

Perceptions of GI Bill recipients with disabilities of Science, Technology, Engineering, and Math (STEM) as a viable career choice

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Abstract.

BACKGROUND: Student veterans with disabilities are attending higher education programs at an increasing rate as a result of receiving educational benefits through the GI Bill. Yet limited data is collected by state agencies on the characteristics, needs, and preferences of this population.

OBJECTIVE: This study describes an analysis of STEM as a viable career option for GI Bill recipients enrolled in two and four year public institutions in Virginia. Researchers explored the factors affecting the interests, enrollment, performance, and retention in STEM of GI Bill recipients with disabilities along with institutional and personal factors that impacted their decisions.

METHODS: A 48-item survey, titled *GI Bill Recipients and Their Career Choices*, comprised of a series of questions using dichotomous responses, checklists, and five point Likert type scales was distributed to 19,000 GI Bill recipients at two and four year public colleges and universities in Virginia.

RESULTS: The results provide insights on some of the factors that influenced the decisions of GI Bill recipients about STEM, and the institutional characteristics and supports that contribute to their overall college experience.

CONCLUSIONS: The experiences of GI Bill recipients with disabilities and their decision to select a STEM major remains an important area of research. Further study is needed to examine more in-depth the extent to which their disabilities played a role in how these decisions were made.

Keywords: Veterans with disabilities, STEM, higher education, GI Bill recipients

1. Introduction

The GI Bill impacts over 870,000 students and has provided more than 24.4 billion dollars to veterans and their families since 2009 (McBain, 2013). In Vir-

ginia alone, 884 million dollars in GI Bill benefits have been paid to residents, making Virginia 4th in the nation in terms of veterans accessing their GI Bill benefits (Virginia Department of Veterans Services, 2015). Since 2007, the percentage of Virginia veterans accessing GI Bill has increased by 194%, and Virginia has 1063 institutions where veterans can use these benefits. Veterans are attending college at a considerable rate, often because college is a helpful transition back into civilian life after military

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service. A college degree can provide hope, purpose, and training for a more productive and successful life as a civilian (Trauth, Joshi, & Graham, 2014). With this in mind, it is clear that colleges and universities must become aware of what this population's specific needs and strengths are.

According to National Science Foundation data (2015a), 11.1% of all US undergraduate students and 12.6% of the entire US population report having a disability. Students with disabilities are 1.4% less likely to enroll in Science and Engineering majors than their peers without disabilities. NSF (2015b) estimates 563,250 students with disabilities majoring in Science and Engineering compared to nearly 4.8 million students without disabilities majoring in those fields. Meanwhile, the National Center for Veterans Analysis and Statistics (2016) indicates that there are currently about 2.6 million Post- 9/11 United States veterans, with 32% of those individuals having a service-connected disability. Veterans from Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) have higher rates of unemployment, disability, and substance abuse than their civilian peers (Ness, Rocke, Harrist, & Vroman, 2014). The most common disabilities that student veterans experience include physical injuries, mental health conditions like PTSD, and traumatic brain injury (Ostovary & Dapprich, 2011).

Hawley and colleagues (2013) cite a number of educational, psychological, economic, and attitudinal factors that can impede the STEM participation of students with disabilities. Some of these include lack of preparation in high school, low expectations for individuals with disabilities, an absence of role models, physical barriers in laboratory settings, and faculty misperceptions of disability. In spite of these potential barriers, Lee (2011) found that students with disabilities in college are more likely to choose STEM majors than students in college without disabilities, and more students with disabilities take on STEM majors in two-year institutions than students without disabilities. Lee's (2011) findings indicate that we should dismiss the idea that individuals with disabilities cannot be successful in STEM majors and careers. In addition to having high levels of self-efficacy, persistence, time management and goal setting skills, many student veterans have previously served in STEM-related military assignments; these qualities and experiences equip them for the classroom and workplace (Vance, 2015; Zoli, Maury, & Fay, 2015).

