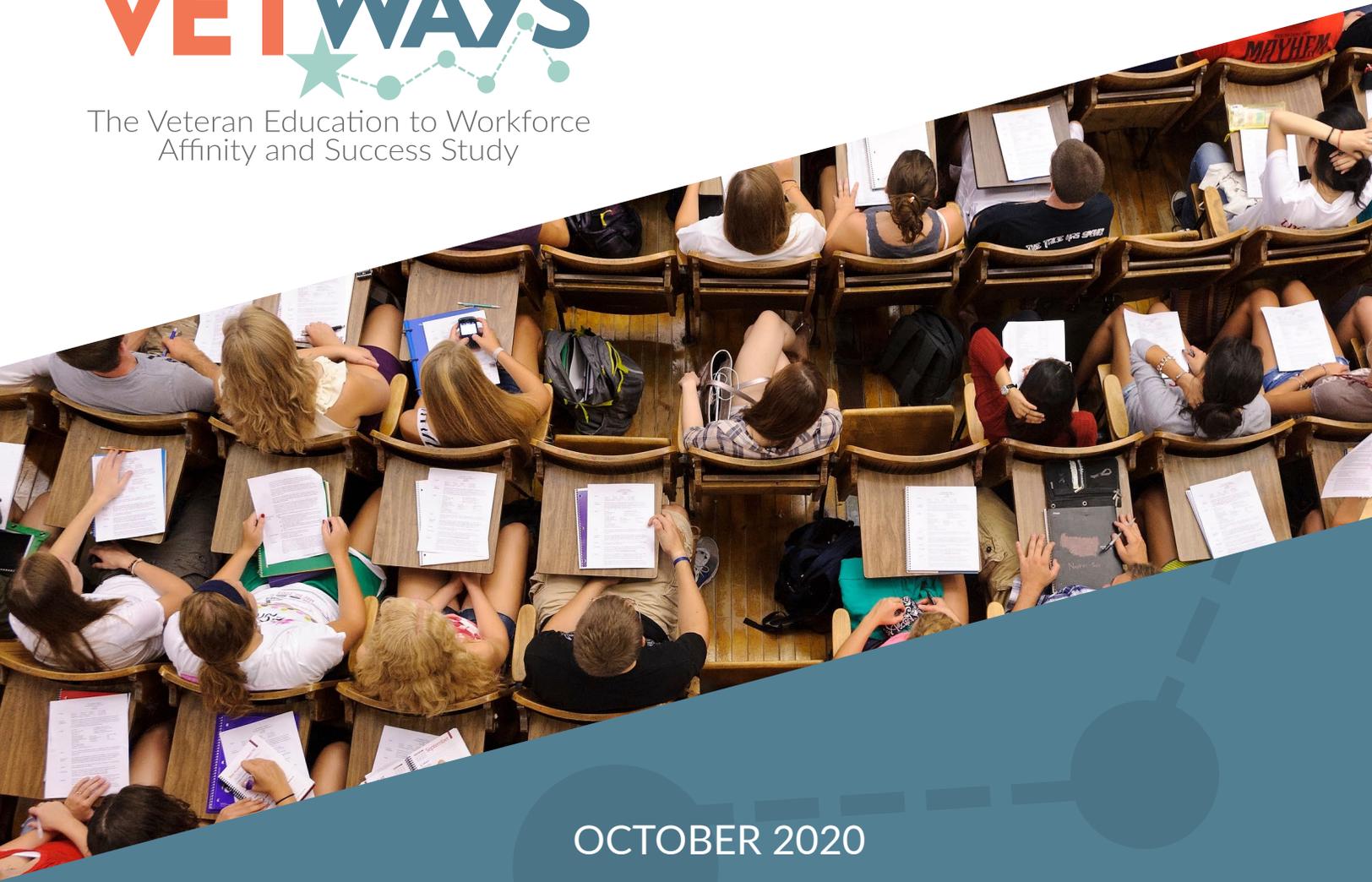




The Veteran Education to Workforce
Affinity and Success Study



OCTOBER 2020

RESEARCH BRIEF

Campus Belonging among
Student Military Service Members
and Veterans in STEMM Majors:
A Social Network and Social
Capital Study

