Open Access License Notice

Easing Student Veterans' Transition to Cybersecurity and STEM through a "Math Boot Camp"

Helen Burn, Ph.D.
Department of Mathematics
Highline College

Michael Mulcahy, Ph.D.
Department of Sociology
Central Washington University – Des Moines

Barbara Endicott-Popovsky, Ph.D.
School of Information
University of Washington

Abstract - In this paper, we report on data collected from a group of student veterans who participated in a community college "Math Boot Camp" for student veterans interested in Cybersecurity and STEM fields. The Math Boot Camp combined three levels of remedial mathematics into a single course that relied heavily on interactive, instructional software. The strategic importance of remedial math classes results from the confluence of three factors: the importance of math skills in STEM degrees; veterans' interest in STEM fields; and veterans' actual and/or perceived math skill deficits. We describe the Math Boot Camp and present pre- and post-survey and focus group data collected from the 17 participants. The findings revealed that student veterans entered the Math Boot Camp with a positive view of the importance of mathematics to their lives and were not overly anxious about the course. Fifteen of seventeen students passed the course (2.0 or above). In focus groups, the student veterans commented most frequently about the positive benefits of instructor and the class tutor, the hybrid nature of the course, and the flexibility of placement and advancement afforded by the multi-level classroom. We present implications for design and evaluation of transition courses for student veterans in STEM and policy implication related to Post-9/11 GI bill benefits.

INTRODUCTION

Over 754,000 veterans and their families have used Post-9/11 GI Bill benefits since the law was enacted in 2008 (National Center for Veterans Analysis and Statistics, 2015). Among this student population, public two-year institutions (henceforth: 'community colleges') are a common starting point for their post-service educational career. Furthermore, student veterans beginning their postsecondary education at community colleges have been consistently more likely (than non-veterans peers) to pursue a degree in a STEM field (Science, Technology, Engineering and Mathematics; U.S. Department of Education, n.d.). On the other hand, veterans face academic and social challenges in transitioning from military to college that result in lower retention and attainment rates for this group. Barriers to veteran students' educational success can be eased, however, through transition courses that integrate student veterans into college culture and establish a peer community while focusing on core academic topics. In this paper, we report on the experiences and outcomes of student veterans enrolled in one such course - a community college "Math Boot Camp" for veterans interested in Cybersecurity and STEM fields.

The thesis guiding the development of the Veterans' Math Boot Camp was that remedial math classes offer a particularly important opportunity to facilitate veterans' social and academic integration in community college, and increase the likelihood of their success in attaining a STEM-related postsecondary degree. The strategic importance of remedial math classes results from the confluence of three factors: the importance of math skills in STEM degrees; veterans' interest in STEM fields; and veterans' actual and/or perceived math skill deficits. We discuss the project and the data in the context of recent research on veterans' transition to college. Given the national need to cultivate STEM talent (NSF, 2012; PCAST, 2012), this paper should interest faculty and administrators responsible for creating programs for student veterans in STEM.

RELEVANT LITERATURE

Student Veterans' Enrollment Patterns in Community Colleges

For decades, public two-year institutions served as the primary portal to postsecondary education for student military veterans. Data from the National Postsecondary Student Aid Studies revealed that 52.7% of veterans who began their postsecondary education in the 1995-96 academic year started out at community colleges (U.S. Department of Education, n.d.). The percentage grew to 56.2% in 1999-2000 and to about 66% in 2003-04 before beginning a decline to only 39.5% in 2011. The decrease in community college enrollments among new student veterans in the second half of the last decade was largely due to the growing role of for-profit postsecondary education businesses in this period, which accounted for about 37.5% of the 2011-12 cohort of new student veteran enrollments. For the better part of the last two decades, then, community colleges have been the preferred starting point for military veterans beginning their postsecondary education, although for-profit businesses have begun to contest the dominance of community colleges in recent years.

