Student Veteran and Service Member Participation in Undergraduate STEM Education: Descriptive Findings from a Systematic Scoping Review

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Abstract

This full paper presents initial descriptive findings from a systematic scoping review of published literature related to the participation of veterans and current service members in undergraduate STEM education. There are increasing national and global needs to recruit, train, and sustain an adaptable STEM workforce capable of addressing the 21st century socio-technical and environmental challenges using a variety of perspectives and talents. Student veterans and service members (SVSM) represent one vital source of future U.S. STEM workforce talent. Skills acquired during military service, such as leadership, teamwork, and technical skills, as well as the accumulation of a broad range of life experiences, suggest that SVSM are promising candidates to help meet this demand. This comprehensive scoping review of 51 sources characterizes current published literature and provides insights for future empirical research examining undergraduate SVSM participation in STEM higher education.

Due to our initial uncertainty regarding the current breadth of this literature, we selected a scoping review methodology to characterize the extent and fullness of literature related to SVSM in undergraduate STEM education in the United States. We followed published procedures for systematically identifying and selecting literature to be included in this review. ensuring our methods aligned with PRISMA guidelines for performing systematic reviews and meta-analyses. While our synthesis of scoping review data is still ongoing, current findings indicate that empirical research on SVSM participation in STEM education generally— and engineering education specifically—increased over the past 20 years, peaking sharply during the years 2016-2021 and since receding. Notably, most studies were conducted in the context of engineering education, rather than other STEM disciplines or STEM education generally. Approximately 75% of the included sources are published in conference proceedings; increasingly research findings are being disseminated in archival journals. While sources reported engaging participants with a variety of demographics and military affiliations, participant samples across sources are majority White and male, despite broad participant recruitment efforts. Implications for future research are discussed.

Keywords: military-connected, PRISMA, scoping study, sustainable development, systematic review, workforce development

Introduction

This full paper presents initial descriptive findings from a systematic scoping review of published literature related to the participation of U.S. military veterans and service members in undergraduate science, technology, education, and mathematics (STEM) degree programs. In our work, we take the broadest possible view that those who have served and subsequently completed their term of service are now considered to be military *veterans.* Alternatively, *servicemembers* are those who concurrently serve in the US Armed Forces, such in the Reserves or National Guard, while attending college. Nationally, these undergraduate *student veterans and service members (SVSM)* are highlighted as an untapped source of human potential for education, training, and employment in STEM fields [1]. The continuing ingress of military veterans and

service members into U.S. colleges and universities— owing to recent U.S. military personnel drawdowns overseas and vastly increased federal education benefits since 2008—have catalyzed renewed interest in understanding how undergraduate SVSM participate and persist in STEM education. Given few [e.g., 2] available (and no systematic) literature syntheses on the topic, we undertook this scoping review [3]-[6] to characterize the current breadth of this literature and inform continued research and policy efforts in this area. We guided our scoping review with the following research question:

What broader (e.g., contextual, disciplinary, methodological, publication) trends characterize the literature related to the participation of U.S. military veterans and service members in undergraduate STEM education, and what do we learn from these trends that can be applied to future research?

Background

Now more than ever, our technology-driven and -dependent global society is re/producing urgent sustainable development and workforce development challenges that affect our communities, nation, and world. These challenges present overlapping and compounding threats to human health and flourishing, economic prosperity, and fair treatment across all geographic regions and societal sectors. There is broad agreement that increasing the *numbers* of post-secondary students in STEM disciplines is a necessary, but not sufficient, condition to meet and overcome these challenges. U.S. STEM higher education systems *must also* (a) expand and reshape the landscape of technical and non-technical disciplines and the knowledge and skills trained, maintained, and provided [7]; and (b) broaden the range of abilities, backgrounds, and experiences students and workers possess and bring to bear on problem-solving and solution-making toward a sustainable future [8]-[10].