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SUMMARY

Analysts contend that the U.S. science, technology, engineering, mathematics, and medical (STEMM) workforce suffers from a training and diversity shortage. While recent university reforms have aimed to improve STEMM undergraduate persistence in response, little research has studied STEMM retention among student military service members and veterans (SSM/Vs), a group of students with the potential to broaden and strengthen the scientific workforce through their diverse backgrounds and experiences. With research indicating SSM/V academic experiences improve with strong social support, this mixed-methods study explores links between social support networks for SSM/V in STEMM and feelings of campus belonging that are important to college success. Findings from SSM/V surveys ($n=333$) indicate that larger support networks that include students and university educators positively associate with a sense of campus belonging, while SSM/V interviewees ($n=54$) describe how feelings of belonging often come through student friendships, faculty care, and campus veteran support in their day-to-day lives. Results reconfirm the importance of social support among SSM/Vs and suggest that university service providers looking to support these students should actively and purposefully encourage social ties with fellow students, staff, and faculty members.

Background and Goals

With evidence suggesting that science, technology, engineering, mathematics, and medical (STEMM) degrees are essential to individual and national economic interests, workforce development efforts designed to expand and diversify postsecondary STEMM programs have become a priority among U.S. leaders (National Science Board, 2018; National Science Foundation, 2017). Student military service members and veterans (SSM/Vs), a growing nontraditional undergraduate population, offer much promise for expansion and diversification in STEMM. In addition to the unique skills and know-how they bring from their service, SSM/Vs are older, more likely to report physical and cognitive disabilities, and more often first-generation students from low-income backgrounds than traditional students (American Council on Education, 2014; National Survey of Student Engagement, 2010). SSM/Vs also typically enter college with experience using sophisticated technical systems and equipment or with health training (e.g., National Academies of Science, Engineering, and Medicine, 2017), which would seem to position them well to be STEMM majors. Yet SSM/Vs graduate with STEMM degrees at lower rates proportionally than traditional students (Cate et al., 2017; National Center for Education Statistics, 2019).

Student military service members and veterans are a growing undergraduate population that can expand and diversify the U. S. scientific workforce, yet they graduate with STEMM degrees at lower rates than traditional students.

Though little previous research has explored SSM/V experiences in university STEMM fields, existing work offers a way forward. It is well established that a student's sense of *campus belonging*—the feeling that they “fit” as a member of their campus community (Hurtado & Carter, 1997)—is important to college success in general and STEMM completion in particular, especially for students from marginalized backgrounds (e.g., Gopalan & Brady, 2020; Rainey et al., 2018). The research literature also shows that SSM/V academic experiences improve with strong *social support networks*, or people with whom students can exchange personal, academic, or career advice and reassurances, whether on or off campus (Benbow, 2020; Bagby et al., 2015; Griffin & Gilbert, 2015). To date, no research has explored these sets of relationships among SSM/Vs nor how they could be a valuable leverage point for improving SSM/V STEMM experiences and retention. More specifically, a better understanding of the connections between campus belonging and SSM/V social support networks on and off campus could not only help scholars begin to build a knowledge base focused on SSM/Vs in STEMM majors, but also inform local efforts to better support this talented student population.