Indeed, not only are veterans more likely than their non-veteran peers to start their postsecondary education at community colleges, but veterans at community colleges are more likely than non-veterans to choose a STEM field. In fact, many community colleges now offer four-year bachelor of applied science [BAS] degrees in fields including IT and computer science. In the most recent NPSAS survey (2011-12), 23.8% of veterans enrolled in community colleges were in a STEM related field, compared to 15.5% of non-veterans. Furthermore, data from the *Baccalaureate and Beyond 2008* study show veterans who attained a Bachelor's degree in a STEM field in 2008 were more than twice as likely as non-veterans to have started at a community college (26.4% of veterans vs. 11.5% of non-veterans, t= -1.94).

Student Veterans' Transition to Higher Education

Recent research documents a host of challenges students veterans face as they transition to higher education. Academically, studies have found that student veterans report the subjective feeling that they are "behind" their non-veteran peers; student veterans talk about the need to "catch up," academically, to their non-veteran peers. They report that their academic preparation is deficient, particularly in mathematics, and that they have weak study skills or lack of focus, sometimes associated with PTSD (DiRamio, Ackerman, & Mitchell, 2008). Students who redeploy report academic setbacks such as needing to repeat a prerequisite mathematics course taken previously (Rumann & Hamrick, 2010). Socially, student veterans are challenged by role incongruities between civilian and military life and by the loose structure of college life. Student veterans report that differences in maturity levels interfere with developing relationships with their civilian student peers. While this is due in part to factors such as age and family responsibilities, student veterans also report that their military experience intensified their belief in the importance of educational attainment and heightened their cultural awareness, separating them from their civilian peers (DiRamio et al., 2008; DiRamio & Jarvis, 2011; Persky, 2010; Rumann & Hamrick, 2010).

Furthermore, in interaction with other students, faculty and staff, student veterans frequently encounter ignorance and lack of understanding of the military, military veterans, and their experiences, as well as negative attitudes and stereotypes. These experiences alienate student veterans, withhold needed validation of an important dimension of their identity, and thus hinder their transition and the incorporation of "student" as an identity dimension (DiRamio et al., 2008; Rumann & Hamrick, 2010). With respect to faculty relationships in particular – a point to which we return in our discussion of the Math Boot Camp below – students report both positive and negative experiences – finding very supportive faculty, as well as instructors who use their control of classroom interaction to derogate the military and military service and create a hostile environment for student veterans. As DiRamio et al. (2008) point out, it is not that student veterans

desire special status; instead, they wish that faculty would "understand and acknowledge them" (p. 95), and appreciate their life circumstances.

To help student veterans transition to college, DiRamio and Jarvis (2011) recommend that colleges develop transition courses to improve academic performance, and co-curricular activities (e.g., orientations) that promoting peer-group interactions. The Math Boot Camp was designed to accomplish the necessary academic skills remediation and, at the same time, address social, cultural and logistic challenges that student veterans face during the transition to postsecondary education. This focus on academic and social integration is consistent with Tinto's (1975, 1993, 2004) integration framework, which posits that students who develop a more complex network of relationships with the institution, academically and socially, are less likely to drop out, especially in the first year. In commuter schools such as community colleges, the classroom environment is instrumental in fostering academic integration. However, while it is well-established that interactions with peer groups and faculty positively influence students outcomes in college (Pascarella & Terenzini, 2005), research is not yet clear about whether a "segregated" or "cohort" strategy hinders opportunities for student veterans to integrate into the larger campus and to establish relationship with civilian peer students (DiRamio & Jarvis, 2011).

Student Veterans' Math Readiness

The mathematics required for STEM degrees can range from introductory statistics to graduate level mathematics (Klappenberger, 2014). Student veterans interested in STEM fields but with insufficient mathematics preparation will be required to complete remedial mathematics courses. The challenge this presents for student veterans cannot be overstated. On the one hand, students who successfully complete remedial mathematics courses obtain college degrees at similar rates to students who arrive "college-ready" in mathematics (Bahr, 2010; Bettinger & Long, 2005). More than half of students referred to remedial courses, however, never enroll in them, or enroll but do not complete or do not pass the class (Attewell, Lavin, Domina, & Levey, 2006; Cullinane & Treisman, 2010).