Once students with disabilities are enrolled in college and university settings, their success can be significantly impacted by access to accommodations and support services as they complete coursework (Kim & Lee, 2015). However, veterans with acquired disabilities may be hesitant to identify as "disabled" or to disclose disability (Burnett & Segoria, 2009). Some reasons for this hesitance may include negative connotations with the term "disability" and concerns about confidentiality and stigma.

It is critical that institutions, practitioners, and researchers better understand and implement best practices for serving student veterans with disabilities, yet research is limited and data on GI Bill recipients with disabilities is rarely, if ever, collected by state agencies. This indicates a clear need for projects to continue exploring the characteristics, needs, and preferences of this population.

The primary purpose of this study was to conduct an in-depth analysis of Science, Technology, Engineering, and Math (STEM) as a viable career option for GI Bill recipients with disabilities through an online survey disseminated to GI Bill Recipients enrolled at two and four year public institutions in Virginia. We investigated the factors affecting interest, enrollment, performance and retention in STEM programs among GI Bill recipients with disabilities compared to GI Bill recipients without disabilities. In addition, we sought to identify the demographic characteristics that described survey respondents.

2. Methods

This study consisted of a three phase mixed methods qual-QUAN-qual sequential design, used to develop and administer an online survey to military veterans and their family members who were GI Bill recipients attending public two and four year colleges and universities.

2.1. Participants

The study focused on the population of over 19,000 GI Bill recipients enrolled at two and four year public institutions in Virginia. Veterans and current service members are included within this group, as well as family members and dependents of veterans who may or may not have served in the military.

2.2. Survey instrument development

Structured interviews with key stakeholders were conducted to guide the development of content for

the online survey. Interviews were conducted with seven student veterans, five career center personnel, ten STEM faculty, five certifying officials, and three dependents of veterans. Interview data was summarized and reviewed by members of the project's technical workgroup, a diverse group with expertise in research and statistical methods as well as student veteran and STEM issues. In addition to the qualitative interview study, a literature review of related studies helped to shape the content of the online survey. After a draft of the survey was constructed, members of the technical workgroup reviewed survey drafts and helped study personnel to refine survey questions. Two student veterans studying in STEM fields were also recruited to pilot the online survey.

2.3. Survey description

The 48-item survey, titled *GI Bill Recipients and Their Career Choices*, is comprised of a series of questions using dichotomous responses, checklists, and five point Likert type scales. The survey uses "skip logic" to create two separate pathways of items, depending upon whether a respondent is pursuing a STEM major or a non-STEM major. Survey content was drawn from extensive literature reviews, and was designed to obtain information about choice of majors, reasons for choosing a STEM major or factors that influenced the decision not to select a STEM major, use of and experiences with on-campus services and supports, use of technology devices to help with coursework, and a variety of other factors related to and leading up to the respondent's current college experiences. In addition, the survey asks for demographic information including disability status and veteran status.

For example, the survey included questions such as "Are you pursuing a major in STEM?" (yes/no), "Did you ever have a military occupation related to a STEM field?" (yes/no/not applicable), "What factors do you feel contributed to your decision to pursue a major in a STEM field?" (select all that apply), and "How have academic accommodations had an impact on your college experience?" (select all that apply).

2.4. Distribution

After Virginia Commonwealth University IRB approval, project staff collaborated with the State Approving Agency for Veterans Education and Training (SAA) of the Virginia Department of Veterans Services to administer the online survey. The SAA

is responsible for approving courses of instruction at postsecondary education institutions operating in Virginia so that eligible veterans, war orphans and widows may enroll in and receive financial assistance from the U.S. Department of Veterans Affairs (DVA) while pursuing an approved course or program.

The SAA emailed school certifying officials at two and four year public institutions in Virginia and requested that they contact GI Bill recipients enrolled at their institutions and inform them of the opportunity to take an online survey regarding the perceptions of GI Bill recipients of STEM careers. Four reminder emails were sent by SAA over a five month period. In an effort to boost survey response rates, two emails regarding the survey were sent by the Virginia Department of Veterans Services to members of its listserv.

