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Board 78: Establishing a Pathway to Completion for Pursuing Engineering and Engineering Technology Degrees through a Scholarship Program at Old Dominion University

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Dr. Vukica Jovanovic is an Associate Professor of Engineering Technology in Mechanical Engineering Technology Program. She holds a Ph.D. from Purdue University in Mechanical Engineering Technology, focus on Digital Manufacturing. Her research is focused on mechatronics, digital manufacturing, digital thread, cyber physical systems, broadening participation, and engineering education. She is a Director of Mechatronics and Digital Manufacturing Lab at ODU and a lead of Area of Specialization Mechatronics Systems Design. She worked as a Visiting Researcher at Commonwealth Center for Advanced Manufacturing in Disputanta, VA on projects focusing on digital thread and cyber security of manufacturing systems. She has funded research in broadening participation efforts of underrepresented students in STEM funded by Office of Naval Research, focusing on mechatronic pathways. She is part of the ONR project related to the additive manufacturing training of active military. She is also part of the research team that leads the summer camp to nine graders that focus on broadening participation of underrepresented students into STEM (ODU BLAST).

Dr. Anthony W Dean, Old Dominion University

Dr. Anthony W. Dean has had several roles in academia. He is currently Assistant Dean for Research, Batten College of Engineering and Technology (BCET) at ODU. His previous appointments include Associate Professor of Engineering Technology and as Associate Director of the Institute for Ship Repair, Maintenance, and Operations at Old Dominion University (ODU). His research has focused mostly on control systems (integration and testing) and the reliability and maintainability of complex systems. He has been selected as both a NASA and an ONR Faculty Fellow. He regularly teaches courses in Marine Engineering and in Maintained Systems. Most recently Dr. Dean was on the Headquarters Staff the American Society of Naval Engineers. He received his Ph.D. from the Department of Engineering Management and Systems Engineering, and a B.S. in Nuclear Engineering Technology, from the Batten College of Engineering and Technology at Old Dominion University. Additionally, Dr. Dean received an MBA from the College of William and Mary. Prior to his academic career Dr. Dean was Director of Operations and Business Development for Clark-Smith Associates, P.C., and served as an Electrician in the US Navy aboard the USS South Carolina and the USS Enterprise.

Dr. Kim Bullington Sibson, Old Dominion University

Dr. Sibson is an experienced and accomplished leader in higher education and university administration with strong expertise in program management, organizational development, and student and academic affairs administration, with over two decades of university experience.

During this time, Dr. Sibson has worked on numerous projects and initiatives aimed at forging strategic relationships and building consensus among faculty, staff, and students while being a motivated self-starter and reliable colleague. Seeking opportunities to expand her knowledge in her many areas of expertise, Dr. Sibson will bring her unique approach to higher education administration to ensure student success.

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Dr. Landaeta is an Associate Professor with tenure in the department of Engineering Management and Systems Engineering at Old Dominion University in Norfolk, Virginia. He holds a Ph.D. in Industrial

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Establishing a Pathway to Completion for Pursuing Engineering and Engineering Technology Degrees through a Scholarship Program at Old Dominion University

There are various barriers facing adult students and veterans completing engineering degrees. Many of these students work part- or full-time while in college. In order to help these students, enable high retention rates, and decrease time to graduation require an in-depth understanding of specific student populations, especially ones classified as underrepresented. This paper provides an initial look into the first year of a scholarship program, funded by the National Science Foundation, and student success activities designed to support high-achieving, low-income students with demonstrated financial need pursuing bachelor's degrees in engineering and engineering technology. Support services and scholarships are for veterans who have exhausted their GI Bill Benefits, but have not yet graduated. This paper will give an overview of current academic and mentoring support to increase academic success and workplace readiness, ensuring these students are ready to meet the demands of government, industry, and business.