Data from the NPSAS allows us to form some snapshots – albeit coarse and grainy – with regard to questions of community college student veterans' math readiness and participation in remedial academic courses. For example, in the 2011-12 NPSAS survey, student veterans at community colleges at the time of the survey had average math SAT scores of 489.4, compared to 476.5 for non-veterans (t = 1.29). Among community college STEM majors however, veterans' average math SAT score was 482.2, compared to 496.0 for non-veterans (t = -.74). Among current community college students in their first or second year of studies, veterans were more likely to take a remedial math class in the survey year, compared to their non-veteran counterparts (9.1% vs. 7%, t = .81), and 12.9% of community college student veterans in STEM fields took a remedial math class in the 2011-12 academic year, compared to only 7% of non-veterans.

METHODS

Data for this study derived from 17 military veteran students who participated in a "Math Boot Camp" at a community college in Washington State in 2011. Another group of student veterans completed a Math Boot Camp in the summer of 2012. Our analysis focuses on the data from the 2011 cohort completed by researchers at the University of Washington which included pre and post-course survey (n=16 and n= 12, respectively; on four pre-post matched questions, n=10 for one question, and 11 for the remaining three), focus group data (n=10, 30% female, 70% male, 40% underrepresented minorities), and student persistence and achievement data. IRB was secured through the University of Washington.[1] The surveys included demographic information, Likert scale items about attitudes towards mathematics and academics, and several open-response questions about students' goals, and perceived barriers and challenges to reaching those goals. In focus groups held during the final week of class, the course participants shared their

[1] We are grateful to Dr. Liz Moore who served as evaluator for the VetsEngrProject grant and designed and conducted all surveys and focus groups.

experiences in the course, discussed the aspects that they found most helpful, and offered suggestions for improvement.

Below, we present analyses of these data – descriptive statistics and analyses of pre-post changes, as measured by Wilcoxon signed-rank tests.[2] The open-response survey questions and focus group data were coded for themes using HyperRESEARCH™ software. Given the small sample size, the analyses are descriptive and interpretative, and intended to identify themes and compare the participants' pre-entry characteristics, academic outcomes, attitudes, feelings and expectations regarding math and their educational and career goals, impressions of the boot camp, and pre-post attitudinal changes.

MATH BOOT CAMP DESCRIPTION

The Math Boot Camp offered at Highline College [HC] was part of the VetsEngrProject (NSF 1037814, 2010-2012) secured by the University of Washington's Center for Information Assurance and Cybersecurity (CIAC). The purpose of the VetsEngrProject was to identify and overcome challenges military service members face in using their educational benefits, especially in pursuit of science, technology, engineering, and math [STEM] careers. Highline College was selected to host the boot camp due to its mathematics curriculum and location in the Puget Sound Region, 30 minutes from Joint Base Lewis McChord and Camp Murray, which services Washington National Guard (NGWA). The Math Boot Camp took place during an 8-week summer quarter in 2011 at HC campus (June 20 through August 10), and was taught by the lead author. Two classes were offered daily, and course participants were military veterans, members of the Washington National Guard, and reservists. Cohort recruiting was accomplished through NGWA Employment Transition Services team, HCC, veteran's organizations, and word of mouth[3].

[2] Wilcoxon sign-rank tests can be used when sample sizes are small, and assumptions of normality are violated.

[3] We are grateful to Morgan Zantua for help in recruiting and advising the participants.