2.5. Data collection

Participants were emailed a link to the online survey, which was created using Survey Monkey (<http://www.surveymonkey.com>). On average, it took participants 10 minutes to complete the survey and submit their responses. All responses were collected anonymously, and participants were not asked to provide any personally identifiable information. SSL encryption was used to ensure that responses remained secure. The survey was open for responses by GI Bill recipients who were currently attending two or four year colleges and universities across Virginia. If a respondent did not meet these criteria as reflected by his or her answers to several screening questions at the beginning of the survey, the survey was ended and no further data was collected. A printable version of the survey was available for those respondents who were unable to complete the survey online.

Upon completion of the full survey, eligible participants had the opportunity to participate in a raffle to win one of three iPad minis. Those choosing to take part in this incentive were directed to a separate questionnaire where they could submit their contact information, which was stored separately from the content of their survey responses.

2.6. Response rate

The survey was open for responses between August 2014 and February 2015. A total of 1,495 eligible respondents participated in the survey during that time, with a response rate of 7.9%. A literature review of projects that used similar methods to recruit

veterans revealed that the majority of such studies did not include response rates in published articles. Of those that did, response rates between 6% and 22% were reported, suggesting that the present study is within range for the target population.

2.7. Data analysis

Frequencies, percentages, and central tendencies were first computed to obtain a general overview of the responses to each item. Then, a variety of filters were applied in order to compare various subgroups to one another, including those with and without disabilities, veterans/active duty versus family members/dependents, and those with and without prior work experience in a STEM field. Crosstabs were run to examine the relationships among these groups in terms of their patterns of enrollment in STEM programs, on-campus services accessed, and level of satisfaction with these programs and services. Alpha was set at 0.05.

3. Results

3.1. Participants' demographics

Overall, respondents were evenly split between male and female. Most (77%) were Caucasian, 12% were Black, and 6% were Asian, Native Hawaiian/Pacific Islander, American Indian, or Alaska Native. Seven percent of respondents reported a Hispanic ethnicity. Nearly half of respondents (47%) were between 18 and 22 years of age, one third (34%) were between 23 and 33 years of age, and 15% were between the ages of 34 and 44. Nearly 60% of respondents were veterans, while 40% were family members/dependents.

More than half of all GI Bill Recipient respondents (58%) reported that they had no disability rating, while nearly one third (30%) indicated that they had a VA disability rating of at least 10% (See Table 1). The four disability categories most associated with disability ratings of 10–50% or more than 50% were mental health condition, PTSD, orthopedic injury or hearing impairment.

The majority of respondents who reported a disability rating indicated that they were veterans (95%). Those without disabilities were most likely to identify as family members/dependents (57%) (See Table 2).

Survey respondents with disabilities indicated a wide variety of conditions. Overall, the most fre-

Table 1
Frequency of disability rating

VA Disability Rating (<i>n</i> = 1225)	Number
Less than 10%	39 (3.2%)
10–50%	181 (14.8%)
More than 50%	189 (15.4%)
None	713 (58.2%)
Decline to report	103 (8.4%)

Table 2
Veteran status by disability status

Veteran Status	Disability (<i>n</i> = 409)	No Disability (<i>n</i> = 713)	Total (<i>n</i> = 1481)
Veteran	389 (95.1%)	265 (37.2%)	869 (58.7%)
Family Member/ Dependent	42 (10.3%)	408 (57.2%)	577 (39.0%)
Never Served	8 (2.0%)	175 (24.5%)	230 (15.5%)
Currently Serve	17 (4.2%)	86 (12.1%)	131 (8.9%)

quently reported disabilities were mental health conditions (17%), orthopedic injuries (17%), post-traumatic stress disorder (PTSD) (13%), and hearing impairments (13%). Participants could identify one or more disabilities. Of the 200 respondents who checked mental health condition, 45% also identified a post-traumatic stress disorder (See Table 3).