With these gaps in mind, we use a mixed-methods social network analysis (SNA)—a perspective centered on measuring an individual's relationships or “social ties” to understand their influence on attitudes or behavior (Wasserman & Faust, 1994)—to answer two research questions (RQ):

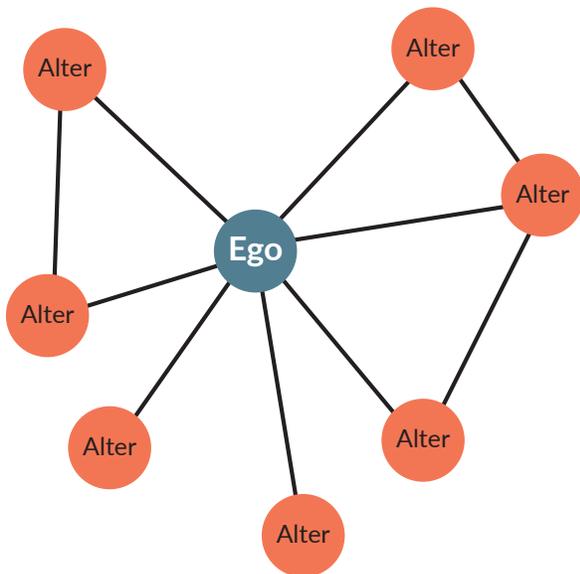
RQ1. How, if at all, do SSM/Vs' social support networks associate with a sense of campus belonging?

RQ2. How, if at all, do SSM/Vs perceive social support networks influencing their sense of campus belonging?

Social Capital

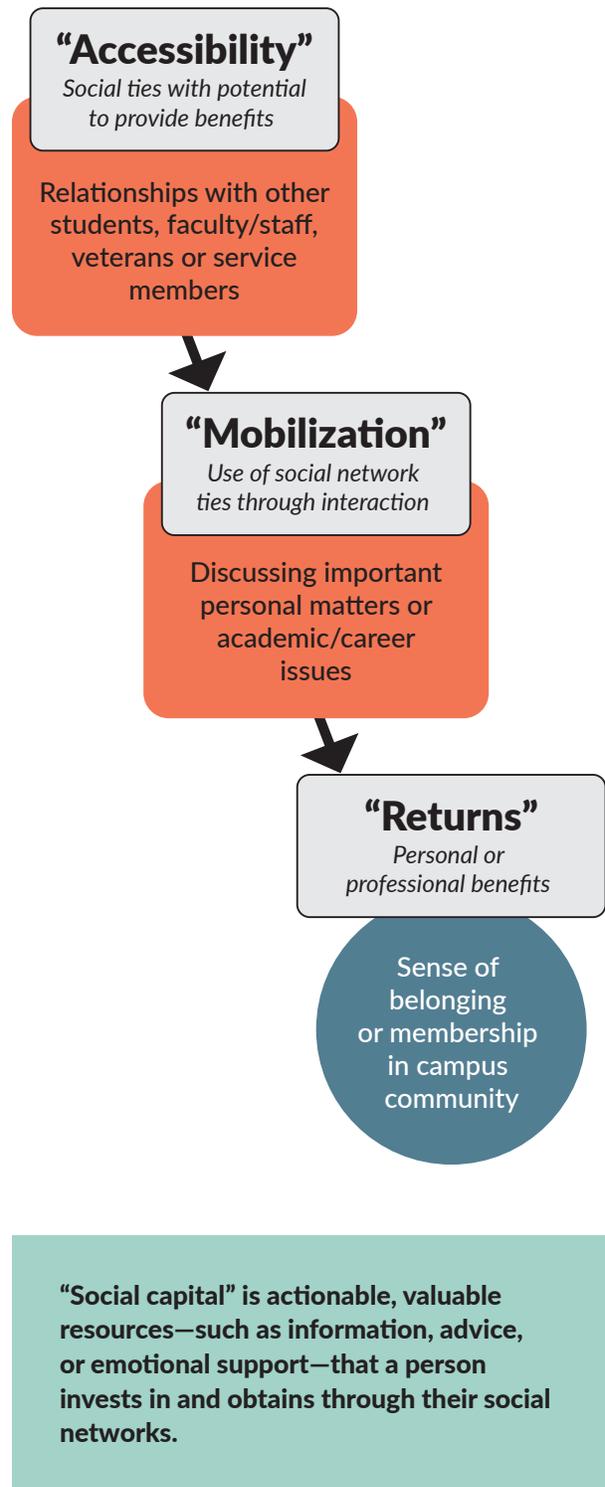
This study is framed using Nan Lin’s (2001) “social capital” theory. Social capital is defined as actionable, valuable resources that a person invests in and obtains through groups of social ties called “social networks.” Social networks, which mirror the social support networks on which this study focuses, are often represented in diagrams mapping a central person (called the “ego”) and their contacts (“alters”) as nodes. Social ties are represented as lines between these nodes (Figure 1).