The Math Boot Camp combined three levels of precollege mathematics (Math 81, 91, 98)[4] into a single course, using the Emporium Model (NCAT, 2005). The Emporium Model relies heavily on interactive instructional software, and thus requires a computer-equipped classroom. The Math Boot Camp used MyMathLab[5] software that included online videos, worked examples, homework problems, and online quizzes. The use of these tools allowed students to set their own pace as they work through material. At the same time, the Emporium model is intended to reduce the proportion of face-to-face time consumed in one-way instructor-to-student communication. Instead of lecturing, instructional staff circulate among students, interacting and responding directly to the questions and needs of individuals or small groups.

The Math Boot Camp was offered as a hybrid course, to take full advantage of the flexibility built into the Emporium model - the online component permitted student veterans to keep up if they were unable to physically attend classes. To accommodate the multi-level structure, all of the participants were registered for "Math 80" and then self-determined their initial placement (Math 81, 91, or 98) on the first day of class, by working through sets of level-specific sample problems. At the end of the quarter, student veterans received credit either for Math 81, Math 91, or Math 98, depending on how far they had progressed over the summer. Of the 17 Math Boot Camp participants, seven initially placed themselves in Math 81, another seven placed themselves in Math 91, and three began working at the level of Math 98. In most cases, the student veterans chose the appropriate level for themselves, though a few subsequently decided to drop back a level and proceed at a slower pace.

The Math Boot Camp met daily, Monday through Thursday, for 80 minutes in a computer classroom, with an instructor and a tutor present at all times. Despite

[4] The three courses were Introduction to Algebra (Math 81), Essentials of Intermediate Algebra (Math 91), and Intermediate Algebra for Calculus (Math 98). Curriculum guides, including course content, are available upon request from the lead author.

[5] MyMathLab is a Pearson Education product (http://www.pearsonmylabandmastering.com/northamerica/mymathlab/)

the multi-level nature of the course, it convened as a single, math level-integrated section. Student veterans were provided a highly detailed syllabus that included a pacing and timeline schedule for each of the three levels, as well as homework and quiz due dates. There were two exams, and a comprehensive final exam on the last day. Five of the participants took advantage of a two-week extension of the final exam due date, which was introduced to accommodate student veterans who missed the initial final exam date due to service obligations. The design of the course allowed student veterans to work independently, in groups, or with the help of the instructor and tutor. The multi-level format allowed student veterans to learn at their own pace and, if necessary, dip back into an earlier level to fill a specific knowledge gap, without having to complete the entire earlier course. The instructor monitored progress with daily check-ins, and level-specific group instruction once or twice a week. On a typical day, seven student veterans were present in a given class.

Several class sessions included teaching study skills and building students' academic identity. The student veterans were thus provided with tools such as mechanical pencils, erasers, note cards, bus passes, and folders to organize their work, i.e., functional but also symbolically meaningful "tools of the trade" – material elements of the new institutional culture. In one class session, students viewed and discussed a video about *growth mindset* (Dweck, 2006) and were introduced to the argument that beliefs about the malleability of intelligence (e.g., having either a growth or fixed mindset) can influence long-term achievement and persistence. Students also received in-class advising by the instructor. Dr. Endicott-Popovsky from the University of Washington visited the class as well, to discuss pathways to careers in cybersecurity. The grant covered all costs, including tuition, text books, calculators and other supplies that were provided to the student veterans.

FINDINGS

This section begins with key student pre-entry characteristics identified in the "pre-treatment" survey: demographics, educational and career goals, and attitudes towards math. Following this, we present the data on student achievement, student

impressions of the Math Boot Camp drawn from the focus groups and, finally, pre-post survey changes in student attitudes.

Student Pre-Entry Characteristics

Demographics

A total of 17 student veterans enrolled in the course (37% female; 63% male). Two additional participants were spouses or relatives of student veterans, and were omitted from the analysis. The student veterans ranged from 22 to 64 years of age, with an average age of 39. Participants were racially diverse: 20% African-American/Black, 7% Hispanic/Latino, 6% Asian/Pacific Islander, 7% Native American/Alaska native, and 60% Caucasian/white. The modal service branch affiliation was the Army (53%) followed by the Navy (20%), the Marines (13%), and the Air Force (13%). Nine (60%) identified their status as "veterans," "inactive," or "retired." Four (27%) identified as currently serving in the National Guard, or Reserves. The participants' length of service ranged from two to 20 years, with an average of eight years and two months.