Respondents with and without disability ratings differed greatly in terms of their demographic characteristics. When compared to those without disabilities, respondents with disabilities were more likely to be male, and more likely to be over the age of 22. Those without disabilities were more likely to be white (77%) and almost half were between the ages of 18–22. Approximately 20% of the participants with a disability were African American compared to 10% without disabilities.

3.2. Enrollment choice and reasons for selection

Survey participants with disabilities were evenly split between two-year and four-year programs (See Table 4). They were more likely to attend two-year or community colleges and more likely to be enrolled part-time than those without disabilities.

When asked to identify their reasons for selecting a college, GI Bill Recipients with and without disabilities both considered the location and cost to be the two most important factors. For participants with disabilities, campus programs and services for veterans and the presence of a veteran population were frequently identified after cost and location. Both groups identi-

Table 3
Frequency of reported disabilities

Reported Disabilities	Number and Percent by Gender	
	Male (<i>n</i> = 636)	Female (<i>n</i> = 503)
Mental health condition	98 (15.4%)	101 (20.2%)
Orthopedic injury	119 (18.9%)	69 (13.8%)
Post-traumatic stress disorder	103 (16.2%)	45 (9.0%)
Hearing impairment	114 (18.0%)	35 (7.0%)
Attention deficit disorder/ADHD	59 (9.4%)	45 (8.9%)
Blindness/visual impairment	43 (6.9%)	54 (10.9%)
Traumatic brain injury	43 (6.8%)	12 (2.4%)
Learning disability	27 (4.3%)	20 (4.0%)
Spinal cord injury	35 (5.6%)	6 (1.2%)
Burns	17 (2.7%)	11 (2.2%)
Speech impairment	13 (2.1%)	9 (1.8%)
Autism spectrum disorder	4 (0.6%)	4 (0.8%)
Amputation	3 (0.4%)	2 (0.4%)

Table 4
Type of college/university by disability status

Type of College/University	Disability (<i>n</i> = 409)	No Disability (<i>n</i> = 713)
Two-year or community college	207 (50.6%)	206 (28.9%)
Four-year college/university	202 (49.4%)	507 (71.1%)

Table 5
Factors contributing to choice of college/university

Factors Contributing to Choice of College/University	Disability (<i>n</i> = 408)	No Disability (<i>n</i> = 712)
College/university location	301 (73.8%)	536 (75.3%)
Cost	162 (39.7%)	345 (48.5%)
Campus programs and services for veterans	145 (35.5%)	123 (17.3%)
Veteran population	128 (31.4%)	90 (12.6%)
Friendliness of faculty and staff	120 (29.4%)	270 (37.9%)
Accessibility of physical environment	89 (21.8%)	142 (19.9%)
Financial aid package	58 (14.2%)	104 (14.6%)
Information sessions by the college	57 (14.0%)	175 (24.6%)
Friendliness of students	47 (11.5%)	230 (32.3%)
Campus tours	37 (9.1%)	225 (31.6%)
Quality of STEM programs	26 (6.4%)	112 (15.7%)
Campus programs and services for students with disabilities	25 (6.1%)	13 (1.8%)
Mentoring opportunities	22 (5.4%)	44 (6.2%)

fied the friendliness of faculty and staff as important. For survey respondents without disabilities information sessions by the college, friendliness of students and campus tours were frequently identified (See Table 5).

3.3. Academic descriptors

GI Bill recipients with and without disabilities differed in the types of degrees they were pursuing; nearly two thirds of those with disabilities were enrolled in masters or associates programs,

while more than half of those without disabilities were enrolled in a bachelors program. There was no difference in grade point average (GPA) between participants with disabilities ($M = 3.44$, $SD = 0.47$) and those without disabilities ($M = 3.38$, $SD = 0.47$). There were also differences in length of time attending college or university between participants with disabilities and those without disabilities. Forty-one percent of the GI Bill recipients with disabilities had been attending university/college for less than one year, whereas 38% of recipients without disabilities had been attending for one to two years.

