

Influence of Pre-professional Organizations on TEE Students

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ABSTRACT

Since the 1970's, there has been a notable decrease in the number of Technology and Engineering Education (TEE) teacher preparation programs, as well as TEE teacher preparation program graduates within the United States. Previous studies have investigated reasons that post-secondary students pursue a TEE degree. However, no research is currently available regarding factors influencing student retention in TEE teacher education programs as well as factors that influence whether TEE preservice teachers enter the education field. Using the expectancy-value theory, this study investigates the relationship of participation of communities of practice in a student's intention to graduate from the program and enter the teaching field following graduation. This is the first step to a cross-sectional study looking at the influence of exposure to and participation in the Technology and Engineering Educators Collegiate Association on TEE teacher preparation program students. Participation in TEECA was measured ordinally with varying levels of participation depending on a student's activity level in student chapter meetings, conference attendance, and event participation.

Key Words: TEE, Technology Education, Preservice Teachers, Teacher Preparation, Pre-Professional Organization

1. INTRODUCTION

Volk (2019) has expressed concern regarding a notable decrease in the number of Technology and Engineering Education (TEE) programs (formerly recognized as Industrial Arts and Vocational Education) across the United States as part of a decrease in the number of TEE educators. This trend has been tracked back to the 1970s when there were 203 undergraduate Industrial Arts and Vocational Education teacher preparation programs in the United States. During this time, there were over 6000 undergraduate degrees awarded, which declined to just over 160 awarded by TEE programs in 2017.

Concerns with these statistics have motivated continued research surrounding the current status of TEE teacher preparation programs in the United States, including recruitment and retention

(Litowitz, 2014; Love & Love, 2022). Litowitz (2014) investigated the similarities and differences in the curricula required and offered between these pre-service TEE programs that pre-service teachers are enrolled in. Additionally, Love and Love (2022) found that face-to face interactions with members of the TEE community were the most influential factor in pre-service teachers choosing to pursue their TEE degree.

Given the importance of face-to-face interactions within the TEE community for prospective technology and engineering teachers, further investigation into student recruitment and retention for students involved in a pre-service teacher collegiate association could prove to be an important variable in TEE program success. The prominent pre-service TEE teacher program in the United States is the Technology and Engineering Education Collegiate Association (TEECA) affiliated with the International Technology and Engineering Educators Association (ITEEA). Participation in TEECA allows for students pursuing a future in TEE a chance to network while competing in skills and content-based challenges against students from other universities. Students are also afforded the opportunity to participate in leadership positions at both a chapter and national level. Affiliation with, and participation in TEECA can vary between TEE teacher preparation programs. Further investigation of possible benefits associated with pre-service teachers' involvement with TEECA could help serve current TEE programs in their recruitment and retention of future teachers to the field. However, no research currently exists regarding TEECA and its role in the retention of TEE students.

1.1. Purpose of the Study

This study is a first step in an investigation of the influence of participation in TEECA on students' intentions to teach and continue in their undergraduate degree. The purpose of this study was to identify the participation levels in TEECA and their intentions to complete their TEE teaching degree as well as pursue a career as a TEE educator after graduation from their teacher preparation program.

2. LITERATURE REVIEW

2.1. TEE Teacher Shortage

Teacher shortages in the education system in the United States have been a recurrent trend throughout the history of the United States (Hawley, 1986; Ingersoll, 2003). Reasons found for teachers leaving have ranged from job dissatisfaction, retirement, pursuing a new career, and personal reasons (Ingersoll, 2001). However, in addition to teacher attrition, the teacher shortage in Career and Technical Education (CTE) has come as a result of a lack of college graduates in teacher preparation programs (Boyd et al., 2006; Conneely & Hyslop, 2009; Ingersoll, 2001, 2002). This is particularly true for TEE which lies under the CTE umbrella (Moye, 2009; Volk, 1997).

ITEEA has reported a decrease in existing TEE teacher preparation programs, which dropped from 72 reported programs in 2007 to 43 programs as of 2015 (Love, 2016; Warner et al., 2007). Various studies have been conducted to look at the curricula and content offered within these

programs (Litowitz, 2014; Strimel, 2013). In addition to these studies, Love (2016) investigated further into the informal experiences that were offered within the various TEE teacher preparation programs. This study looked at mentoring and organization or club experiences. Love and Love (2022) continued this research to find that face-to-face interactions with secondary TEE educators, alumni, and faculty were a significant influencer for students pursuing a TEE undergraduate degree. While these studies help to show secondary influences that have led to the recruitment of students enrolling in TEE teacher preparation programs, there remains an absence of studies surrounding collegiate experiences that encourage the retention of preservice teachers within TEE or the increased intentions of preservice teachers to enter the teaching profession.

