AC 2011-1550: ENGINEERING VETERAN PATHWAYS

Ingrid St. Omer, University of Kentucky

Dr. Ingrid St. Omer is an Assistant Professor at the University of Kentucky in the department of Electrical & Computer Engineering. She was the Co-Principal Investigator for the ten institution Kentucky West Virginia Alliance for Minority Participation. Prior to earning her doctorate, she worked in industry at Rosemount Inc., attaining the rank of Senior Engineer and Engineering Supervisor. Upon completion of her Ph.D. at the University of Missouri-Columbia (MU), she served as a Visiting Assistant Professor in the MU Department of Electrical Engineering, a Research Associate and President's Postdoctoral Fellow at the University of Minnesota, and as an Assistant Professor and Director of the Advanced Microelectronics Laboratory at Northern Arizona University. Dr. St. Omer is an active member of IEEE, MRS, ASEE, and NSBE AE. She has also held several leadership positions at the national level during her academic career.

Engineering Veteran Pathways

Abstract
The University of Kentucky (UK) is extremely proud of its long-standing relationship with the men and women in uniform that bravely serve this country. The state of Kentucky is ranked 9th in the Nation for numbers of active duty military personnel. It is home to two major U.S. Army installations, Forts Knox and Campbell. It is also home to a very strong National Guard presence bringing the state's total figures to over 60,000 military/military civilian employees. In addition, Kentucky services over 300,000 military veterans. The UK College of Engineering (COE) is partnering with the recently established Veterans Resource Center (VRC), and Bluegrass Community & Technical College (BCTC) to develop clear programmatic guides for educating veterans in engineering and computer science in a manner that recognizes the unique characteristics of veterans as a community of interest. Our approach is grounded in the adult learning theories of Knowles and Lawler, the experiential learning theory of Kolb, the recommendations of the Veterans' Education for Engineering and Science workshop report, and the recommendations developed from a case study completed by the University of Kentucky Military Veterans of America. The three focus areas of our approach are: 1) Recruitment and Support Constructs, 2) Transition, and 3) Integration of Technical Experience. Recruitment and Retention strategies include development of "dummy proof" advertising and structured curriculum plans which incorporate BCTCblue+, a transfer/dual enrollment program between BCTC and UK that includes advising, guaranteed admission, UK courses at BCTC tuition rates, and more. This program offers pathways for BCTC students to COE baccalaureate degree programs to help address the time to graduation constraint. Institutional support constructs are continuously evolving through the VRC, and both the COE and BCTC will leverage VRC knowledge to create discipline specific efforts. Transitional strategies comprise veteran orientation workshops, faculty training workshops, and on-campus community building activities. Integration strategies focus on the Engineering Cooperative Education Program and the development of guidelines for evaluating Army/ACE Registry Transcript Service (AARTS) and Sailor/Marine/ACE Registry Transcript (SMART) transcripts.

Introduction
As of December 2010, deployment levels in Afghanistan were widely reported at approximately 100,000 U.S. troops. President Obama has announced plans to begin withdrawing forces in July 2010 as security is turned over to Afghan forces. Prior to August 2010, troop levels in Iraq were reported at 142,000. Under an agreement with the Iraqi government, over 90,000 combat troops were withdrawn by the end of August 2010. The remaining troops are scheduled to return by December 2011. Thus, our current national situation resembles that of post WWII, and it is reasonable to expect that a significant number of returning troops will flock to campuses to take advantage of the improved benefits under the GI Bill. Returning veterans will face high unemployment rates. While the military is more educated now than any other time in its history, many service members still do not meet the academic criteria to be accepted directly into the University of Kentucky (UK).[1] The Engineering Veterans Pathways project began during the fall of 2010 with support from the National Science Foundation in an effort to counter this situation. UK is working closely with its neighbor Bluegrass Community and Technical College (BCTC) in order to attract and groom veteran students for success at UK.   One initiative already

in action is the BCTCblue+ agreement that is a partnership that allows BCTC students to transfer to UK into 1 of 50 Bachelor degree programs.

