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Student Veteran Decision Points in Selecting Two Year or Four Year Engineering Degrees

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As STEM education continues to emphasize applied and experiential learning while workforce demand for technically skilled employees accelerates, Student Veterans and Service Members (SVSMs) face a critical choice between two academic pathways: 2-year programs in engineering technology and 4-year programs in engineering. Traditionally, engineering has been positioned as the more theoretical discipline, while engineering technology has emphasized applied skills. Yet, these distinctions have blurred: contemporary engineers increasingly describe themselves as "technologists" and rely heavily on applied computational tools such as machine learning. For SVSMs seeking to translate military technical expertise into civilian credentials, this ambiguity creates a set of underexplored decision pressures. What signals do they trust in evaluating program legitimacy? How do institutional, financial, and cultural factors interact with their prior training? And what pain points arise when navigating pathways that are nominally distinct but increasingly overlapping? This project explores these gaps by examining the decision-making processes that shape SVSMs' selection of engineering versus engineering technology degree tracks, with attention to how these choices affect both individual career trajectories and broader workforce alignment.

The purpose of this study is to explore considerations for student veterans in choosing a two-year engineering program versus a traditional four-year engineering program. Two-year technical degrees are typically offered at junior or technical colleges, while four-year engineering programs are offered at many traditional universities and colleges. This paper will focus on the results of anonymous survey responses comprised of Likert-scaled answers and some qualitative responses to gain insight on the veterans' backgrounds, priorities, and means to higher education. Responses will help identify decision points and pressures that may affect student veterans' degree and career choices in engineering and engineering technology, including access to career counseling resources. The student population in this paper refers to student veterans and reservists. Faculty, staff, and students who have a direct connection to the College of Engineering will be surveyed. Mixed model statistical models will be built to better understand any correlations between prior service status and degree pathway considerations.

Key Words: veterans, engineering, engineering technology, academic program selection, academic program retention

1.1 Introduction: Pathway Pressure

For decades, policymakers and corporate leaders have been concerned that the nation's status as a world leader in innovation is falling. They have been vocal to expand and improve the quality of the nation's technical workforce [1]-[2]. Businesses struggle to fill critical skilled roles in STEM occupations and thus suffer sluggish growth. In fact, some estimate that up to 2.4 million STEM jobs go unfilled as some college graduates in STEM fields struggle to find jobs. STEM jobs have doubled as a proportion of all jobs since the industrial revolution [3]. Employers have stated they need employees who can do and work with their hands as much as their heads, placing high value in internships and coops. These experiences lead to future job placement and increased intern participant confidence and resilience [4].

These workforce concerns are not new, and higher education has long responded to similar pressures through pedagogical models that focus on learning-by-doing. Similarly, experiential learning has been a recognized part of engineering education for approximately 70 years (post-Korean War) [5]. Higher education institutions are still investing heavily in educational approaches which have a strong foundation in experiential learning [6].

Despite this shared commitment to experiential learning, not all engineering-adjacent pathways have been equally valued or clearly distinguished. Often described as ‘engineering, but more hands-on,’ engineering technology degrees and jobs have waxed and waned. While there are distinct differences between engineering and engineering technology, the boundaries have been ill-defined, and recent discussions have shown a shift in the views of both sides of the debate which has, in some instances, created conflict. The fact is that these career pathways, when properly defined, do not conflict, but rather supplement each other [7].

When examined through accreditation standards and credentialing outcomes, engineering technology programs demonstrate a level of rigor and workforce alignment that is often underappreciated. Engineering technology programs often have accreditation legitimacy, and graduates of these programs often earn various credentials, making them immediately valuable to their employers. A division of the National Society of Professional Engineers (NSPE) is the National Institute for Certification in Engineering Technologies (NICET). NICET certification is recognized—and even required—by many employers and government agencies throughout the United States and internationally as assurance that an individual has mastered the critical elements in a specific discipline of engineering technology [8].