Table 6
STEM/Non-STEM major by disability status

Major of GI Bill Recipients	Disability (n = 409)	No Disability (n = 713)
STEM	152 (37.2%)	321 (45.0%)
Non-STEM	257 (62.8%)	392 (55.0%)

3.4. STEM participation

While less than half of respondents with and without a disability rating were currently working on a major in a STEM field of study, those with disabilities had lower participation in STEM programs (37%) than those without disabilities (45%) (See Table 6).

When non-STEM majors with disabilities were asked why they did not consider a STEM field, respondents most frequently cited unappealing employment opportunities in STEM careers (31%), lack of academic preparation (22%), and lack of career counseling and academic advising (14%).

All STEM majors with disabilities were over the age of 22, and were more likely to be male than STEM majors without disabilities. They provided a number of reasons as to why they selected STEM majors (See Table 7). A majority indicated that personal interest (79%) and employment opportunities (61%) played an important role. Prior military experience (36%), natural aptitude (36%), and contribution to society (34%) were also frequently reported considerations.

3.5. Campus services and supports

Survey respondents were asked about their experiences with a number of different on-campus services and supports, including academic advising, career services, military student services, tutoring, and disability support services (See Table 8). Academic advising was the most frequently accessed service, with 75% of respondents with disabilities and 80% of those without disabilities utilizing it at least once in the past year. When those who did not use academic advising were asked why they didn't, respondents without disabilities were more likely (71%) to indicate that they did not feel they needed this service than those with disabilities (55%). Among those who did use academic advising, the majority of respondents with disabilities (92%) and without disabilities (94%) felt that it was helpful.

Disability support services were utilized the least of all on-campus services and supports, even among those with a disability rating. Less than 10% of respondents with disabilities had accessed disability support services in the past year. Three quarters (76%) of those with disabilities who did not use disability support services indicated that they didn't need these services, and 15% were not sure how to access disability support services. The majority of those who did access disability support services found them to be useful.

Table 7
Reasons for selecting STEM majors

Reason	Disability (n = 151)	No Disability (n = 309)
Personal interest	119 (78.8%)	272 (88.0%)
Employment opportunities	92 (60.9%)	205 (66.3%)
Salary projection	72 (47.7%)	159 (51.5%)
Prior military experience	55 (36.4%)	45 (14.6%)
Natural aptitude	54 (35.8%)	151 (48.9%)
Contribution to society	52 (34.4%)	154 (49.8%)
Career prestige	39 (25.8%)	104 (33.7%)
Availability of the program	30 (19.9%)	63 (20.4%)
Prior civilian work experience	23 (15.2%)	29 (9.4%)
Family encouragement	15 (9.9%)	82 (26.5%)

Table 8
On-campus services/supports by disability status

Services/supports used at least once in the past year	Disability (n = 409)	No Disability (n = 713)
Academic Advising	305 (74.6%)	571 (80.1%)
On-Campus Military Services	262 (64.1%)	355 (49.8%)
On-Campus Career Services	115 (28.1%)	270 (37.9%)
On-Campus Tutoring	81 (19.8%)	160 (22.4%)
Disability Support Services	37 (9.0%)	16 (2.2%)

4. Discussion

This study was designed to obtain data on the views of GI Bill recipients with disabilities on pursuing STEM as a viable career option. The majority of respondents who reported a disability rating indicated that they were veterans. Thus, the results of the study from a disability standpoint are heavily based on the viewpoints of veterans. Therefore, it is not surprising that the most frequently reported disabilities were mental health conditions, orthopedic injuries, PTSD, and hearing impairments, which are all well documented conditions in the veteran population. As for survey respondents without disabilities, over half were identified as a family member/dependent, while over a third of those without disabilities were also veterans.

GI Bill recipients with disabilities were evenly divided between attending a two-year or four-year institution of higher education compared to 71% of those without disabilities attending a four-year program. Both respondents with and without disabilities chose a college based on location and cost of attending. Those with disabilities also looked for campus programs and services for veterans, and the presence of a veteran population, reflecting the higher number of veterans in this subsample.

Several themes emerged from the survey results that have potential implications for the enrollment and success of student veterans with disabilities in STEM programs.

