study skills.⁸ Student veterans matriculating in engineering, however, may experience the transition

differently. Our project investigates how student veterans in engineering experience the transition from active duty military to educational settings.

The educational pathways of student veterans vary widely^{1,9,10,11} and these students face unique challenges.¹² Some enlist and serve prior to beginning higher education. Others may be in the midst of their college education only to be deployed and withdraw from school to serve. Military personnel may complete a degree, or partial degree, at the same time that they are serving in the military.¹¹ These “episodic” educational trajectories often have costs and benefits for student veterans, in terms of knowledge gained and credits accepted. These experiences parallel those identified for transfer students who experience a “transfer tax” burden in terms of the time and money lost when student lose credits as a result of their transitions.¹³

RESEARCH QUESTIONS

Student veterans experience diverse pathways into and through higher education; the relevance of their military experiences to their field of study in higher education is equally diverse. Few studies provided detailed insights into their educational experiences. The following research questions guide our qualitative investigation of the experiences and pathways of student veterans in engineering:

- 1: Why do veterans pursue a Bachelor’s degree in engineering?***
- 2: How do military experiences shape student veterans’ educational experiences?***
- 3: What are the experiences of student veterans in engineering education?***
- 4: How do institutions support veterans in engineering education?***

THEORETICAL FRAMEWORK

The proposed research will contribute to the sparse literature on student veterans’ development by building upon Tinto’s research on student integration and Schlossberg’s adult transition theory. Tinto’s acclaimed theoretical research on student integration suggests students must undergo a transition period to establish new membership required for academic persistence and adopt norms required for college success.^{14,15,16,17,18} Social integration is seen as complementary to academic integration; both are essential to graduation, and these are mitigated by the influence of family and social class. In considering Tinto’s work with a population of student veterans, of relevance is how student veterans adjust to, and perceive, their connections in higher education, and how these experiences relate to veteran social identities and needs.

Schlossberg’s research on adult transition defined the transformational stages adults encounter as they move in, through, and out of various roles.^{19,20} Schlossberg’s theory posited a 4S system (Situations, Self, Supports, and Strategies) to determine the internal and external coping strategies. This theory has implications for student self-efficacy and transitions into higher education in general^{21,22} and engineering education in particular, especially given the changes in student veterans’ roles, relationships, and educational routines. This framework is especially relevant for veterans²³ who may feel marginalized because they differ from the majority of traditional civilian students by salient status characteristics, such as age, socio-economic status, race/ethnicity, and ability among others. Overlaying the influence of these characteristics is the additional challenge that most post-9/11 student veterans are first generation college students, coming from households without a college-educated family member.²⁴

A qualitative, multiculturalist and feminist approach to studying the experiences of veterans will add to these theories. As discussed above, veterans are not monolithic groups, and thus their experiences must be considered within a wider prism of difference that accounts for gender, race, social class, sexual orientation, and ability. By using the powerful lens of intersectionality, this work contributes to the growing field of engineering studies, which considers how social categories are enacted in engineering.^{25,26,27,28,29,30}

RESEARCH PLAN

Comparative Case Study

We will use a comparative case study approach across our four partner institutions. This approach is applied to explanatory inquiries that involve “how” and “why” questions and is conducted through the collection and comparison of data across multiple sites.³¹ The resulting data will offer rich description about the experiences of student veterans in engineering that we would not otherwise be able to obtain. In our study, each institution will serve as a case: University of San Diego (USD), North Carolina State University (NCSU), Purdue University, and Clemson University. These institutions were selected to represent variations in geographic location, proximity to military installations, availability of support services for veterans, enrollment size, school history and mission, and other characteristics.

Table 1. Comparison of Case Study Institutions (Source: University Data)

	USD	NCSU	Purdue	Clemson
Major nearby military installations	Pacific fleet, SPAWAR, Camp Pendleton, Miramar	Ft. Bragg, Camp LeJeune, Seymour-Johnson AFB	None	Shaw AFB, Parris Island, Ft. Jackson
Type	Private - Liberal Arts	Public - Land Grant	Public - Land Grant	Public - Land Grant
Total Enrollment	8,300	34,000	39,000	20,700
# of Veterans using GI benefits	345	296	379	175
# of undergraduate engineering students (2011)	350	6,300	7,300	3,950
# of Veterans in Engineering using GI benefits	29	88	33	30

Our in-depth investigation of the educational pathways of student veteran engineering majors will include interviews with key informants, content analysis of programs and policies, and focus groups and in-depth interviews with student veterans in engineering. The key informant interviews and content analysis will provide critical information about the context of student experiences; the focus groups and in-depth interviews will elicit the student perspective and result in rich student narratives. We will recruit focus group and interview participants through our partnerships on each campus. As part of the recruitment process, we will ask prospective

participants to complete a survey that includes their demographic information, service-related data, and prior post-secondary educational experiences. The focus groups will allow us to uncover important general themes related to transitioning into the university and into the engineering major. The individual interviews will allow us to gain more detailed knowledge about student veteran experiences in engineering, particularly those that they might not be willing to share in a group setting. We will conduct one focus group at each institution, comprised of 8 respondents. We plan to conduct 15 in-depth individual interviews at each institution, resulting in 60 detailed student narratives.

OUTCOMES

Through our multi-method qualitative study, we will create grounded theory^{32,33,34} to build a conceptual model for better explaining the educational pathways of student veterans in engineering. This study will have broad systemic impact by diversifying pathways to and through engineering programs, and in capitalizing on the informal and real-world experiences of engineering student veterans. A comprehensive dissemination plan ensures that the study results, particularly the best practices for supporting veterans in engineering, reach a variety of stakeholders and audiences interested in student veterans and engineering education. Our research efforts and dissemination plan will benefit from an extensive partnership with the Space and Naval Warfare Systems Command (SPAWAR) and an advisory board that includes military veterans, leaders in the Student Veterans of America, the Director of the Center for Families & Military Family Research Institute, the former manager of the California *Governor's Troops to College Program*, an adjunct engineering professor who is a retired Marine, and an engineering student currently using GI benefits.

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