1.2 Background and Conceptual Framing

History. To support innovation, the U.S. requires development and retention of individuals who are highly skilled in science, technology, engineering, and mathematics (STEM). These STEM professionals operate globally, spanning government, industry, and academia. Engineers play an especially important role as the designers of technological systems and processes to enable economic growth, to maintain and improve quality of life, and to assure national security [1]. Additionally, engineering technologists and engineering technicians play an important role as implementers of those engineering design solutions. Engineering technology degrees can be traced to the mid-to-late 1950’s to meet the anticipated need for more technically trained individuals in industry that would have otherwise not been met by new engineering graduates who were more theoretically oriented having come from traditional engineering programs. These engineering technology programs tended to emphasize the development of hands-on, practical, and problem-solving skills relevant to the needs of industry [1].

Accreditation. ABET accredits both engineering and engineering technology programs from two different commissions, the Engineering Accreditation Commission (EAC) and the Engineering Technology Accreditation Commission (ETAC), respectively. ABET acknowledges that engineering and engineering technology are separate but are closely related professional areas that differ in curricular focus and career paths, as illustrated in Table 1 [9].

Table 1: Relationship between Engineering and Engineering Technology [9]

	Engineering	Engineering Technology
Curricular Focus	• Theory and conceptual design. • Additional, higher-level mathematics, including multiple semesters of calculus and calculus-based theoretical science courses. • More foundational analysis of problems.	• Application and implementation. • Algebra, trigonometry, applied calculus, and other courses that are more practical than theoretical in nature. • Current industrial design practices that allow students to start developing practical workplace skills.
Career Paths	• Entry-level work involving conceptual design or research and development. • Eligible to become registered professional engineers (P.E.) in all U.S states and territories by a process of two examinations, the Fundamentals of Engineering (FE) Examination and the Principles and Practice of Engineering (PE) Examination, together with documentation of engineering work experience.	• Entry-level positions in sectors such as construction, manufacturing, product design, testing, or technical services and sales. • Four-year program graduates are eligible to become P.E.'s by the same process in many (though not all) U.S. states. Two-year program graduates' eligibility for P.E. licensure varies by U.S. state. • Positions in maintenance, production, or product development.

2. SVSMs in Engineering and in Engineering Technology Programs

There have been several studies on leveraging military veteran skills to fill shortages or accelerate qualifications for employment. Some industries in need of helicopter pilots include medical transport and offshore oil support. In a recent article, one university explored a new program to allow student veterans to earn their Federal Aviation Administration (FAA) Commercial Pilot and Flight Instructor certification and a Bachelor of Science degree in Aviation Science [10]. Another university facilitated veterans' transition into hardware security roles [11].

Many SVSMs who pursue higher education have several financial resources to assist them and have many skills to include persistence and teamwork, making them well-suited for engineering or engineering technology degrees [12]. However, many SVSMs face other challenges often from staff, faculty, and other students who may view them differently as a non-traditional student. Some of these views may be positive or negative and may be based on stereotypes [13]-[16].

While there are interest and a growing literature in the SVSM transition into higher education for career progression, there are gaps in the existing literature regarding pathway selection. The difference between a two-year engineering technology degree and a four-year engineering degree could bring very different outcomes for a non-traditional student coming from the military. One study suggests that student veterans may struggle with finding their place in the engineering profession and how their military experiences translated to both academic and professional contexts [17]. Another recent paper [18] examined the unique characteristics of engineering and engineering technology degrees within the subject institution's campus system and the state's rurality. Expanding this work but focusing on SVSMs and their backgrounds and interest in engineering or engineering technology programs, the remainder of this paper discusses faculty and staff perceptions of SVSMs who pursue engineering or engineering technology programs.

3. Research Questions

This study was guided by two distinct research questions:

1. How do faculty view SVSMs' selection of 2-year engineering technology versus 4-year engineering pathways?
2. How do faculty view SVSMs in general?

4. Methods

Study Design. This study employed a cross-sectional mixed-methods survey (see the Appendix) to examine factors influencing SVSMs' decisions between two-year engineering technology programs and four-year engineering degree pathways. The survey instrument deployed Likert-scaled items on a 5-interval scale. Likert-scaled responses ranged from 1 – strongly disagree; 2 – disagree; 3 – neutral; 4 – agree; 5 – strongly agree.

Participants and Sampling. The study was conducted at a large, public, multi-campus institution, The Pennsylvania State University (Penn State). Engineering and engineering technology programs are distributed across multiple campuses, while the College of Engineering at Penn State is physically located at the flagship campus and administratively connected to both affiliated and functionally autonomous engineering units across the broader University.