Figure 1. Social network diagram



For Lin (2001), forms of social capital such as material items, information, advice, or support are embedded in social networks (e.g., Wellman & Wortley, 1990). When one invests time and energy in building and maintaining their relationships, he argues, social ties can be accessed and mobilized for beneficial “returns” on the person’s investment (Lin, 2001). This social capital development process of accessibility, mobilization, and returns, modelled by Lin (2001) and reframed for this study, is displayed in Figure 2.

Figure 2. The development of belonging-oriented social capital among SSM/Vs (Lin, 2001)



Here we use this concept by testing whether four social support network characteristics, all based on previous research, increase the social capital returns for SSM/Vs in the form of a sense of campus belonging (e.g., Baker, 2013; London et al., 2011). **Network size**, referring to the number of contacts in an individual's social support network, is associated with increased social support (Burt, 1987) and achievement among college students (Dawson, 2010). **Educator ties**, representing whether university faculty or staff are in a student's social support network, allow SSM/Vs greater access to local mentorship opportunities and institutional support (Ackerman et al., 2009). **Student ties**, represented by whether there are college students in one's social support network, can draw SSM/Vs into academic communities and help make STEM climates more inviting (Kitchen et al., 2018). **Military ties**, representing whether a student's social support network is comprised of fellow service members or veterans, allow students to connect with others with similar experiences and have been shown to be important to SSM/V college transitions (Barry et al., 2014; Bagby et al., 2015).

Research Methods

We use a convergent mixed-methods case study to answer the research questions (Creswell & Plano Clark, 2018), an approach in which a research issue is deeply explored using quantitative and qualitative data. Data were collected simultaneously in spring 2020 and then analyzed separately. Combined results are meant to provide a wider, triangulated interpretation of SSM/V campus belonging and social support networks.

Sampling

Our data are made up of SSM/V survey and interview responses gathered across five universities, referred to here as State Colleges 1–5, that were

chosen for their institutional and geographic diversity. We used a purposeful, nonprobability procedure to recruit SSM/Vs, defined as undergraduate students in the Guard or Reserves or who had completed military service (Barry et al., 2014), by asking veteran service coordinators in each of the five universities to email information on this study and a link to an online survey to all identified SSM/Vs. The emails elicited 333 student survey respondents in STEM fields, defined as Biological or Life Science, Engineering, Health, Mathematics or Computer Science, Physical Science, or Social Science majors (National Science Board, 2018). All STEM SSM/V survey respondents were asked if they were interested in participating in an hour-long interview for the study, and those who agreed were contacted by a researcher. Fifty-four STEM SSM/Vs in total participated in interviews. Descriptive statistics for survey and interview participants are displayed in Table 1.

Analysis

Surveys. Online surveys included five questions following established SNA “egocentric” techniques to elicit the four social support network measures associated with social capital returns for each survey respondent (e.g., Perry et al., 2018). These questions began with two items meant to identify significant on- and off-campus alters with whom each SSM/V respondent discussed personal and academic/career matters (see Burt, 1984; Burt et al., 2012). The number of alters listed in answer to these two “name generators” was used to measure *network size*. Follow-up questions on each listed alter gathered information on whether listed contacts were *educator*, *student*, and/or *military ties*. Answers from these questions were used to create measures representing whether or not respondents had at least one educator, student, or military tie in their social support network.