Educational and career goals

Thirteen student veterans responded to pre-survey questions about their educational and career goals, and reasons for enrolling in the Math Boot Camp. Most (69%) stated an educational goal of a bachelor's level or above: masters (4), professional/med (2), bachelors (3), AA or AAS (2), or other (2). Student veterans stated a variety of career goals: medical school (3), IT or engineering (2), "civilian job" (6), human services (1), unknown (1). Respondents chose the Boot Camp "to prep for a future math course" (5), to "build confidence" (2), to "refresh their math skills" (3), to "prepare for the GRE" (2), or because of the opportunities to accelerate (1).

Attitudes towards mathematics

Student veterans entered the Math Boot Camp with a positive view of the importance of mathematics to their lives. On pre-surveys, the vast majority (13) agreed somewhat or strongly that math is important in daily life. Twelve students agreed they needed math for their major, and ten cited mathematics as part of the *critical path* to their career goal, stating, for example, that "mathematics is an integral component of the educational degree I would like to pursue." Most (10) stated they had not adjusted their educational or career goal because of a math challenge. In an open-response question, 40% of the respondents expressed having no concerns, while the remainder stated concerns about long-term retention of learning (30%), the ability to learn mathematics (20%), and time (10%). Table 1 shows additional pre-entry questions related to attitudes towards mathematics and reveals that the Math Boot Camp participants were not overly anxious about mathematics but acknowledged the need for remediation.

Survey Question	Percent Agreed
I'm rusty in math, just need a refresher	80%
Math is very helpful for any course of study	73%
I'm willing to take more than the required mathematics classes	67%
I have a very weak math background	53%
I have low math ability	40%
I am worried about this course	36%
I prefer to avoid math in college	20%

Table 1: Pre-entry characteristics of participants (n=15) related to attitudes towards mathematics

Student Achievement in Math Boot Camp

Fifteen of seventeen (88%) of the Math Boot Camp student veterans passed their chosen course with a 2.0 or above (5/7 in Math 81, 7/7 in Math 91 and 3/3 in

Math 98). One student completed both Math 91 and 98 in the quarter; and two student veterans originally started in Math 91 and dropped back to complete Math 81. At the end of the course, 10 student veterans (59%) had enrolled in a follow-on math course at HC. Of the remaining seven students, four enrolled in the Math Boot Camp for personal interest or to hone their math skills for the GRE and were not planning to enroll in further mathematics courses at HC, one was deciding which college is the best choice for their next course, one had secured employment and did not plan to attend college, and one student was undecided.

Student Impressions of Math Boot Camp

In focus groups, the student veterans commented most frequently (10) about the instructor and the class tutor. Participants emphasized the importance of personal, one-on-one contact with the instructor and the tutor (5), and noted that the instructor worked well with student veterans to make sure they understood the concepts (4). For example, one student veteran commented that, when students were having trouble, they would "…go to the whiteboard and get help one-on-one." Many student veterans contrasted this with negative experiences in previous math classes, where they felt the teacher was distant, inaccessible, or moved too fast, without worrying about whether they fell behind (5). One student described the Math Boot Camp as "more of a one-on-one" that "made a difference" for the participants, in contrast to their last math class, where "there were 20 people and once you fell behind, you were done."

Positive assessments of the hybrid structure of the course constituted the second major theme in the focus group comments (7). Participants underscored the advantages associated with having access to course materials outside of class, including being able to do homework and quizzes online. One student commented that the hybrid structure made it possible for him to accommodate a two week absence without falling behind. In this context, again, student veterans contrasted the boot camp experience with prior negative classroom experiences, which left them feeling uncomfortably aware of academic weaknesses, compared to their peers, or embarrassed about having to take remedial courses (5).