Several scholars [1], [11] point to reasons why Post 9/11 veterans and servicemembers are *good candidates* for strengthening the STEM workforce. Today, the combined U.S. military includes more than two million servicemembers [12], the majority of whom transition off active-duty service in 3-5 years [13]. The fact that the military is not a lifelong career (for most) results in 200,000 servicemembers transitioning out of the U.S. military *each year* [14]. Notably, the 200,000 potential STEM workers leaving military each year are prepared to meet postsecondary education entry requirements and demands. In today's All Volunteer Force, servicemembers are required to have earned high school diplomas (or equivalent) prior to enlistment; military run transition assistance programs support exiting servicemembers prepare for civilian employment [15]. Along with high school diplomas, today's servicemembers garner increasingly advanced technical and nontechnical training and real-world experience in leadership, personal time management, and working in teams during their time in service. Many servicemembers gain international teaming experience and an ingrained desire to put "service above self" by working toward something bigger than themselves [16]. Importantly, military leadership and teaming experiences are particularly impactful preparation for civilian employment because military teams, at every level of service, are likely to be culturally, demographically, socio-economically, and age diverse [12].

Research Team Positionality

We describe our research team positionality as a key part of conducting a reflexive scoping review. Our team comprises seven members, four White women and three White men, ages 22-

60, who each support and adhere to assets-based approaches for including underrepresented, underserved, and "invisible" students in engineering and STEM education. Two team members served on active duty in the U.S. military; other team members have no direct connections to military service except having a close relationship with a grandparent who served. Five teammates are members of the regionally dominant religion; two members experienced different religious upbringings. The team includes two faculty members and one doctoral student in the field of engineering education, and four undergraduate researchers, majoring in mechanical engineering (2), computer engineering, and math education and interested in engineering education research. A key strength of our team lies in our individual diversity of experience and thought, which supports combined trust, openness, and the ability to view life from multiple perspectives.

Methodology

We employed scoping review methodology [3]- [6] to conduct this study. Following Daudt and colleagues [4 p.8], we defined a *scoping review* as a form of secondary (data) research that "… aims to map the literature on a particular topic or research area and provide an opportunity to identify key concepts; gaps in the research; and types and sources of evidence to inform practice, policymaking, and research" and ensured that the research question we developed to guide the work was compatible with this definition. We conducted our scoping review *systematically* in that we aimed for comprehensive and repeatable searching of the peer-reviewed published literature [3] and adhered to PRISMA [17] guidelines for performing and reporting systematic literature reviews and meta-analyses.

Inclusion criteria. We developed seven criteria for selecting articles for inclusion in the review:

IC1: The source is a peer-reviewed journal article, conference paper, or dissertation and is not a literature review.

IC2: The research focus includes undergraduate education rather than being solely focused on graduate education and/or professional contexts

IC3: The research context is an institution of higher learning in the United States.

IC4: The research focus includes students in one of the four STEM disciplines or STEM education rather than other non-STEM majors.

IC5: The research focus is undergraduates who are U.S. military veterans and/or current service members (i.e., NOT Reserve Officer Training Corps or military service academy cadets).

IC6: The research context is a non-military affiliated (i.e., civilian) U.S. institution of higher learning (i.e., NOT a military service academy).

IC7: The article was published in/after the year 2000.

We developed **IC1** to ensure that all included articles were primary sources that had gone through peer (or scholarly committee) review and, thus, were of sufficient quality to include in a systematic review. As the education of SVSM is an emergent topic in STEM, we included conference papers and dissertations to capture developing research trends. We excluded three master's theses our search identified because, in our experience, requirements for committee review and approval of master's level work can vary by institution, department, and degree plan and program. We developed **IC2** and **IC3** to focus on undergraduate STEM education in the United States, since STEM undergraduate experiences may differ from those of STEM graduate

students/professionals and non-STEM undergraduates. We developed **IC4** to include sources related to each of four STEM disciplines, as well as STEM generally, to map the broadest literature base relevant to SVSM in undergraduate engineering education. We developed **IC5** and **IC6** to focus our review on the education of SVSM who are *in transition to civilian employment/careers,* either after or while serving in the U.S. military. We chose to exclude research focused on Reserve Officer Training Corps (ROTC) and state/federal military service academy cadets who are *in transition to military service/careers* while earning bachelor's degrees based on the marked difference in purpose and context of ROTC and service academy education as compared to the purpose and context of civilian institutions and programs. We developed **IC7** to focus our review on literature that reflects the context and experiences of SVSM from the current/most recent generational veteran cohort (i.e., Post 9/11) that began on September 11, 2001.