Table 1. Descriptive statistics for SSM/V survey (n=333) and interview participants (n=54)

Measure	Survey		Interview	
	N	%	N	%
Gender				
Female	96	28.8	17	31.5
Male	232	69.7	36	66.7
Nonbinary	4	1.2	1	1.9
Race/Ethnicity				
White Students	267	80.2	43	79.6
Students of Color	64	19.2	11	20.4
Undergraduate Major				
Biological and Life Sciences	46	13.8	8	14.8
Engineering	77	23.1	14	25.9
Health	76	22.8	12	22.2
Math and Computer Science	47	14.1	16	29.6
Physical Science	13	3.9	4	7.4
Social Science	74	22.2	0	0.0
Service Status				
Discharged or Retired Veteran	171	51.4	33	61.1
In Reserves or National Guard	162	48.6	21	38.9
First Generation Students ¹	113	33.9	15	27.8
Disability Status				
Cognitive Impairment	31	9.3	6	11.1
Mobility Impairment	35	10.5	7	13.0
Sensory Impairment	20	6.0	4	7.4
Impaired Students	66	20.4	13	24.1
Institution				
State College 1 (undergrad enrollment~8,000)	62	18.6	9	16.7
State College 2 (~33,000)	81	24.3	14	25.9
State College 3 (~19,000)	81	24.3	13	24.1
State College 4 (~13,000)	50	15.0	6	11.1
State College 5 (~7,000)	59	17.7	12	22.2
Mean Age	28.3	-	29.6	-

¹ "First Generation" students are student interviewees reporting that parental guardians have not obtained an associate's level college degree or above.

We use several other measures gathered from the survey—including SSM/V participant gender, race/ethnicity, first generation status, first year grade point average, full- or part-time student status, years on campus, child/dependent status, age, and institution—to control for other factors that have been shown to influence adult student belonging and academic experiences (e.g., Bergman et al., 2014; Museus et al., 2017). Surveys also included three questions focused on student feelings of connection to their campus community to measure campus belonging (Hurtado & Carter, 1997). A mean score for these three items was created and used as our belonging measure.

To examine the association between variables, we estimated the Ordinary Least Squares (OLS) regression model of respondents' sense of campus belonging on social network measures with covariates. Results are reported in Table 2 in answer to RQ1 below.

Interviews. One-hour Zoom or Skype interviews with volunteer SSM/Vs were based on semi-structured interview protocols including questions that began with the inquiry, “Do you feel like you belong at [name of university]?” followed by a series of probes. Each interview was recorded, transcribed, and loaded into NVivo 11 for coding.

Qualitative analysis began with segmenting belonging-related statements across all transcripts. These segments were then open coded with the constant comparative method as the process continued, to group developing codes by similarity (Charmaz, 2014). After coding all transcripts and reorganizing results, second cycle analyses were based on further refining themes and re-reading transcripts, with the first author reorganizing eight final themes into Table 3 (Saldaña, 2015). We display this table, as well as detailed descriptions of three themes, to answer RQ2 below.

Results

RQ1. How, If at All, Do SSM/Vs' Social Support Networks Associate with a Sense of Campus Belonging?

Table 2 displays the results of our regression model. Results show that *network size* is positively associated with campus belonging, indicating that the larger a student's social network, the greater their access to and mobilization of campus belonging-oriented social capital returns (Lin, 2001). This result aligns with network research linking increased network size to greater levels of social support (e.g., Walker et al., 1994) and breaks new ground in regards to SSM/V research. *Educator ties* and *student ties* are also each positively correlated with campus belonging, confirming research showing that peer and faculty support can improve STEMM outcomes (Estrada et al., 2018; Hernandez et al., 2018).

Social support network size, as well as the presence of educator and student ties, are positively associated with a feeling of campus belonging among student military service members and veterans. Military ties, however, are not correlated with belonging.