Introduction

The Post-9/11 Veterans Educational Assistance Act of 2008, also known as the Post-9/11 GI Bill, is a current educational benefit for active duty military and veterans and replaces the original GI Bill of 1944 [1]. Many resources note that this Bill is credited for education of millions of scientists, doctors, engineers, entrepreneurs, authors, actors, and teachers, while providing vocational training for millions more [1-4]. Some researchers claim that nowadays there is a record number of new veterans in undergraduate education since many joined military with the goal to further their education after they leave military and make their education more affordable [4, 5, 6]. Some credit that increase to the downsizing of overall military-related jobs [7]. Research suggests that the transition from the intense tasks of active duty military to more self-sufficient civilian life can be overwhelming for many and some compare it to the experience of laid-off workers [5]. Often, it is hard to navigate through a fairly unstructured academic environment and learn and hear about existing resources that are otherwise available on many campuses such as student veteran organizations, veteran resource centers, and veteran-specific orientations [8]. There are not sufficient data about faculty training and other new approaches although various resources suggest various student success support practices [4, 9]. Some veterans might feel deeply alienated from their environment, they might be dealing with loss of friendships, or even with the loss of their fellow military peers in combat [5]. Other problems make veterans' transitions even harder. These include various combat injuries, failure to self-identify, various invisible disabilities, and late-to-develop or interrelated and significant delays in obtaining needed documentation that needed to identify them as persons with disabilities once becoming students [10]. Current data show that 17% of returning veterans may experience mental and physical health disorders, which can negatively affect their academic performance [11]. Another problem that was noted was that younger veterans are often perceived as traditional students and their military experiences are not being noted [7]. Some research notes that it is harder to market some specific information to veteran students than to traditional students [12].

Some veterans hope that their college experience can provide them with a collective environment and community that would provide some form of structured environment [5]. Hence, sense of community is of utmost importance through the environments that are both inclusive and supportive [2]. Student veteran organizations have been identified as important venues for veteran students’ networking and sense of community [2, 13]. These can serve as vehicles related to sharing information, which is important for veterans since they are often less likely to seek academic support and more inclined to pursue social support from fellow veterans with whom they feel more comfortable [14]. Supportive military culture and presence of campus spaces, even symbols and pro-military posters, which are utilized by veterans are positively characterized by veteran students [11]. Various sources recommended faculty and staff training related to the issues that veteran students are facing while transitioning to the campus environment such as “Veteran Ally” programs [15, 16].

Table 1: Diversity of Student Veterans in Higher Education [17]

	Active Duty	Reservists	National Guard	Veterans
Women	22%	31%	33%	21%
Minorities	48%	47%	40%	37%
Income	\$35,413	\$34,937	\$47,403	\$30,538
Age at Entry	22	22	20	25
4 or more risk factors	60%	37%	30%	44%
≥ 1 Dependent	57%	46%	32%	52%
Full-time Employment	70%*	36%	36%	42%
*Some Active Duty students do not work full time if attending school through certain military programs (e.g. ROTC/NROTC scholarship or Green to Gold program).				

Old Dominion University (ODU) is located in Norfolk, Virginia. It has over 300 diverse student veterans pursuing degree in the Batten College of Engineering and Technology, each experiencing a range of risk factors described above. Interventions that specifically address the academic achievement of this population are particularly important due to the increasing number of veterans transitioning from the military to institutions of higher education and into technical careers.

Table 2: Student Veterans in Batten College of Engineering and Technology (Fall 2015)

Total	314
Freshman	10
Sophomore	15
Junior	61
Senior	204
Degree Seeking (Unclassified)	24
Women	9%
Underrepresented Minorities	25%
First Generation College Student	27%
Freshman, Years to Degree*	5.32
Transfer, Years to Degree**	3.44

*For graduating seniors during the 2014-2015 academic year who entered ODU as freshmen

**For graduating seniors during the 2014-2015 academic year who transferred to ODU

Project Description

The main focus of this NSF Scholarship in Science, Technology, Engineering, and Mathematics (S-STEM) project is to provide 70 scholarships and student support services to student veterans which will address the major barriers to degree completion in engineering and engineering technology. Students who participate in this program are veterans who are either juniors or seniors. They also have to demonstrate a financial need, motivation, and proven academic excellence, and have exhausted their Post-911 GI Bill benefits. The students participating in this program are from one of the following majors that are available at our college. These are: Civil and Environmental Engineering, Electrical and Computer Engineering, Mechanical and Aerospace Engineering, Modeling and Simulation Engineering, and Engineering Technology. Students are placed in yearly cohorts to participate in academic support services and activities. Veteran students with previous military experiences often have strong technical background but lack theoretical training in underlying engineering principles [17]. This educational initiative highlights the importance of mentoring and supporting students through degree completion tailored to their specific needs. It includes various parallel initiatives, such as an up-to-date website, face-to-face orientation, online faculty training, face-to-face panels and monthly interactive webinars, as shown in Figure 1.