Search strategy. We identified and gathered primary sources by searching seven online databases available at our institution: Academic Search Ultimate, Education Source, ERIC, ProQuest, IEEE Xplore, Scopus, and Google Scholar. We selected these databases and iteratively developed search terms in collaboration with a university librarian. From August 9 through October 3, 2023, we conducted and saved preliminary searches using each database to check variations in search terms; we then conducted and saved a single search for each database using information gained during the preliminary searches. Our search strings included the following search terms: armed forces, engineer*, military, servicemember, soldier, undergraduate, and veteran. We saved a total of 1794 search results and uploaded them into the Zotero reference manager, which we used to identify and remove 203 duplicates. We removed one other source because it was retracted by the authors, resulting in an initial set of 1,590 sources.

Selection process. Using the IC, we applied two stages of consensus-driven screening [18]-[19] to the initial set of sources. During first stage screening, two members of the research team reviewed the title and abstract of each source, and then reached consensus about whether to include or exclude the source based on the IC. During second stage screening, two members of the research team reviewed and discussed the full text of each source remaining after first stage screening. At any time when the two assigned team members did not initially agree on whether to include a particular source, they consulted at least one additional team member, and the larger group discussed the source until they reached consensus.

Last, we conducted forward and backward snowballing [18]-[20] of sources remaining after stage two screening to ensure our source identification was as comprehensive as possible. Snowballing began on August 1, 2024, and ended on December 11, 2024. During forward snowballing, we located additional sources directly from the citations of the sources that remained after the second screening process. We then used backward snowballing to "mine" the references of these sources, looking for other sources not already identified. We then screened each source identified from snowballing using the same two-stage process.