The presence of *military ties* in SSM/Vs' social support networks, however, does not predict a sense of campus belonging with any statistical significance. Though further analyses are needed, this final, inconclusive result may point to conflicting needs among SSM/Vs. As research suggests, relationships with others who have had similar military experiences provide an important and necessary form of social support (e.g., Bagby et al., 2015), but this support may be detrimental to feeling like one “fits” in on campus, particularly if campus communities are geared towards younger, more

Table 2. Regression of STEMM SSM/V campus belonging on network variables (n=333)

	Belonging
Network size	0.048*
	(0.023)
Educator ties	0.296*
	(0.134)
Student ties	0.294*
	(0.130)
Military ties	-0.209
	(0.118)
Gender (Female)	0.120
	(0.120)
Race/ethnicity (ref. White)	0.346*
	(0.157)
First generation status	-0.032
	(0.112)
First year grade point average	-0.019
	(0.048)
Part-time status (ref. Mostly full-time)	-0.301*
	(0.152)
Years on campus (log)	-0.039
	(0.053)
Age (log)	-1.360***
	(0.296)
Having a child/dependent	0.138
	(0.156)
State College 2 (ref. State College 1)	0.162
	(0.177)
State College 3	-0.106
	(0.170)
State College 4	0.233
	(0.195)
State College 5	0.007
	(0.180)
N	303

Note: * p<0.05, ** p<0.01, *** p<0.001; Standard errors are in parentheses

traditional college students. In social capital terms, though network ties with fellow veterans or military service members may provide access to certain forms of beneficial returns, a feeling of campus belonging may not be among them (Lin, 2001).

RQ2. How, If at All, Do SSM/Vs Perceive Social Support Networks Influencing Their Sense of Campus Belonging?

Table 3 displays SSM/V interviewee themes reflecting forms of social support that influenced feelings of belonging. We focus on three themes that help explain quantitative results.

Student friendships. Fourteen SSM/Vs told us that their sense of belonging was linked to whether or not they had developed friendships on campus, buttressing quantitative findings and previous research (Heller et al., 2011). Interviewees said such friendships offered a direct connection to the social and academic life of their university as well as camaraderie, study partnerships, and the opportunity to relax. According to interviewees, one's affinity (or lack thereof) for others in their major program, in particular, could have an outsized impact on how quickly and easily one developed ties with fellow students, a finding that supports previous research on STEMM climates (e.g., Ong et al., 2012). One freshman from State College 4, for example, said she already felt a strong sense of campus belonging because she had quickly developed relationships with students in her nursing cohort, who took all their classes together. "We're all close," she told us. "It really happens fast." Another student, however, told us that she had not meshed well with other students in her computer science program. She had only started to feel like she belonged recently after starting a campus job with students outside her department. "Now I've got something that really connects me to the school," the State College 2 student reported.

Table 3. Social support themes influencing STEMM SSM/V campus belonging (n=54)

Theme	N	Description
Student friendships	14	Close relationships with other university students offering a connection to the social and academic life of their university through companionship, study partnerships, and/or the opportunity to relax
Familiar faces	13	A feeling of positively recognizing, and/or being recognized by, other members of the campus community
Faculty care	12	Expressed attention, concern, guidance, interest, and/or empathy from university instructors (not including support from veteran coordinators)
Campus involvement	11	Clubs, work, or other extracurricular involvement taking place on campus
Timing	11	Time as a social support factor, either regarding how long one has been at the university, the (larger, more impersonal) size of one's classes, or missing classes or semesters because of military responsibilities
Veteran support	10	Perceived university encouragement, inclusion, and advocacy specifically for SSM/Vs at the university, communicated through policies and/or service member and veteran-specific support staff
Home/heritage	4	University has been a social focus for years, through athletic fandom, proximity to home, and/or family member alumni status
Academics	2	Broader teaching and learning approach in student program or institution (e.g., hands-on, theoretical), which may or may not make SSM/Vs feel like they fit in

Note: Themes are listed from top to bottom by number of interviewees mentioning each theme.

According to interviewees, one's affinity for others in their major program could have an outsized impact on how quickly and easily one developed ties with fellow students.