A convenience sample of faculty affiliated with engineering and engineering technology programs was recruited via email solicitation, with the final sample including 74 faculty representing 15 campus locations and 21 academic departments or units. No campus affiliation was recorded to protect the anonymity of respondents. The sample reflected a mix of faculty appointment types, with roughly 60% tenure-track and 40% non-tenure track. Faculty rank and role are known to have impacts on a student's educational experience and student perceptions [14]. For this reason, the authors were interested in faculty perceptions of SVSMs as a potential variable with SVSMs' engineering experience.

Instrumentation. The survey instrument (see the Appendix) included:

- Likert-scaled items using a 5-point scale as described in *Study Design.*
- Demographic and background information items related to prior military service, academic pathway, contact with SVSMs.

- Items to probe degree pathway considerations, including perceptions of program legitimacy, time-to-degree, financial constraints, and access to academic advising.

Data Collection. The research survey study was IRB approved and administered via email solicitation of faculty in the institution associated with the College of Engineering at the subject institution. Surveys were administered electronically using an email-based recruitment strategy targeting faculty affiliated with engineering and engineering technology programs across the institution's distributed campus organization. Participation was voluntary and confidential. No identifying information was collected beyond role-based and program-level descriptors necessary for analytic grouping, except for those individuals who reached out to a study author via email.

Data Analysis. Quantitative survey data were analyzed using descriptive statistics to characterize respondent distributions and central tendencies across degree pathway considerations. The Appendix contains all survey question averages and standard deviations for Likert responses.

5. Results

Participant characteristics. Participants consisted of faculty from the institution's main campus (engineering only) and several satellite campuses where engineering and engineering technology programs exist (n = 18, excluding incomplete records). These campuses vary in terms of mission and advising structure, with some regional campuses relying more heavily on faculty to provide academic advising, while most flagship campus engineering programs utilize professional academic advising staff.

Approximately 29% of the survey respondents were women. Respondents represented a range of faculty ranks and appointment types, including tenure-track/tenured and non-tenure-track faculty. Faculty rank and appointment type were treated as descriptive and contextual signals in this study.

Quantitative Findings. Quantitative results are presented in two parts. First, descriptive statistics summarize faculty respondent characteristics to contextualize the institutional environments in which SVSMs navigate engineering and engineering technology pathways (Table 2). For example, about 30% of faculty self-identified as first-generation college students, most of them being men.

Table 2: Distribution of Faculty Roles

Faculty Rank	**n**	**%**
Assistant Professor	2	11.1
Associate Professor	5	27.8%
Full Professor	10	55.6%
Instructor or Lecturer	1	5.5%
Total	18	100%

Second, Likert-scaled survey items capture faculty perceptions of SVSM experiences in higher education (Figures 1-3). Several items of interest appear in the survey results, presented in Figures 1-3. First, most faculty believe the SVSMs have a mostly positive experience in higher education (Likert = 3.81). Descriptive statistics were used to summarize central tendencies and variability across items. Across individual items, responses clustered primarily between neutral and agree, with fewer responses at the extreme ends of the scale. This pattern suggests that while faculty generally view SVSM experiences favorably, perceptions are not uniformly strong and vary by specific dimension of experience. The sample size is small, but several items were observed to display skewed responses in their overall distribution.

Items related to 'SVSM preparedness and capability' (e.g., [Item Q65]) tended to receive higher mean ratings than items related to 'institutional structures or support mechanisms' (e.g., [Item Q73]), indicating greater confidence in individual student attributes than in systemic or organizational factors. Several items exhibited wider response dispersion, reflecting the breadth of faculty experiences across campus contexts and instructional roles. No inferential comparisons by faculty rank, appointment type, or campus location are reported here due to sample size and the exploratory nature of the study. Instead, Likert-scale findings are presented descriptively to characterize the perception landscape in which SVSMs navigate engineering and engineering technology pathways.