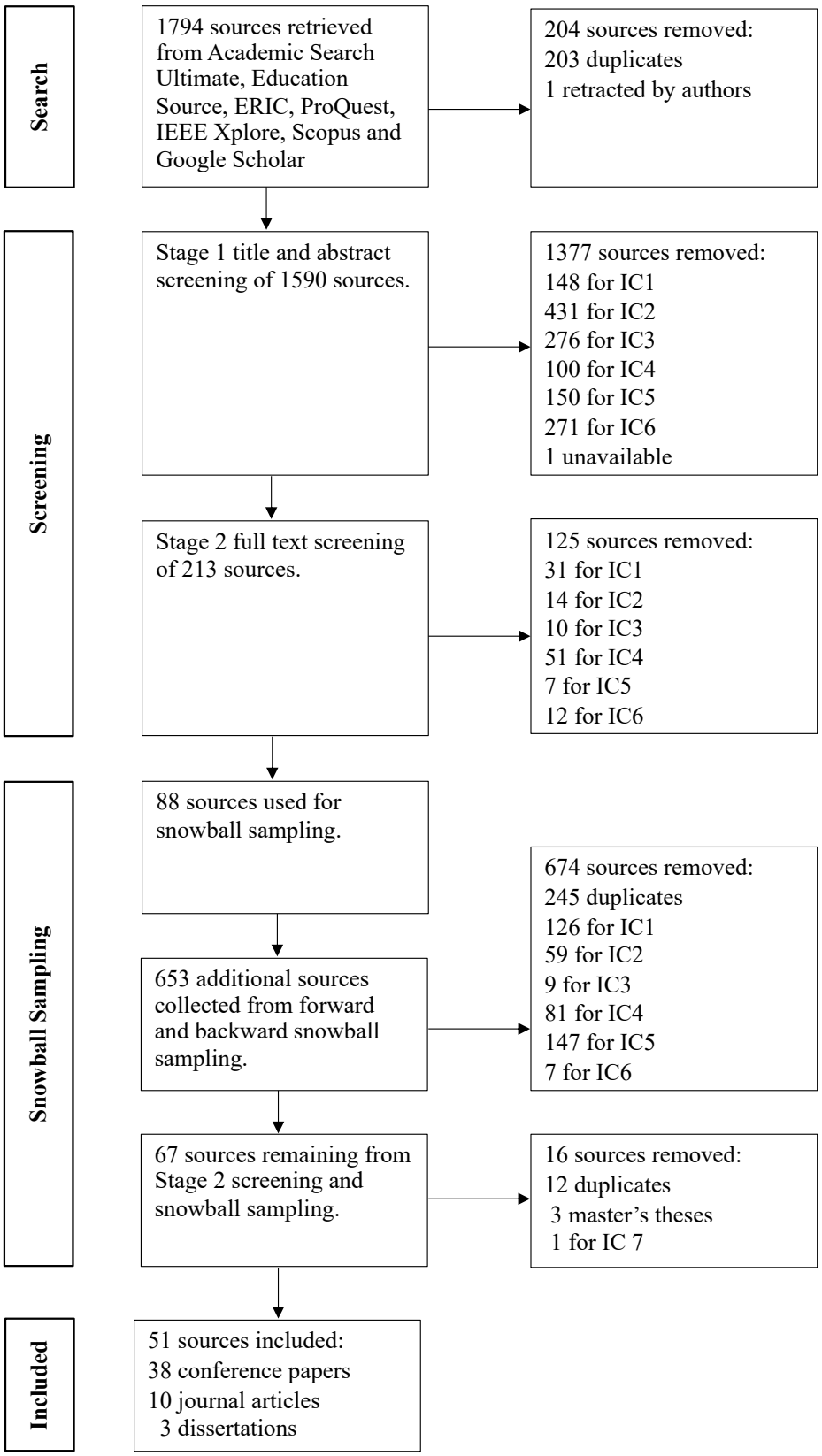

Fig 1. Scoping review PRISMA diagram.

Fig. 1 provides the PRISMA diagram documenting our scoping review search and selection process. Out of the 1794 sources retrieved through database searches and 88 sources identified through snowballing, we identified 51 sources, comprising 38 conference papers, 10 journal articles, and three doctoral dissertations, that met the IC.

Analysis and synthesis. Currently, we are continuing our in-depth analysis of the information extracted from the 51 included sources (see Appendix for a list of sources included in the review). For the current work, we employed a broad Microsoft Excel-based coding table [4], [19]-[21] to record and examine distinct elements across sources. We categorize elements under one of the following categories: (a) publication type; (b) study location (i.e., U.S. region); (c) institutional context; (d) research approach and methods; (e) participant characteristics (i.e., demographics, discipline, and service branch and status); and (f) author positionality. During our search and selection processes, we recognized that our final data set included multiple publications by the same authors and research study (i.e., same participant sample). In the review, we decided to include each as a distinct source, assuming that each is sufficiently unique to warrant a separate publication.

Findings

In this section, we present initial descriptive findings related to trends in publication timeline, research approach and methods, participant demographics, and military service characteristics across the included sources.

Publication timeline. To understand how this literature evolved over time since 2000, we plotted the number of publications per year by publication year for the 51 included articles.

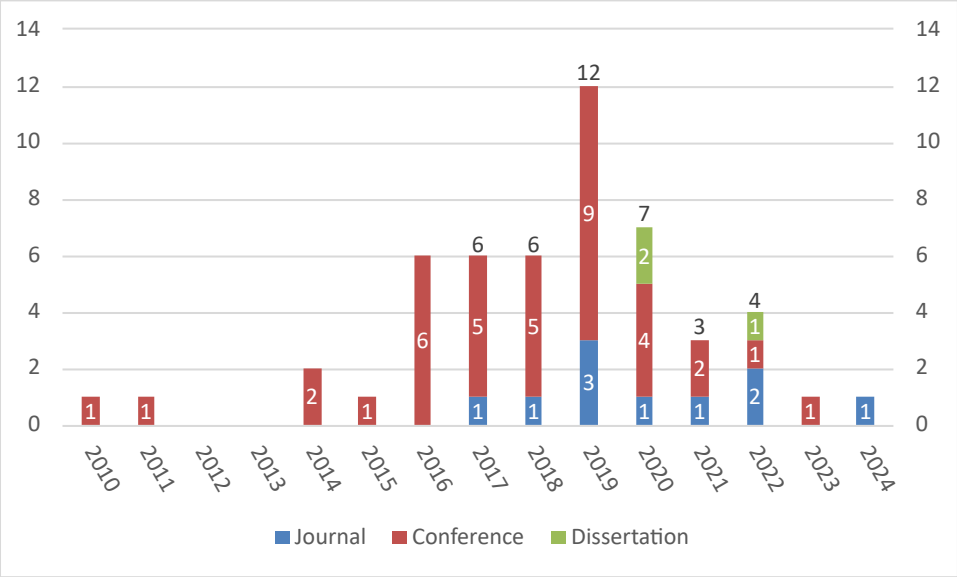

Fig. 2. Publication timeline since 2000 by type.