Since the dominant service represented in Kentucky is the Army (4th largest presence in the US), the demographics highlighted below will reflect the makeup of the U.S. Army.

For FY 08:
Female	16.3%
White	61.1%
Black	21.1%
Hispanic	11.9%
Asian	03.3%
Other	02.6%
High School Diploma	82.8%

These demographics suggest that approximately one-third of the potential target population could be underrepresented students. It is our intention to use the cohort model, and support courses (supplemental instruction and peer mentoring) to attempt to address the needs of these students. We believe that a veterans' transition course will be extremely important to identifying unique needs of this student population.

Joseph Gayheart, December 2009 graduate and past president of the University of Kentucky Military Veterans of America (UKMVA), conducted a study to determine the means by which universities could improve or create services to impact veteran recruitment and retention. Using the 2008 Contingency Tracking System Deployment File for Operation Enduring Freedom and Operation Iraqi Freedom, Gayheart's study revealed an estimated 7,019 deployed veterans within a 65-mile radius of Lexington, KY, home to UK.[2] He further noted that Ohio's veteran population is fifth in the country with 1.1 million resident veterans. Gayheart's research also revealed that in 2008, less than half of the eligible veterans had participated in any educational benefits under the old Montgomery Bill.[2] The Post 9/11 GI Bill offers greater support over a longer term than its predecessor. Improved institutional policies and recruitment materials that succinctly explain the education process and provide appropriate support constructs can significantly increase the proportion of veterans tapping their benefits. Even if only 10-20% of the available veterans were reached, this would be a significant contribution on both the technical workforce and the economic contribution to the Commonwealth.

Recruitment
The Veterans Resource Center (VRC) was established in June 2009 to continue the tradition of support by providing UK's military and veteran populations with the service and assistance they deserve. The Center's goal is to ensure that veterans' transition to college is as smooth as possible. Whether they are entering college for the first time; transferring from another school or returning after a deployment, the VRC is there to help. The center is where veterans can come not only for assistance but also for a cup of coffee and some fellowship. In addition to the center, the University has a Veterans Resource Team made up of members from various departments all across campus. This team meets monthly to address veteran student issues and to improve our standing as a veteran friendly campus. Co-PI Anthony Dotson leads the VRC team. As a retired

U. S. Army Lieutenant Colonel, Mr. Dotson is in a position to provide important information about, and access to, military/veteran students. BCTC is in the process of developing a similar resource center for their campus efforts. Mr. Alexander DeSha, a National Guard veteran of the Iraq war, was hired in November 2010 as the Military and Veterans Student Services Coordinator to lead the development for BCTC.   Mr. DeSha is lending his experience to their center development efforts.

The VRC focuses on four main areas of support to veterans; recruiting, transition, retention, and transition again. While many institutions are leaning heavily on the first two, UK feels that to provide the best service, it must support the entire process. The VRC is working diligently to establish policies, procedures and practices that strengthen each of these four areas.

Present estimates place the veteran population at UK at approximately 350. The engineering cohort is estimated at between 30 – 40 students. Prior to Fall 2010, the University had no tracking mechanism for determining veteran status outside of those who applied for financial aid. As of Fall 2010, applicants can note their veteran status on their application for admission. The University has also eliminated the enrollment and advising fees for veterans. A rolling admissions window for veterans has been created to assist those who can't meet the standard timelines. These efforts should provide more accurate data regarding UK's veteran populations and allow for cohort tracking.

The University of Kentucky is aggressively recruiting military members in Kentucky and worldwide. In addition to the VRC website, monies have been allocated towards military publications such as GI Jobs Magazine, and the Military College Guide. UK is also involved with Recruit Military, GoArmyEd, and regularly attends Military Opportunity Fairs. Our most successful recruiting tool to date has been word of mouth. Veterans are bringing other veterans to our institution.