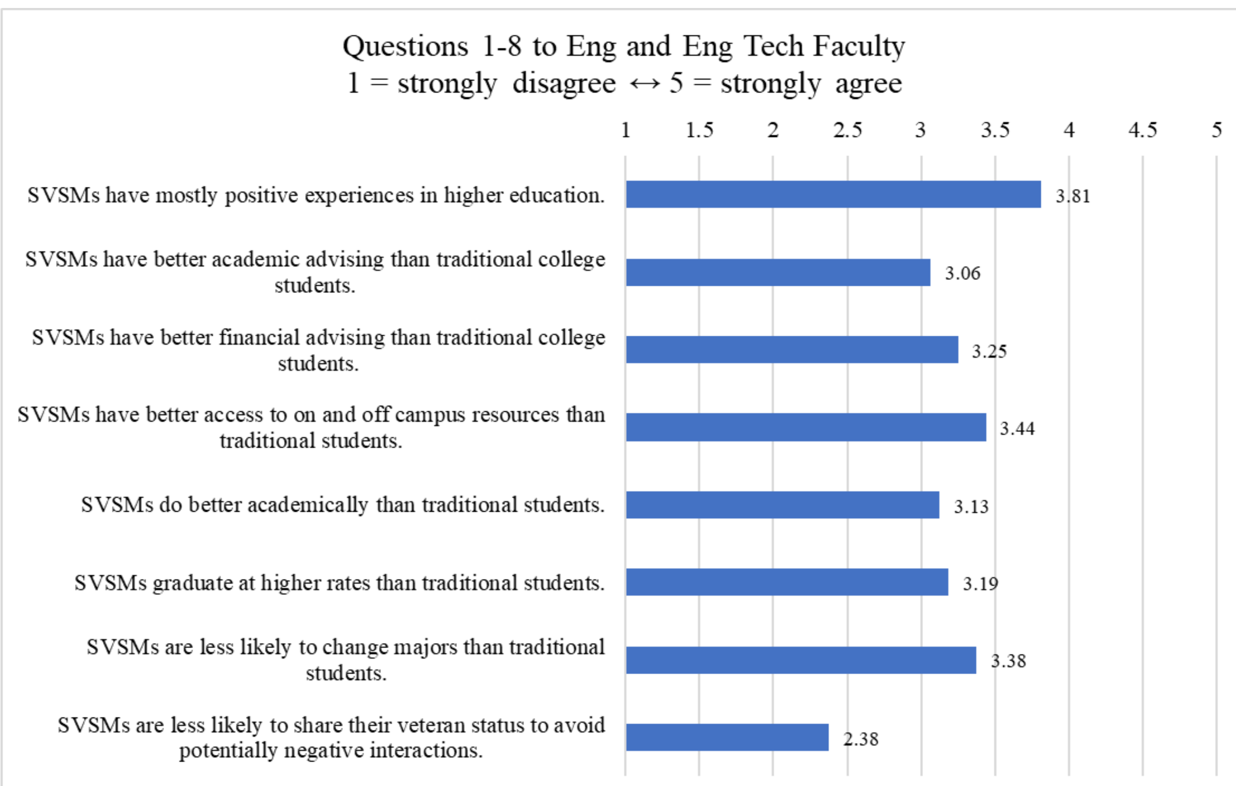

Figure 1: Survey Question 1-8

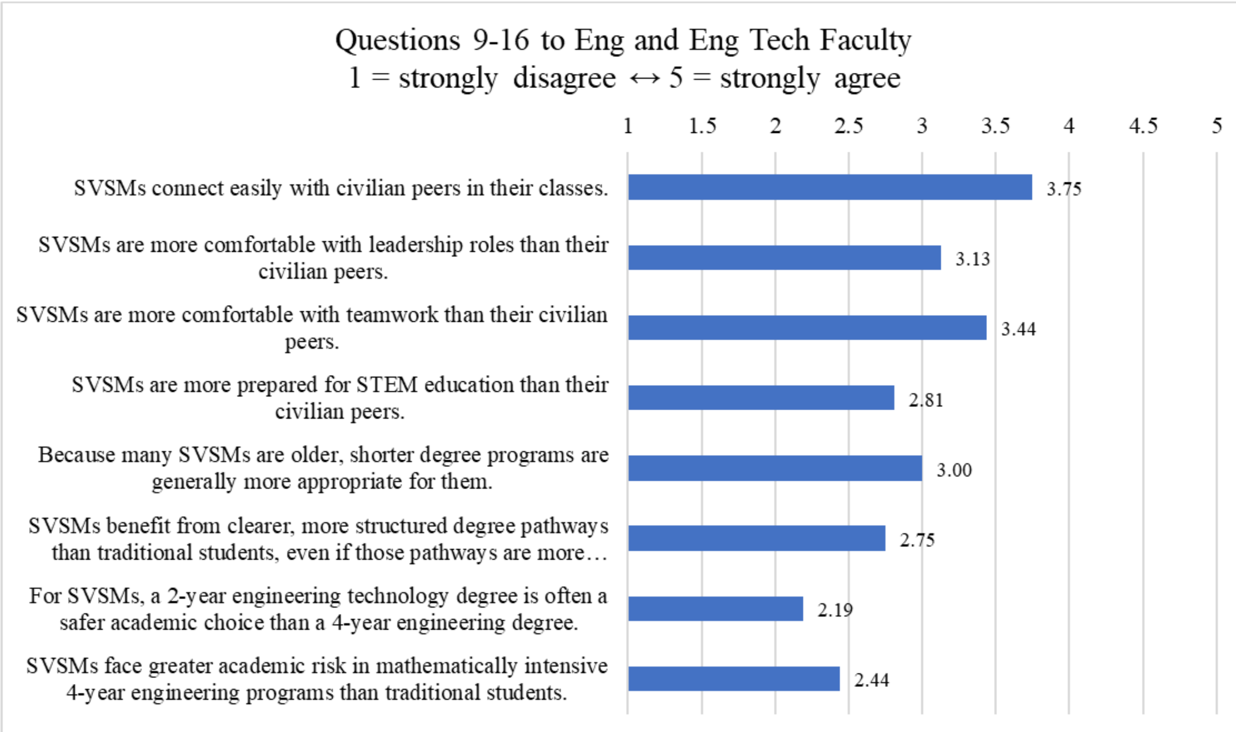

Figure 2: Survey Question 9-16

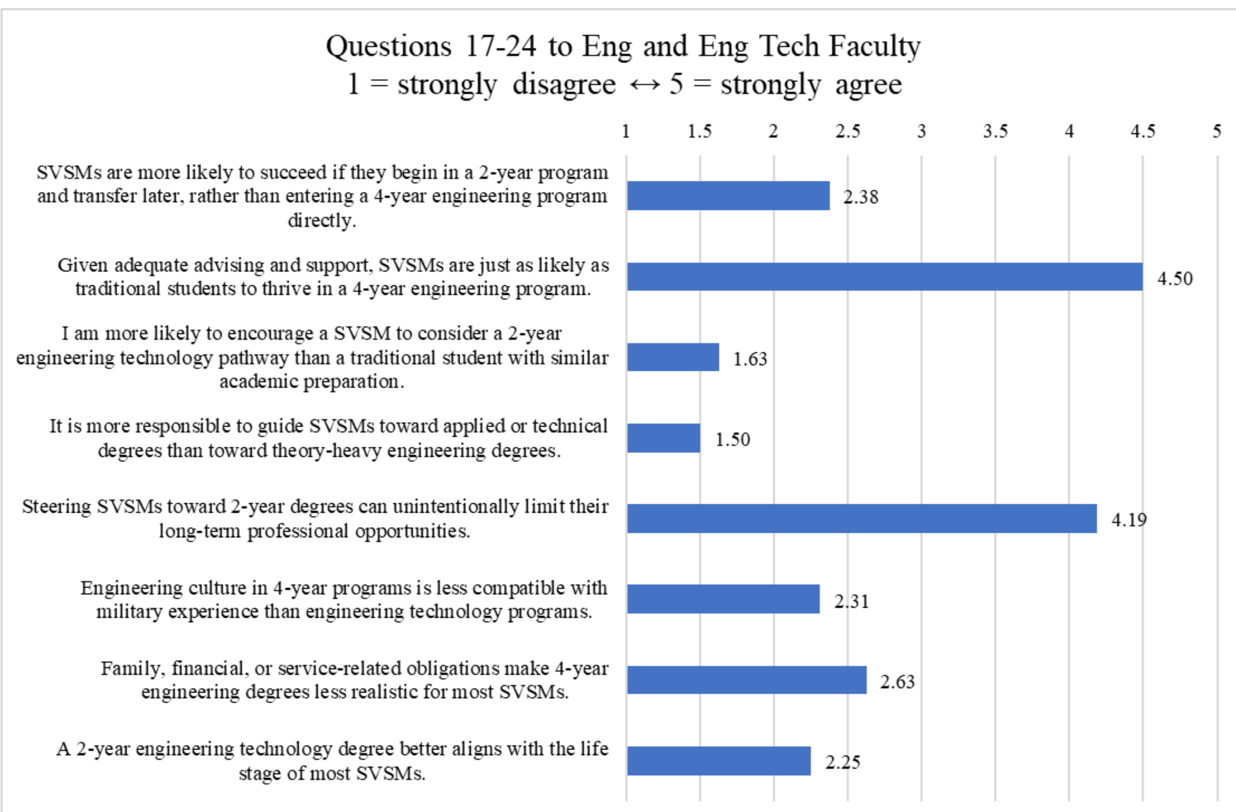

Figure 3: Survey Question 17-24

However, responses varied notably across specific dimensions. In particular, it should be noted that items relating to SVSM disclosure and self-identification exhibited lower levels of agreement. Faculty responses to the statement assessing whether SVSMs are reluctant to report or disclose their veteran status yielded a mean of 2.38, indicating overall disagreement with the premise that non-disclosure is a concern.

This contrast between generally positive perceptions of SVSM experiences and lower recognition of disclosure-related dynamics highlights variation in faculty understanding across domains. While faculty expressed confidence in SVSMs' educational experiences and capabilities, perceptions related to institutional navigation and identity signaling were less aligned with documented challenges [19]-[21] faced by student veterans.

6. Discussion

The typical survey respondent did not have experience teaching, training, tutoring, or advising SVSMs. Faculty perspectives on SVSM educational pathways therefore appear to be largely formed in the absence of such experiences. The absence of such experiences does allow for the possibility that respondent views could partially be influenced by societal