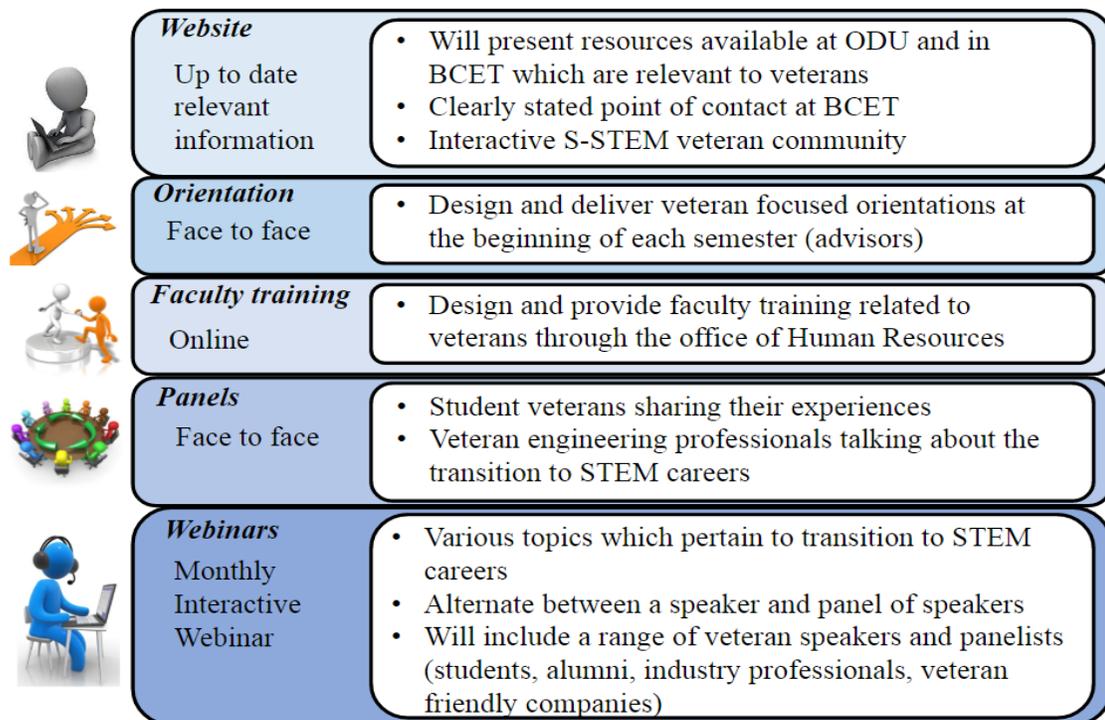


Figure 1: S-STEM Veteran Learning Community at ODU University

This paper focuses on the data collected from a first cohort of veteran students who participated in a scholarship program offered at Old Dominion University, a project funded by the National Science Foundation. The main purpose of this project is to enable financial assistance, university support services, a learning community experience, and various other support mechanisms as

requested by the veteran student learning community. The first group of scholars attended a seminar course Veterans in Engineering and Engineering Technology that was offered in the Fall 2018 semester. Initial meetings collected data from veterans in open-ended focus groups. Students were asked what kind of support they need to be more successful. The students mapped course topics that would become part of their syllabus. Throughout the course, various lectures followed with visiting speakers from university career services, veterans who have a proven record of success in the different engineering jobs in government, industry, and academia. This project will last five years. Figure 2 shows one of the sessions from the seminar offered to the first cohort of S-STEM veteran scholars.



Figure 2: Seminar about transitioning from the military to a work environment by a fellow veteran staff employee

Exploratory Project Phase - Main Obstacles

The first phase of this research project focused on exploratory research and qualitative data collection. The main purpose of this activity was to understand:

What are the main obstacles for veterans when choosing and completing engineering and engineering technology degree programs?

Obstacles were defined as choosing a major and completing a program in a selected major.

Motivation

Motivation is one of the most important factors for veteran students' success at their further transitioning from veteran to undergraduate engineering students and forward to a professional. Some students are noted that after leaving military they were too scared to apply directly to a Bachelor's degree that they first started with Associate of Applied Sciences (A.A. S.) or Associate of Science (A.S.) degree before they came to the university. Three students in this cohort already have associate degrees and other the five are transfer students from other four year institutions.