We grouped the articles published each year by type of publication (i.e., journal paper, conference paper, or PhD dissertation) (Fig. 2). STEM education-related publications first appeared in 2010-2011 as conference papers; conference and total publications per year peaked in 2019. Conference proceedings papers, presented at meetings of the ASEE (24), CoNECD (4), EDUCON (1), and FIE/IEEE (5), FYEE (1), IDETC-CIE (1), ISEC (1), SEFI (1) account for

nearly 75% (38/51) of all sources; the number of conference publications exceeded the number of other publication types each year through 2021. Three doctoral dissertations have been completed since 2020. These trends occur in combination with a small yet consistent publication rate of journal articles beginning in 2017, suggesting that interest related to SVSM in STEM education may be becoming more established as a research area.

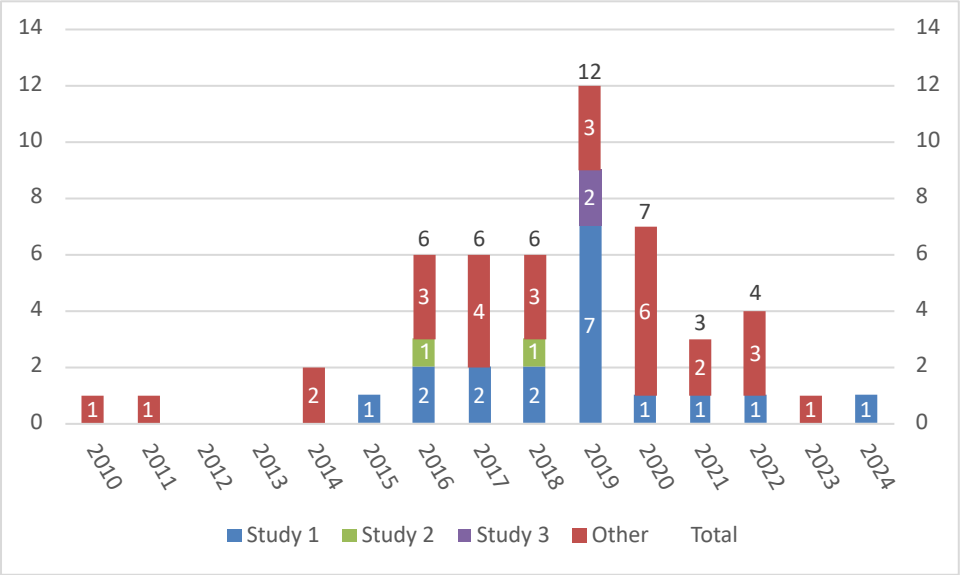

Fig. 3. Publication timeline since 2000 by research sources using a common dataset.

Fig. 3 displays this same timeline trend data (as Fig. 2) grouped into sources that came from a single study and, therefore, common dataset. Interestingly, we found that 35% (18/51) of included sources reported on a single, multi-institutional dataset ("study 1"). Two additional research teams ("study 2" and "study 3") authored multiple publications (2 each) from a single study. Consequently, the publication timeline of this literature should be interpreted using Figures 1 and 2 together: While there have been 51 individual publications since 2010 (Fig. 1), these publications reported findings from 29 unique datasets /research studies (Fig. 2). We also noted that 88% (45/51) of publications were conducted in engineering education, rather than another STEM discipline (i.e., science, technology, or mathematics) or an integrated STEM education context.

Research design. Next, we examined general trends in research approach across included sources (Fig. 4). The most common research approach, employed by more than one-half (28/51) of the sources, is qualitative research; more frequent use of qualitative approaches aligns with the emerging nature of research about SVSM in the STEM context. Approximately one-quarter (14/51) of sources employed mixed methods approaches, which are particularly useful for evaluation or intervention-based studies. A little over 10% (6/51) of sources used purely quantitative approaches, which have been employed more frequently since 2019.