Faculty care. Past research, as well as our quantitative results in this study, show that educator ties are positively correlated with campus belonging (e.g., Estrada et al., 2018; Semer & Harmening, 2015). But what does this kind of social support look like in the lives of SSM/Vs? Twelve interviewees told us that they felt a closer connection to their campus because

of how much certain faculty members seemed to care for them and their educational success. While SSM/Vs discussed different scenarios in which this kind of care stood out, it was typically individualized attention—in which faculty members made a concerted effort to show students they had thought about them as individuals—that made students feel others on campus were invested in them and their future success. “I saw an old professor, and he had remembered that I was going to basic training, and he asked me about it,” one State College 3 student explained. “He had taught five massive English classes in the fall, and remembered that about me... it can be hard to feel a sense of belonging to such a big university, but then, those little moments, you're like, ‘You know what? I do belong here.’”

State College 4 guidelines made one student feel like he was in the right place. “They have priority registration for veterans,” he explained. “They’re just a veteran friendly university.”

Veteran support. Ten interviewees told us that their university’s perceived support for service members and veterans was important to their sense of belonging. Tangible, positive interactions with university systems or personnel, in this regard, could be the difference between SSM/Vs who felt socially supported on campus and those who did not. One student told us, for instance, that State College 4 guidelines alone made him feel like he was in the right place. “They have priority registration for veterans,” he explained. “They’re just a veteran friendly university.” Another student, however, told us State College 2’s transfer credit policies showed a lack of respect for her military training. “They were very reluctant to give me credit,” she said. “I felt like it meant that the university doesn’t recognize the trainings that we go through that literally translate perfectly into my major.” Interviewees reported that university service professionals who provide support for students affiliated with the military could also make an important difference. As university educators who better understood SSM/V experiences, these coordinators were able to directly help and support students, whether through outreach or by organizing events bringing veterans together. Research shows that such connections are helpful (Barry et al., 2014).

Implications and Significance

According to Lin (2001), a person obtains social capital returns after investing in, accessing, and mobilizing groups of beneficial relationships. If we focus on a sense of belonging as the return, here we find that larger networks that include university educators and fellow university students are most

helpful for SSM/Vs. Additionally, while SSM/V interviewees explained how student relationships and faculty care can foster the sense that they fit in on campus, so too can wider university policies and procedures that show respect and support for military-affiliated students’ unique experiences and training. Though military network ties have been linked to a number of positive outcomes in previous studies, their specific relationship to campus belonging—a sentiment shown continually to improve academic success—is more complex and should be explored further.

Findings suggest that educators looking to increase feelings of belonging among SSM/Vs in STEM should actively encourage the development of social ties with university staff, faculty, and fellow students, taking care to plan events and programming options during weekdays when older students are typically on campus and available (e.g., Kasworm, 2014). Financial and political support for service professionals who work with SSM/Vs, particularly in their role as community builders and institutional advocates for all these students, is critical in this regard.

Findings suggest that educators should encourage SSM/Vs to form social ties with staff, faculty, and fellow students. Financial and political support for SSM/V service professionals, particularly in their role as SSM/V advocates, is critical in this regard.

This study is significant not only because of the rarity of social support network-oriented research among SSM/Vs, a population for whom social support is critical, but also because it is among the first to focus on the potential of SSM/Vs to diversify and strengthen the STEM workforce. More work is needed, however. Future research should further explore the contours of social support networks among STEM SSM/Vs, as

well as network relationships to other outcomes, including persistence and successful transitions into gratifying careers after graduation (Ghosh & Fouad, 2016). The gap between U.S. civilians and military personnel is wider now than at any other time in the modern era (e.g., Zucchini & Cloud, 2015). Responsible educational scholarship should not

only illuminate the lived realities of this important student population, but also advance work on an issue of national significance: how to support future STEM professionals from highly skilled yet under-supported populations.

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The Veteran Education to Workforce
Affinity and Success Study

About

The Veteran Education to Workforce Affinity and Success Study (VETWAYS) is a three-year National Science Foundation-funded project focused on a growing and increasingly important segment of the U. S. college student population: military service members and veterans.

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