influences or on personal life experiences rather than on observations of actual SVSMs in higher education itself. That said, the relative inexperience of survey responses tends to suggest the existence of opportunities for faculty professional development training in relation to SVSM populations.

Faculty respondents leaned towards disagreement with the statement that SVSMs expect special recognition (M = 2.23), though there was a non-trivial minority of respondents who agreed or strongly agreed that SVSMs expect special recognition. In follow-on work, it may be fruitful to explore further why respondents felt this way – given that respondents tended to believe that SVSMs largely have positive experiences in higher education (M = 3.81) and that SVSMs connect well with the civilian peers in their classes (M = 3.75), a possibility exists that respondents may have felt this way because they perceived atypical advantageous social statuses for SVSMs.

7. Implications for Practice

SVSMs are one type of non-traditional student. Faculty and fellow student in-class interactions with SVSMs are known factors impacting student veteran persistence and degree success [22]-[23]. Faculty, advisers, and administrators should have a basic understanding of the SVSM population, based on facts, and the SVSMs will likely expect faculty, advisers, and administrators to understand and work with them towards their educational goals. Organizations should assess what professional development opportunities are available for faculty and staff to support SVSMs similarly relative to traditional college students. Many SVSMs take college-level courses and earn academic credit while in the military. Some of these courses can be recognized for credit and ease the academic requirements of engineering and engineering technology programs for SVSMs.

Academic advising redesign. Some institutions have leaned on academic advising support structures in part as retention structures. Academic advising has been linked more fundamentally to student success [24]. SVSMs are at elevated risk of feeling lost at post-secondary institutions, particularly as they acculturate to the institution [25]. At the subject institution, advising organizational models are generally distributed and variant, leaving scope for future investments to systematize student supports that would further assist not only SVSMs but other engineering and engineering technology students.

Articulation agreements and credit recognition. Acquisition of credit policies can impact student institution selection and academic program selection; given market dynamics, it is typical for students to “shop” admission offers considering both experience and net cost. The subject institution has invested in updating prior learning assessment processes, including military credit over the last eight years.