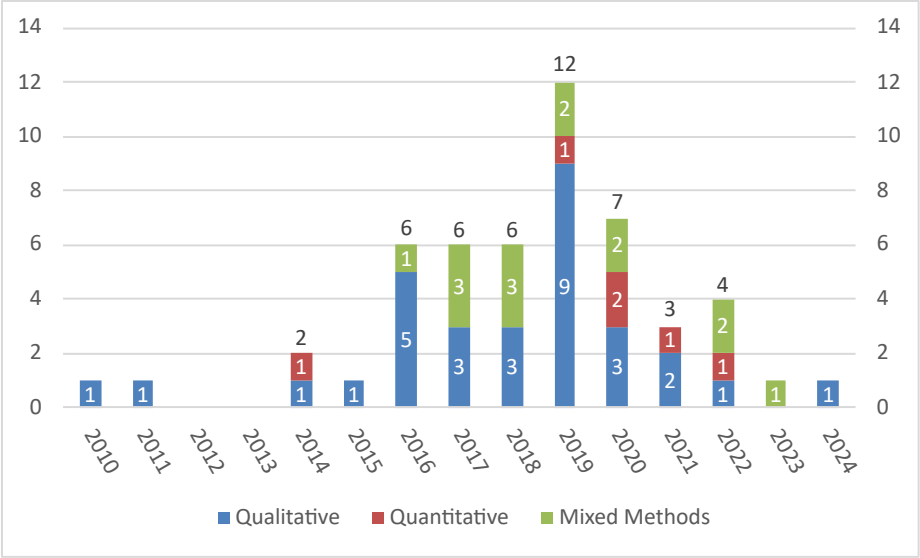

Fig. 4. Publication timeline by research approach.

Table 1 depicts research methods use across included sources. The two most frequently used data generation methods—one-on-one interviews and other "novel" or nonstandard methods such as the identity circles, life history timelines, and journals—were used primarily for qualitative research studies. Researchers conducting mixed methods studies typically used interviews in combination with surveys or questionnaires. Quantitative studies used surveys and/or questionnaires as the main if not the only source of data collection.

TABLE 1

RESEARCH METHOD USE ACROSS INCLUDED SOURCES

Research Methods	Number of sources	Percentage* of sources (51 total)
Questionnaires	14	27 %
Pre/post surveys	5	10 %
One-on-one interviews	29	57 %
Focus group interviews	11	22 %
Observations	7	14 %
Student records	1	2 %
Other novel methods (e.g., artifacts, journals, identity circles, timelines)	17	33 %

*Since several sources employed more than one data generation method, percentages do not total 100%

Participant demographic and service characteristics. We documented how participant characteristics, including gender, demographics, military branch affiliation, and military service status, were reported across included studies. As shown in Table 2, one-half (24/51) of sources described having at least one participant who identified as a woman; over 70% (36/51) of sources describing having at least one participant who identified as a man. Overall, however, more than one-quarter (14/51) of sources did not characterize their participant sample based on gender. We note that we included four studies that engaged participants other than SVSM (i.e.,

institutional agents, researcher/educator panelists, etc.) because the focus of these studies included SVSM in undergraduate STEM education (i.e., IC. 2).

TABLE 2

PARTICIPANT DEMOGRAPHIC CHARACTERISTICS ACROSS INCLUDED SOURCES

Participant Demographic Characteristics	Number of sources	Percentage* of sources (51 total)
Gender (Binary)		
Women	24	47 %
Men	36	71 %
Not reported (participant sample)	14	27 %
Race, Ethnicity, and other Identities		
Asian/Asian American	14	27 %
Black/African American	19	37 %
Hispanic/Latin	14	27 %
Underrepresented**	15	29 %
White	25	49 %
Not reported (participant sample)	13	25 %

* Since sources enroll multiple participants with varied racial/ethnic characteristics, percentages do not total 100%.
** "Underrepresented" includes first generation college students and students with disability-related identities.

The number/percentage of sources that describe participants with nondominant racial/ethnic and other identities are provided in Table 2. Although many of the included studies engaged at least one participant that has non-dominant racial/ethnic demographic characteristics, demographic characteristics across participant samples can be characterized as majority White and male.

TABLE 3

PARTICIPANT SERVICE CHARACTERISTICS ACROSS INCLUDED SOURCES

Participant Service Characteristics	Number of sources	Percentage* of sources (51 total)
Military Branch Affiliation		
Army	25	49 %
Navy	23	45 %
Air Force	18	35 %
Marine Corps	24	47 %
Coast Guard	4	8 %
Space Force	0	0%
Not Reported for participant sample	27	53 %
Military Service Status		
"Veteran"	36	71 %
National Guard	16	31 %
Reserves	13	25 %
Not Reported for participant sample	14	27 %

* Since sources enroll multiple participants with varied service characteristics, percentages do not total 100%.

We also documented how participant military service characteristics were reported across included source, as shown in Table 3. Approximately one-half (27/51) of sources did not report the military branch affiliation of the participants. Among those sources that did report participant military branch affiliation, five of the six current branches of the military were represented in literature (the Space Force, which became a military branch in 2019, was not represented). The observed differences in percentages among branch affiliations are influenced by branch size (i.e., the Coast Guard is a comparatively small branch) [e.g., 10], and the proximity of a given study location to a military installations (i.e., Air Force Base, Army Post).