Five student veterans commented on the positive benefits of a multi-level classroom and flexibility of placement and advancement. One student is paraphrased as saying, "Multi-level is a plus. You can start where you feel you're comfortable, and if [it's] too easy or too difficult, [you] can move to a different level." Five student veterans requested that this format be used for other introductory courses. For example, one student is paraphrased as saying,

> Do you have one of these for English 101? When you've been out of the educational loop for a while and you get back into college level writing, you can get hit right away with a bunch of stuff. Help out all entry level requirements to get you into college.

Lastly, three student veterans commented specifically on the benefits of the cohort model, expressed by one student who commented that the class was less intimidating because "it's for veterans" so you "don't feel as dumbed down" compared to being in a class with "kids right out of high school who did the math a year or two ago."

Attitudinal Changes Resulting from Math Boot Camp Experience

The Math Boot Camp had a positive effect on student veterans' attitudes towards mathematics, as shown in Table 2. After taking the Math Boot Camp, student veterans were less worried about the course, were less likely to believe they had low math ability, less likely to believe they had test-taking anxiety and more likely to agree that math is helpful for any major.

		Means		Sign Test[a]	Wilcoxon Signed-Rank Test[b]	
Question	**N**	**Pre**	**Post**	**p-value**	**z**	**Prob > |z|**
Worried about this class	10	2.8	3.9	0.008*	-2.581	0.010**
Low math ability	11	2.9	3.8	0.016*	-2.408	0.016*

Test-taking anxiety in math	11	2.5	3.3	0.062+	-1.986	0.047⋆
Math is helpful for any major	11	2.1	1.4	1	1.992	0.046⋆
+ p<0.10; ⋆p<0.05; ⋆⋆p<0.01				a: One-tailed tests		
Strongly Agree = 1 – Strongly Disagree = 5				b: two-tailed tests		

Table 2: Sign Tests of Matched Pre- and Post-Survey Responses

Open-response survey questions suggest that the boot camp experience may have transitioned student veterans from focusing mainly on logistical challenges associated with reaching their educational goal, to focusing more on the intellectual or academic challenges. Specifically, both pre- and post-surveys asked student veterans what they saw as the greatest challenge to achieving their educational and career goals. Six of nine student veterans with pre-survey responses cited general challenges related to school, such as "I have not been in school for a while" or challenges of a logistic nature, such as "time," "school finances," "working to pay bills while attending courses." The remaining three cited challenges related to academics, such as "retaining all the information this career field throws at you," or "understanding mathematics." It is noteworthy that this trend reversed itself on the post-surveys, where eight student veterans responded and all but one cited intellectual or academic challenges, such as "college-level math" or "finishing the required courses."

Several post-survey questions assessed the extent to which the experience of the Math Boot Camp had changed their perspectives on the challenges they face in the effort to achieve their educational goals. Seven student veterans responded that the course boosted their confidence. One student's response illustrates this pattern: "This class has significantly boosted my confidence and ability to succeed in the accomplishment of this goal." Another student veteran stated, "I have learned that it may not be as difficult as it may seem." Furthermore, none of the student veterans changed their stated career or educational goal between and pre- and post-survey,

and the majority of participants continued to view mathematics as part of the critical path to achieving those goals. Indeed, when asked how, if at all, the course had affected what they see as possible career and educational goals, half the respondents stated that they now saw their career goal as more obtainable, and half expressed that they now saw math as more doable, or as less of an obstacle, or they had a better understanding about what their math options are.

DISCUSSION

The thesis guiding the development of the Veterans' Math Boot Camp was that remedial math classes offer a particularly important opportunity to facilitate veterans' transition to community college, and to increase the likelihood of their success in attaining a STEM-related postsecondary degree. The strategic importance of remedial math classes results from the confluence of three factors: the importance of math skills in STEM degrees; veterans' interest in STEM fields; and veterans' actual and/or perceived math skill deficits. This discussion focuses on implications for design and evaluation of future transition courses and policy implications related to the Post-9/11 GI bill benefits.