Non-Traditional Students

Veterans differ by age of average undergraduate students at the same level. They mentioned that a lecture pace does not always fit their learning pace since some professors would use slideshows and quickly go through various examples that were hard to comprehend at first glance due to the complexity of the engineering profession. Students mentioned that it would be beneficial to develop a guide for faculty with veterans in classes, because most of the faculty knows what works for 18 to 22-year-olds. Some adjustments would be required so that a solution can be established between non-traditional and regular students. Veterans noted that as students they are interacting with younger people with different previous degrees or certifications. Some noted that there is a need for veterans to come together and talk about these interaction issues and different work ethics. In the military, they noted that if there are some problems, they do not lose their job but instead get transferred to another. They also noted that not all veterans are the same: Navy veterans are different from Army veterans, etc., but still they have more common ground, and similar work ethic, than they do with the traditional population of students. They noted that they prefer classes that are attendance optional and more interactive. They agreed that while professors are clicking through slides fast, it is hard for them to sit and watch a slideshow.

Course Relevance

Veteran students face various different articulation issues since they transfer their military credit from various previous experiences. They also have different levels of previous technical knowledge so it is important to be informed about the appropriate course relevance to their future careers. Students expressed a desire to meet engineering role models, other veterans who work in industry and academia. They noted that it would be especially important to hear about the first five years after graduation and the transition to an engineering role. One student noted that he has started to work in the Army Corps of Engineering in a mechanical engineering position. He explained that he started doing cost estimation and project management, which is outside of the traditional mechanical engineering curriculum and wondered why the workforce did not match his coursework.

Scholarship and Job Opportunities

Veteran students have identified importance of training related to the scholarship and job opportunities. They do receive a plethora of available scholarship information but it is sometimes overwhelming and hard to navigate. They commented that sometimes it is not clear what they need for the application, what exact criteria would be used for selection. They mentioned that it would be beneficial to have more specific information about what evaluators and employers are looking for and how to best evaluate job opportunities. Students expressed a need for assistance in resume building and cover letter preparation, particularly in regard to translating military training into more traditional resume language. They also noted that they would like to hear from the working professionals what the engineering job entails and the difference of working for the government and in industry. Hearing stories about successful veteran engineers' transition from the military to the workplace also rated highly among the students.

G.I. Bill Benefits

Veteran students commented that they need more thorough understanding how to better use the GI Bill and that that process requires more guidance since many students are not aware that it is time-based, not credit- or money-based. One student commented that, if starting again, he would start as a full-time student. Some mentioned that this program was their first scholarship that they ever had. They would all qualify for multiple scholarships since a high GPA was one of the requirements for participation in this S-STEM scholarship program. Some students did not reach out to the resources available at our institution such as the Military Connection Center or the Student Veterans Association. Students also noted that there is a need for better understanding of GI Bill restrictions related to taking how many classes that are on campus versus online. All the students also agreed that understanding the GI Bill was much more important at the beginning of their college journey rather than closer to the end of it.

Childcare Issues

Some veteran students are parents and are experiencing childcare issues due to cost. For example, one student had an active duty wife, three small children, and some classes that were in the evening after the daycare closed. It is a problem for them if the required courses in their major only have an evening option or after school option because of the limited scheduling opportunities. Students mentioned that an on campus drop-off childcare would be very helpful for them to manage their schedule. They also mentioned a need for a priority childcare enrollment for spouses of deployed active duty military as well as providing hourly childcare options instead of weeklong ones.

Course Scheduling Problems

Students mentioned that the class schedule is typically designed for 18 to 22 year olds. They also noted that everything is lock-step: there are not many online options for some courses in engineering. They mentioned that they like some courses that have asynchronous videos through an online platform and that that option really helped them while attending a class that might have a scheduling conflict with their parental or work responsibilities. Students mentioned that having a course pack with course-related problems, in addition to the textbook, was very helpful for some courses that had that option for purchase.

Certifications

Veteran students noted that it was important to get information about different certifications tailored to them and to help make them more competitive. Some of these certifications are the Fundamentals of Engineering exam, which they can take while in their senior year. They discussed other steps in obtaining a Professional Engineer (P.E.) license and the related requirements for an Accreditation Board for Engineering and Technology (ABET) accredited school.

Conclusion

This pilot program funded by the National Science Foundation, grant #1742118 [19], S-STEM project named “A Pathway to Completion for Pursuing Engineering and Engineering Technology Degrees”, led by the Principle Investigator Dr. Anthony W. Dean, has the potential for further understanding of veteran student needs. The research has shown that this underrepresented population still needs further understanding. The initial findings from the first cohort are promising and may help other institutions that have veteran students begin to tailor courses and services to a larger student population. Future cohorts in this program will go into more depth of veteran students’ needs as they continue to emerge.

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