While the included sources reported on participant military service status more frequently than military service branch, these reports were less clearcut. Approximately one-quarter (14/51) of sources did not report on participant service status, which is about one-half the number of sources that did not report participant service branch. Three-quarters (36/51) of sources reported having "veteran" participants. One-quarter (13/51) to one-third (16) of sources reported having participants serving in the Reserves or National Guard, respectively.

Defining Veteran. While three-quarters of sources reported engaging (military service-related) "veteran" participants, none provided distinct and complete definitions of the term. Specifically, we note that just one-eighth (7/51) of sources *provided some working definition* of the word "veteran" and *none made basic distinction between veterans and servicemember clear* (a veteran is someone who served their term of service but no longer serves).

In Table 4, we provide the 7 verbatim definitions of "veteran" provided in 7/51 included studies, After collecting and recording the definitions, we categorized them into one of three categories: (1) definitions that are *incorrect* because they do not accurately differentiate between veterans and those currently serving, (2) definitions that are *incomplete* because they differentiate between veterans and those currently serving but do not clearly state what the difference is, and (3) definitions that are *correct but incomplete* because, while they correctly identify the difference between veterans and servicemembers, the (correct) information provided is muddled by bringing other (undefined) terms (i.e., "active duty", "enlisted", "student veteran", "military student", "military-connected student") into the "veteran" definition.

TABLE 4

DEFINING "VETERAN" ACROSS INCLUDED SOURCES.

Source	**Verbatim Definition of "Veteran"**
Incorrect: *Definition does not accurately differentiate between veterans and those currently serving*	
[23]	For the purposes of this study, a student **veteran** is an enrolled college student or recent graduate **who served or serves** in the United States Armed Forces.
[24]	A student **veteran** is an enrolled student or recent graduate **who served or serves** in the. …..

[25]	Any student who is a **current or former member** of the active-duty military, the National Guard or Reserves regardless of deployment status, combat experience, legal veteran status, or GI Bill use.
[26]	I use the word **"Veteran**" throughout this document to mean **both those who have served in the military and those currently serving** in the military, including Active-Duty personnel, drilling Reservists, and those in the National Guard.
Incomplete: *Definition differentiates veterans from those currently serving but does not describe what the difference is*	
[27]	Military students, defined for the purposes of this study as students who are **U.S. military veterans and/or current military service members**, such as in the Reserves and National Guard, continue to be understudied and underserved in undergraduate engineering education.
Correct but Incomplete: *Definition provides accurate information, but also brings in other undefined terms that are not defined*	
[28]	Much of the research on military-connected students focuses on former members of the military (i.e., "student veterans"), or those **individuals who served in the military (i.e., were a part of the "active component" or AC),** then exited the military and moved on to pursue their college degrees.
[29]	Military undergraduates are understood to be those who comprise a heterogeneous group of prior enlisted military veterans (i.e., **those who have served** in the enlisted ranks in the U.S. military **but no longer serve) and those who concurrently serve** as enlisted members of the U.S. military, such as in the Armed Forces Reserves or National Guard, while attending college.

We categorized four of seven definitions as *incorrect* [23]-[26]because they did not accurately delineate between veterans and current service members. Rather, these definitions lumped SVSM into a single, monolithic "military" research participant. Another definition [27] wa*s incomplete* in that it distinguished veterans from current service members but did not explicitly state what that is. Finally, two definitions [28]-[29] were *correct but incomplete* because they used additional military terms and information in the descriptions that detracted from the basic understanding of what a veteran is and how differ from current service members.

Discussion and Implications

Our preliminary findings present several implications for future research and practice initiatives with SVSM in STEM. To begin, research about undergraduate SVSM in STEM education is still emerging and currently spearheaded by researchers in the field of engineering education. The bell-shaped timeline that describes publication of this literature may reflect the naturally undulating interest in Veterans Studies more broadly, which inversely follows national military activity (i.e., servicemember scaleups/deployments and drawdowns). Drawdowns, which tend to catalyze servicemember departure from service, hasten their arrival on campus, and signal the availability and use of military educational benefits at scale, usually increase both practical and research-related interest in the post-service education of veterans and servicemembers. Additionally, the 2009 enactment of the Post 9/11 GI Bill—the most generous of all time for both

veterans and servicemembers—may work to further spur interest in SVSM STEM education even if/as national military needs vary throughout the 21st century.