DiRamio and Jarvis (2011) recommend that colleges help student veterans integrate academically and socially into college by developing transition courses for student veterans to improve academic performance and co-curricular activities that promote peer-group interactions, whereby – at least in the early stages of student veterans' transition – peers are defined as other student veterans. The findings of this study suggest that transitional courses designed according to the Emporium Model (NCAT, 2005), like the Math Boot Camp described above, hold promise with regard to both of these twin goals. Segregated transitional remediation courses offer opportunities for the development of peer networks among student veterans that facilitate the initial transition; they also create a relatively "safe" environment in which student veterans can address perceived or real academic deficits; and the course structure facilitates mastery of academic material and improved academic performance by meeting the logistic needs of this student population. We believe this model could also be adapted to other core subject areas. Indeed, student

veterans in our study asked for additional introductory courses patterned after the Boot Camp. Key features of the model include: academic subjects vital to students success (e.g., English, mathematics, introductory STEM courses), highly structured and interactive learning environment, high-quality instruction, flexibility in pacing scheduling, and teaching non-cognitive skills (e.g., study skills and academic identity). Particularly within area of mathematics, research reveals that helping students understand themselves as learners and providing early mastery experiences are key to building students' self-efficacy and, hence, persistence and attainment (Yeager & Dweck, 2012). Our findings regarding the importance of intense instructor contact highlights the advantage of small class size, and the need to select instructors who are willing to reach out and not only help students to master the subject matter, but also help them to learn about college, help to create positive classroom experiences, and encourage students to believe in themselves as learners - that is, instructors who *validate* students (Rendon, 1994).

The findings also have implications for program evaluation of transition courses for student veterans in STEM. For example, the goals of a successful transition course include exposing students to realistic academic experiences and expectations. While caution must be taken in interpreting our findings, given the small sample size, there was evidence that the Math Boot Camp experience shifted students' focus from primarily logistic challenges (e.g., time and money) to the intellectual challenges associated with completing college, while maintaining or even boosting student confidence. Program evaluation should including measures of student achievement but also measure the extent to which student veterans have widened their focus regarding challenges. Attention should also be given to non-cognitive outcomes, such as pre-post changes in confidence and attitudes.

Several policy issues arose in developing and delivering the Math Boot Camp – issues that we were only able to overcome because the VetsEngrProject grant covered all student costs: students participated in the Math Boot Camp without tapping their educational benefits. This enabled us to implement several organizational innovations that may be untenable under the current VA certifying guidelines. First, we purposely avoided placement testing in the Math Boot Camp

and instead placed students based on a first-day activity. In general, however, student veterans are required to take a placement test to validate that they need remediation courses. Next, student veterans are not allowed to take remedial courses that are math labs or independent study. During the project, the lead author became aware that in at least one state there was a debate occurring about whether the Emporium Model constitutes a math lab. Lastly, we were advised that having student enroll initially in "Math 80" and then awarding credit for a different course (e.g., Math 81, 91, or 98) would not pass a VA audit and student veterans may be required to pay back money. These issues need to be considered in designing future transition courses of this nature.

Finally, the findings of the Math Boot Camp revealed several gaps in the literature related to student veterans' transition and persistence. For example, the Math Boot Camp research shows the perceived value to students of having a classroom comprising only student veterans - that is a "segregation" strategy. Still, given the small sample size, this is an open question that warrants continued exploration. And while most recent research has focused on social and cultural integration, future research needs to tease out the differential effects of academic versus social factors in student veterans' lower rates of persistence. For example, was the possible shift in focus from logistics to academics revealed in this study a case of unrealistic expectations or *misdirected expectations* (Alexander, Bozick, & Entwisle, 2008)? Do realistic expectations increase the likelihood of persistence? These are just a few questions unearthed by this study that warrant future research.