Interviews with current UK student veterans provided specific suggestions for marketing and recruitment strategies that parallel the information reflected in *From Soldier to Student*[1]. However, their recommendations also take into account the current environment in engineering and science programs at UK. Materials should:

  • Provide step-by-step documentation of the admissions process
  • Explain ACT/SAT requirements; indicate test preparation/coaching resources and
     locations. Many students have not taken any of these tests prior to service, and several
     students were told that their previous results had expired.
  • Highlight the path through the curriculum explicitly and indicate the career paths
     available with that degree. One student said it should be "dummy proof."
  • Utilize out-processing and education centers to educate service personnel about the
     range of the new benefits. This may catch individuals who might re-enlist to meet
     financial obligations.
  • Emphasize physical real-world connections.

Research in the area of personal epistemologies indicates that beliefs have indirect effects on students' use of learning and self-regulatory strategies, which in turn affect academic

performance[6,7]. Two undergraduate students are currently working on a broad survey instrument to measure student perceptions of a) epistemological beliefs regarding the nature of knowledge construction and learning, and b) sense of purpose and self-efficacy regarding academic choices and career aspirations. A veterans survey conducted by BCTC last spring indicated that 23% of the respondents had not chosen a major. Of those listing a major, only 3.4% had selected engineering. However, just fewer than 20% had selected areas (Science, Electrical/Industrial Maintenance, Construction, Computer Information Technology, and Homeland Security) that could lead to engineering. Additional information is necessary to ascertain the motivations behind these selections. The survey information collected will be used in the initial preparation of the new recruiting materials for both institutions.

The University has updated many of its policies to assist veterans with the transition. In turn most of the changes have positively impacted recruiting as well. The goal is to recognize the efforts of the veterans and to possibly help reduce some of the anxiety they feel about starting over. To develop appropriate transition efforts, the differences in the characteristics of many of the potential participants must be acknowledged. The NSF workshop report describes likely student veteran entrants as listed below.

> The majority will likely be married and/or have children. Today's service members marry younger and have children earlier than their civilian counterparts. About half of active duty men and women in uniform today are married, and nearly 60 percent have families. They are accustomed to receiving a broad array of family services and support, including health care, through their military employer. They are likely to expect similar help from schools and civilian employers. Veterans with families are likely to treat schooling as a job. This means they will generally bring a sense of purpose that non-veteran classmates may lack. It also means that they may need programs that provide financial support and educational opportunities throughout the 12-month year, rather than on the typical 9-month academic schedule.

"Andragogy" is the term coined by Knowles to clarify the differences between curriculum development needs of adults and children. He posits that "pedagogy" is the foundational development approach for children and focuses on the self-directed and experiential aspects of the adult learning environment.[3] The typical undergraduate student is between the ages of 18 and 23 and entered college directly from high school. Most practitioners of adult learning theory describe adult learners as over the age of 25, responsible for children or dependents other than a spouse, married, and starting or returning to college.[8] Lawler's theory of adult learning builds on the "andragogy" ideas in terms of practical translation. Her key characteristics for adult learners are reflected in the NSF description: life roles and responsibilities (typically includes children), pragmatic in terms of desire to immediately apply new knowledge, educational motivation is usually prompted by "a transitional event in their lives," and adult learners attend voluntarily.[5]

In response to the social and environmental changes experienced by student veterans, we are developing a one-week summer bridge program for veterans. COE and VRC faculty and staff will design a bridge curriculum that provides an introduction to participating faculty and staff, key campus locations, University bureaucracy, and opportunities to attend class or shadow a current student veteran. Lawler's adult learning strategies suggest a needs assessment to

understand the "gap between 'what is' and 'what could be.'"[5] The bridge program is an excellent opportunity to use interviews, surveys, and focus groups to determine learning styles, expectations, epistemological beliefs about the nature of knowledge, and potential weaknesses. Identification of this "what is" offers direction for "what could be." Given that post-traumatic stress disorder (PTSD) and depression are a few of the non-academic issues that may impact returning veterans, highlighting quiet study areas, typical high-crowd activities, and counseling services are important for the population of interest. Evaluation of this element will provide key feedback for resource management, content, and continuity into the follow-up courses.