Currently, simply tracking the number of publications related to SVSM in STEM education over time is not a reliable approach for judging field-related research interest, as the current literature base is characterized by twice as many publications as uniquely contextualized studies undertaken. Tracking SVSM STEM education research funding dollars and award institutions may provide additional clues as to if/how interest in the topic varies over time and whether it is/is not taking root as an engineering or STEM-specific interest rather than remaining a niche topic peculiar to only certain researchers or institutions. In other words, while this literature may be concentrated at a small number of institutions and U.S. regions (e.g., the Southeast, Northeast, etc.) currently, there is need to deliberately grow this research not only in numbers but also in and across different U.S. geographies and institutional types since SVSM attend college at every type of institution in every region of our nation.

The research to date on SVSM in STEM education is largely qualitative in nature with a growing use of mixed methods approaches. An emphasis on qualitative inquiry must remain, as the contextual nature of military service and transition to college require individual and nuanced approaches to capture the variation of SVSM educational experiences. There is also need for greater use of mixed methods approaches to describe, assess and disseminate promising curricular and co-curricular teaching and learning practices for including and retaining SVSM in STEM. Finally, nationally focused quantitative studies, able to engage more SVSM and simultaneously require less time from each individual SVSM to participate, may help researchers clear the substantial hurdle of recruiting participants with varied demographics, especially as related to race, ethnicity, and gender. Larger scale, demographically diverse studies are needed to support STEM education and the STEM workforce in becoming demographically diverse too.

The field of engineering education and, in particular, members of the Military and Veterans Division (MVD) of the American Society of Engineering Education who represent a variety of academic, industry, and military identities, and experiences, are well-positioned to take a lead role in organizing and communicating quality touchstones related to SVSM scholarship in STEM disciplines. Because military jargon can be cryptic to those not familiar, MVD members are vital to helping define and model appropriate use of military terms and identifiers—particularly terms like “veteran”— with their participants, other researchers, and in their publications. Moreover, MVD leading an effort to define a common language for SVSM research in STEM would support both inter- and cross-study transferability and improve broader understandings of how SVSM research in STEM can best be designed, conducted, and reported. Without a common language to communicate research context, approaches, and findings across military and civilian communities, it will be difficult to make impactful change in SVSM STEM education practice and policy at other than local, institutional levels.

Limitations

As all research does, this scoping review has limitations. One limitation is the potential for researcher biases to influence the identification and selection of review articles. We mitigated this limitation by requiring at least two research team members to make consensus-driven inclusion decisions on all articles identified through database searches and initial set snowballing. If the two assigned researchers could not reach consensus regarding article inclusion at any stage of review, at least one additional team member reviewed the article and

supported the discussion to reach consensus on the final decision. A second limitation relates to the degree of systematicity achieved in our application of the scoping review methodology. To maximize systematicity within our review, we used and documented published procedures for secondary systematic search and selection for synthesis-style literature reviews, including (a) investigating multiple academic databases and developing database-specific search strings in collaboration with an academic librarian; (b) requiring that included sources were peer-reviewed for quality considerations; and (c) conducting snowballing to identify articles either not in the databases we searched or published after our search concluded.

Conclusions

There are increasing national and global needs to recruit, train, and sustain an adaptable STEM workforce capable of addressing the 21st century challenges using a variety of perspectives and talents. Because many of the technical and nontechnical skills and experiences servicemembers acquire during military service are valued in postsecondary STEM education and careers, SVSM have come to represent a vital source of U.S. STEM workforce talent. This comprehensive scoping review of 51 sources of published literature suggests that the current interest in this topic should be actively cultivated. Researchers in STEM education should strive to define research contexts and populations using an accurate and standardized set of terms. To progress knowledge and understanding in this area, researchers should consider expanding their application of quantitative approaches to engage more SVSM across a variety of geographic locations, demographics, and service characteristics. Qualitative and mixed-methods approaches will retain their importance for exploratory and intervention style research to continue to address and account for the highly individual and contextualized nature of this research topic. More synthesis research should be conducted to support the identification of frameworks, strategies, and levers of success that are effective for integrating and engaging SVSM in STEM education across contexts.

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