8. Limitations and Future Work

One limitation of this study is that respondents were from a large, land-grant Research 1 university with several satellite campuses, and campus characteristics were not considered. Some responses were from the flagship campus with a small proportion of SVSMs in relation to the overall student population. Additionally, the satellite campuses have a larger proportion of SVSMs in relation to their overall student population. Knowledge of engineering technology programs is relatively sparse at the flagship campus. However, many satellite campuses have both engineering and engineering technology programs. Most of the satellite campus faculty are familiar with engineering technology programs in curriculum and administrative matters.

Future work in this area will examine, revise, and validate the survey tool, and expand the number of responses. Additional work will include SVSM perceptions to compare their experience to faculty perceptions and experiences. These initial observations suggest there may be more insight that can help the team develop strategies for faculty, staff, and administrators to ultimately improve the SVSM higher education experience and decisions for engineering or engineering technology degrees. Future work will also include investigating the key observations noted in the previous section through focus groups and interviews. Other perceptions towards student veterans come from potential and current employers, fellow students, and even the student veterans themselves. These groups may have perceptions that encumber the student veteran experience in higher education, and their reasons may be significantly different than the faculty and staff population. Similarly, a comparative non-veteran analysis of faculty perceptions of traditional students in engineering and engineering technology programs may be of interest.

Longitudinal tracking of these perceptions as a factor of campus and faculty exposure to SVSMs is another area the team is considering. With structural reorganization of satellite campuses and alignment of engineering and engineering technology programs at particular campuses, perceptions may change over time.

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Appendix: Survey Instrument (Likert Scale 1-5)

Item #	Question	Average	Std Dev
Q53	Students who identify as Veterans, Active Duty, or Reservists have mostly positive experiences in higher education.	3.813	0.634
Q55	Students who identify as Veterans, Active Duty, or Reservists have better academic advising than traditional college students.	3.063	0.658
Q56	Students who identify as Veterans, Active Duty, or Reservists have better financial advising than traditional college students.	3.25	0559
Q57	Student veterans have better access to on and off campus resources than traditional students.	3.438	0.778
Q58	Student veterans do better academically than traditional students.	3.125	0.992
Q59	Student veterans graduate at higher rates than traditional students.	3.187	0.726
Q60	Student veterans are less likely to change majors than traditional students.	3.375	0.696
Q61	Student veterans are less likely to share their veteran status to avoid potentially negative interactions.	2.375	0.781
Q62	Student veterans connect easily with civilian peers in their classes.	3.75	0.901
Q63	Student veterans are more comfortable with leadership roles than their civilian peers.	3.125	0992
Q64	Student veterans are more comfortable with teamwork than their civilian peers.	3.438	0.864
Q65	Student veterans are more prepared for STEM education than their civilian peers.	2.813	0.882
Q79	Because many student veterans are older, shorter degree programs are generally more appropriate for them.	3.000	0.866
Q78	Student veterans benefit from clearer, more structured degree pathways than traditional students, even if those pathways are more limited.	2.750	1.145
Q70	For student veterans, a 2-year engineering technology degree is often a safer academic choice than a 4-year engineering degree.	2.188	0.949
Q71	Student veterans face greater academic risk in mathematically intensive 4-year engineering programs than traditional students.	2.438	1.223
Q72	Student veterans are more likely to succeed if they begin in a 2-year program and transfer later, rather than entering a 4-year engineering program directly.	2.375	0.927
Q73	Given adequate advising and support, student veterans are just as likely as traditional students to thrive in a 4-year engineering program.	4.500	0.612
Q76	I am more likely to encourage a student veteran to consider a 2-year engineering technology pathway than a traditional student with similar academic preparation.	1.625	0.781

Q77	It is more responsible to guide student veterans toward applied or technical degrees than toward theory-heavy engineering degrees.	1.500	0.612
Q74	Steering student veterans toward 2-year degrees can unintentionally limit their long-term professional opportunities.	4.188	0.634
Q82	Engineering culture in 4-year programs is less compatible with military experience than engineering technology programs.	2.312	1.210
Q80	Family, financial, or service-related obligations make 4-year engineering degrees less realistic for most student veterans.	2.625	0.992
Q81	A 2-year engineering technology degree better aligns with the life stage of most student veterans.	2.250	1.031