GI Bill recipients with disabilities are less likely than those without disabilities to select a STEM major. This is consistent with past literature suggesting that students with disabilities do not enroll in Science and Engineering programs as often as their peers without disabilities. Among those survey respondents with disabilities who did not choose a STEM major, more than one third (41%) considered a STEM major. The most common reasons provided for ultimately deciding on a non-STEM major were the unappealing employment opportunities in STEM careers (31%), a lack of academic preparation (22%), and a lack of career counseling and academic advising (14%). Targeted interventions in the latter two areas could potentially result in greater numbers of veterans with disabilities enrolling in STEM programs.

Prior work experience appears to play a substantial role in leading GI Bill recipients with disabilities to pursue a STEM program. More than one third (36%) of survey respondents with disabilities indicated that prior military work experiences related to

STEM fields were important factors as to why they selected a STEM major. Another 15% were drawn to their STEM majors as a result of prior civilian work experience, compared to just 9% of those without disabilities. STEM-related assignments, both military and civilian, appear to equip student veterans with valuable experiences that not only influence their course of study, but most likely also increase their level of success upon enrollment.

Despite high levels of satisfaction among those GI Bill recipients who are utilizing disability support services, only a small fraction of those with disabilities are accessing these services. A small proportion of survey respondents (10%) indicated that they decided not to select a STEM major because they were concerned that their disability might affect their success in a STEM program. Indeed, enrollment and persistence in STEM programs can be significantly affected by access to accommodations and support services.

Three quarters of respondents with disabilities reported that they did not feel as though they needed disability support services. Veterans with acquired disabilities may be wary of voluntarily accepting a disability label of any kind in college by disclosing their condition due to perceived negative connotations and stigma. This may lead to reluctance to take advantage of disability support services. An additional 15% of respondents indicated that they didn't know how to access disability support services at their university. Thus, informational outreach efforts targeting student veterans with disabilities may encourage more participation in disability support services.

4.1. Limitations

The findings of this study provide further knowledge of factors that lead to decisions about STEM participation by GI Bill recipients with disabilities. However, some limitations should be noted. Even though the response rate for this study fell within the range of response rates of other journal publications for this population, the authors used a number of methods to increase the rate for this study by leaving the survey open longer than originally anticipated, sending out numerous reminders, and posting the availability of the survey on different websites and Facebook pages. The survey was sent to GI Bill recipients attending two and four year institutions in Virginia, based on the data collected by the State Approving Agency for the Virginia Department of Veterans Affairs. The database did not identify

individuals with disabilities; therefore, we could not determine the response rate for this subset of the overall population.

Other limitations include only looking at public two and four universities and colleges. Further research will need to expand to other postsecondary institutions, especially the for profit sector. In addition, the results of the survey represent GI Bill recipients in one state. The survey pool needs to be expanded to a national audience to compare our findings with a larger sample, and one that includes a broader range of military personnel and dependents of GI Bill recipients using these benefits for college.

5. Conclusion

The experiences of GI Bill recipients with disabilities and their decision to select a STEM major remains an important area of research. Further study is needed to examine in greater depth the extent to which their disabilities played a role in how these decisions were made. Approximately 10% of the respondents with disabilities who did not select STEM were concerned that their disability might affect their success in a STEM program. Coupled with this perception is the need to ensure that GI Bill recipients with disabilities have an understanding of STEM and potential career areas. One of the top three reasons for not selecting STEM was the lack of career counseling and academic advising.

Ensuring that GI Bill recipients with disabilities are fully aware of the services and supports on campus continues to be an area of further research and demonstration. The literature provides a number of insights into some of the reasons for not seeking services specific to their disability including the stigma of disclosure, limited time on campus to seek services, and a lack of awareness on how to access these services. Institutions of postsecondary education need to examine their outreach efforts and methods of providing services to this population. Studies that provide models of military personnel receiving accommodations that are effectively meeting their academic needs in STEM are needed to better understand the types of supports and their method of delivery within these programs.

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Conflict of interest

None to report.

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