Two additional major changes that will assist veterans with transitioning began during the Fall 2010 semester. The first is on-campus veterans housing. The University of Kentucky is the second school in the nation to offer that benefit. The second major change is a veterans-only first-year transition course. The curriculum is modified from the University's highly successful freshmen and transfer student orientation courses, with the addition of specific veteran topics of interest. The course is designed to give veteran students the tools necessary to be successful in their new environment and taught by the VRC Coordinator. We propose to designate one or more sections for engineering students to focus on study skills, time management, math, physics, and chemistry. The latter three areas are known as "gatekeeping" courses in engineering. Utilizing the BCTCBlue+ program for these courses will also help to ease the transition. Veteran students in the program will have access to the new veterans housing, smaller class sizes, enhanced academic advising, transfer audits, guaranteed admission to UK, and eligibility for BCTCBlue+ scholarships reserved exclusively for program participants.

Once the veteran is in the classroom however, additional efforts are necessary to ensure persistence. Dropout rates for veterans nationwide are higher than their traditional counterparts.[1] While academics are the most often listed as the cause, there are a number of contributing factors that lead to academic failure.[1,9] The VRC is working with the University, student veterans and veteran faculty and staff in developing a tutoring program for student veterans. The VRC is also ensuring that student veterans know about VA monies that are available for tutoring. Additionally, the University is determined to create an environment conducive to the success of its veterans on campus. One of the challenges is to educate its faculty and staff and student population on the military in general and the challenges facing many of our returning veterans. This challenge was highlighted in both the NSF workshop report and *From Soldier to Student*. The VRC has developed a Military 101 presentation that has been given to numerous departments and offices across campus in order to expand understanding of the military culture and environment. The Military 101 training takes a look at the roles and functions of each branch of the military and the unique cultures within those branches. It provides demographics and statistics aimed at erasing bias and preconceived notions that the military is uneducated. It begins at the macro Department of Defense level and works its way down to a support program such as the VRC. The initial offering of the Military 101 course in the College is scheduled for early spring in 2011. An additional workshop for engineering faculty focusing on Lawler's practical strategies for working with adult learners is in development. This engineering workshop will focus on Lawler's "Six Keys to Facilitating Adult Learning."[5]

> 1. Understand and reduce anxiety.
> 2. Elicit and incorporate expectations.

3. Acknowledge and utilize experience.
4. Provide and encourage active participation.
5. Identify and incorporate relevant content.
6. Facilitate change and growth.

Integration of Technical Experience
UK has revamped the process for awarding military transfer credit and now adheres to the American Council on Education's (ACE) guidelines. The ACE recommendations for awarding credit for military training are sufficient for general education requirements. However, there is no mechanism for mapping such training into ABET accredited engineering programs. Co-PI Dr. Richard Sweigard is the Associate Dean for Administration and Academic Affairs within COE. Dr. Sweigard is also a member of the ABET Engineering Accreditation Commission and thus, uniquely qualified to work with the VRC to establish which of the most commonly found training and coursework listed on Army/ACE Registry Transcript Service (AARTS) and Sailor/Marine/ACE Registry Transcript (SMART) transcripts can be mapped into an ABET equivalent course. We recognize that all classes and curriculums are not created equal. However, the ABET EC2000 guidelines establish the program outcomes for each discipline. Our intention is to generate a listing of the core competencies identified in the military transcripts under initial evaluation, and map them with a corresponding ABET a-k profile. Dr. Sweigard is working with Mr. Dotson and the Director for Undergraduate Studies in each of the nine departments within the College to develop a minimum framework to allow veterans to earn credits for knowledge acquired during their service. Both the NSF workshop report and *From Soldier to Student* stressed the importance of developing this process.[1,9]