REFERENCES

[1] Alexander, K., R. Bozick, & D. Entwisle. (2008). Warming up, cooling out, or holding steady? Persistence and change in educational expectations after high school. *Sociology of Education* 81, 371-396.

[2] Attewell, P., Lavin, D., Domina, T., & Levey, T. (2006). New evidence on college remediation. *The Journal of Higher Education*, 77(5), 886-924.

[3] Bahr, P. R. (2010). Revisiting the efficacy of postsecondary remediation: The moderating effects of depth/breath of deficiency. *The Review of Higher Education*, 233(2), 177-205.

[4] Bettinger, E. P., & Long, B. T. (2005). Addressing the needs of under-prepared students in higher education: Does college remediation work? (NBER Working Paper No. 11325). Retrieved from National Bureau of Economic Research Website: www.nber.org/papers/w11325

[5] Cullinane, J., & Treisman, P. U. (2010). *Improving developmental mathematics education in community colleges: A prospectus and early progress report on the Statway Initiative*. Paper presented at the National Center for Postsecondary Research Conference, New York, N.Y. Retrieved from National Center for Postsecondary Research Website: http://www.postsecondaryresearch.org/conference/downloads.html

[6] DiRamio, D., Ackerman, R.A., and Mitchell, R.I. (2008). From combat to campus: Voices of student veterans. *NASPA Journal*, 45(1), 73-102.

[7] DiRamio, D., & Jarvis, K. (2011). Veterans in higher Education: When Johnny and Jane come marching to campus. *ASHE Higher Education Report*, 37(3). Hoboken, NJ: Wiley Periodicals, Inc.

[8] Dweck, C. S. (2006). *Mindset*. New York: Random House.

[9] Klappenberger, F. (2014). *A guide for mapping courses to knowledge units (KUs)*. Largo, MD: National Cyberwatch Center.

[10] The National Center for Academic Transformation. (2005). *Redesigning Mathematics: Increasing Student Success at a Reduced Cost*. Retrieved from http://www.thencat.org/RedMathematics.htm.

[11] National Center for Veterans Analysis and Statistics. (2015). *Utilization*. Retrieved from http://www.va.gov/vetdata/Utilization.asp.

[12] National Science Foundation. (2012). *Veterans' Education for Engineering and Science: Report on the National Science Foundation Workshop on Enhancing the Post-9/11 Veterans' Education Benefit*. Maclean, VA: NSF.

[13] President's Council of Advisors on Science and Technology (PCAST). (2012). *Engage to excel: Producing one million additional college graduates with degrees in science, technology, engineering, and mathematics*. Washington, DC: The White House.

[14] Pascarella, E., & Terenzini, P. (2005). *How college affects students: A third decade of research*. San Francisco, CA: Jossey-Bass

[15] Persky, K.R. (2010). *Veterans education: Coming home to the community college classroom*. Unpublished doctoral dissertation, National-Louis University. Retrieved November 16, 2012, from http://digitalcommons.nl.edu/diss/31/.

[16] Rendon, L. (1994). Validating culturally diverse students: Toward a new model *Innovative Higher Education*, 19(1), 33-51.

[17] Rumann, C. B., & Hamrick, F. A. (2010). Student veterans in transition: Re-enrolling after war zone deployments. *Journal of Higher Education*, 81(4), 431-538.

[18] Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, 45(1), 89-125.

[19] Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago: University of Chicago Press.

[20] Tinto, V. (2004). Linking learning and leaving. In J.M. Braxton (Ed.), *Reworking the student departure puzzle*. Nashville, TN: Vanderbilt University Press.

[21] U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics. (n.d.) *National Postsecondary Student Aid Study (NPSAS)*. Retrieved from http://nces.ed.gov/surveys/npsas/

[22] Yeager, D. S., & Dweck, C. S. (2012). Mindsets that promote resilience: When students believe that personal characteristics can be developed. *Educational Psychologist*, 47(4), 302-314.