Additional integration efforts partner the VRC with both the James W. Stuckert Career Center and the College of Engineering to establish Cooperative Education opportunities and identify potential veteran friendly military employers. Countless corporations and businesses seek military veteran employees due to the skills and experience that they bring in addition to their education. In terms of Cooperative Education, the COE co-op program aims to provide students with at least 12 months (3 rotations) of work experience while they continue to make progress towards an academic degree in engineering. The mission of the co-op program is to integrate theory learned in the classroom with its practical application in industry. Roughly one-third of UK 's eligible engineering and computer science students elect to participate in co-op. Many employers located locally, and across the nation, are consistent co-op partners such as the National Security Agency, GE, Jacobs Engineering, Marathon Petroleum, Belcan, and NASA. Approximately 90% of UK's co-op graduates have received job offers before matriculation. Participating co-op students are required to complete a position appraisal and work reports for each rotation. Reports are reviewed by prospective co-op students, employers, faculty advisors, and the co-op staff for written communication skills, technical self-evaluation, new skill development, adjustments to practical application, typical workday effort, level of social interaction, and sources of learning within the experience. Three of our regular co-op employers, GE, Stantec Consulting Servicers, and Belcan, have committed their support for this project.

Knowing that lack of theoretical grounding may preclude much of the coursework found on AARTS and SMART transcripts from ABET equivalency, and that we may not have a sufficient number of co-op positions available at all times, we propose to use Kolb's ideas concerning

experiential learning to develop a four-stage framework for student veterans to receive a military co-op credit for their knowledge and skills. Kolb's experiential learning consists of immediate concrete experience, observation and reflection of prior experience, assimilation of observation and reflection into "theory" that leads to conception of potential action, and application of "theory" in guiding new experience.[4] An examination of the standard co-op documentation follows this four-stage cycle. The current co-op program is designed to integrate theory learned in the classroom with its practical application. In considering veteran experiences, our proposed military co-op framework would actually flow in the opposite direction; the military co-op would integrate practical application with newly acquired classroom theory. This implies that the student veteran would not be able to apply for the military co-op credit until later in their program of study but it does offer a path for recognizing service knowledge and skills in a novel manner. The proposed framework requires the student to identify their technical skills and trace their development and acquisition backwards. The last stage would be to connect these skills with recently acquired theoretical knowledge. This reverse process has the potential to identify misconceptions and structural issues within current engineering curricula.

Outcomes and Measures
The goal of the project is to develop an effective education and career development program for veterans. Given the early stage of this program, limited data is available, and any analysis would be premature. However, we believe that we have established the critical structural elements, and key personnel are engaged at both institutions. There are three focus areas in our approach: 1) Recruitment and Support Constructs, 2) Transition, and 3) Integration of Technical Experience. Desired outcomes for each of the key areas are listed below.

> Recruitment and Support Constructs:
> • Development of "dummy proof" advertising and recruitment materials that incorporate veteran input.
> • Application of materials at out-processing events and education centers.
> • Perception of Engineering as an attractive and valuable career path.
> • Perception of the University of Kentucky as "Military Friendly."
>
> Transition efforts:
> • Summer Bridge Program
> • Veteran Housing
> • Veterans-only first-year transition course
> • Engineering Faculty Workshop
>
> Integration of Technical Experience:
> • ABET Knowledge Map for common courses
> • Co-op Opportunities
> • Military Co-op

Conclusions
As the project is in its initial stage, this work-in-progress documents current efforts. However, as a result of the overwhelming support of the administration, and the accomplishments of the VRC

thus far, we anticipate the development of easily transferable recruitment materials, structured curriculum plans, ABET interpretation guides, and faculty-training materials. The establishment of structural elements and key personnel roles should result in full institutionalization of program elements determined to be effective. We expect that the longitudinal impact of the project will provide data in regards to individual veterans and cohorts, which the NSF workshop report notes is a lacking. The intent of the COE, the VRC, BCTC, and the University of Kentucky is to recognize the efforts and service of our veteran students and to alleviate many of the obstacles that hinder veterans when transitioning out of the military. Once they have arrived on campus, we are committed to their success.

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