2.2. TEE Programs and TEECA Participation

In addition to the different curricula required for graduation for each TEE teacher preparation program, many TEE programs do not require students to pursue a teaching license, but offer it as an optional track. These programs offer a degree for students to go into industry pursuing manufacturing, instructional design, graphic design, engineering technology, etc. Despite these differences between TEE teacher preparation programs, an opportunity that is afforded to all TEE programs is affiliation with the Technology and Engineering Education Collegiate Association (TEECA). Whether or not a student's school is registered as a TEECA chapter, students can register with a student membership for ITEEA, which would automatically enroll them in TEECA. Both chapters and students can vary in their degree of involvement from no involvement to affiliation, conference attendance, and participation in competitive events. These competitive events include problem solving, manufacturing, communication and design, robotics, and teaching. In addition to the competitive events, university students are afforded an opportunity to network as well as explore various paths for future employment and education when attending conferences.

Universities participating in TEECA have brought a wide range of number of students. The national TEECA event in April 2023 was attended by eight universities. These universities ranged in bringing anywhere between three to thirty students. There is no maximum capacity that a university is allowed to bring, but they may be limited by funds or student interest.

2.3. Theoretical Framework

Within the expectancy-value framework, Watt and Richardson (2007) worked to explore Factors Influencing Teaching Choice (FIT-Choice). This study originally took place in Australia looking at the motivating factors for individuals to work within the teaching profession. By narrowing the expectancy-value theory to look specifically at experiences and motivations that teachers experience, the FIT-Choice scale was created. Additional studies found that a key motivator for pre-service teachers in the United States pursuing a teaching career were centered around socialization influences and social utility (Richardson et al., 2014).

These studies have helped to inform research on why individuals pursue a career in education. However, further studies may help to investigate whether the same factors help to retain preservice teachers throughout their training experience. Further research will help develop

understanding of and improve retention and motivation for preservice teachers preparing to enter the field of education.

2.4. Preservice Teacher Preparation and Retention

Once an individual begins to pursue a career in education, it has been found that perceived field experiences are a key influence in the preservice teachers' career preparation (Erdem & Demirel, 2007; Guyton & McIntyre, 1990; Hollins & Guzman, 2005). These field experiences include activities that involve learning by doing (Cruickshank & Armaline, 1986).

In the creation of personal identity, preservice teachers often connect with the positive field experiences they have when in the field (Dassa & Derose, 2017). Teachers that reported feeling positive during field experiences felt they would succeed in creating positive teaching environments for their future students (Beltman, 2015). Rogoff (1991) explained that to become a skilled practitioner within one's community, the learner should participate in various and repeated experiences. This experience should include both routine experiences and challenging situations. Pre-professional organizations may help provide the experience and skills needed to feel confident in pursuing school positions post-graduation (Cobb, et al., 2015).

3. METHODS

3.1. Research Design, Population, and Sampling

This study utilized a cross-sectional design looking at current students enrolled in TEE programs currently affiliated with TEECA from across the nation. This study did not differentiate between programs that lead all enrolled students to receiving a teaching license and programs that offer it as an optional track for the program. The study relied on voluntary response sampling through an online survey.

The researcher disseminated a survey that included an adapted FIT-Choice Scale through current faculty of TEE teacher preparation programs to students currently enrolled in their programs. The competitive events coordinator was contacted to access the contact information for programs affiliated with TEECA over the past five years. The faculty and advisors of these programs were contacted and asked to forward the email inviting preservice teachers to participate in the survey.

3.2. Data Collection and Analysis

The survey collected information on students' level of participation in TEECA. Participation included being a registered member, attending chapter meetings, attending conferences, and participating in events. In addition to TEECA participation, TEE students were asked to rate their intent to pursue a career in teaching as well as continue in their undergraduate program, both of which were measured on a 5-point Likert scale.

In addition to student attitudes, demographic information was collected including gender, year in school, and year in major. The survey data was analysed using descriptive statistics.

4. RESULTS

4.1. Sample Description

It is unknown how many TEECA advisors and program faculty forwarded the invitation to participate in the study to their TEE students. From the programs that did send on the survey, the survey was started by 65 participants. However, only 41 participants completed all items on the survey. From the survey, 47 of the participants provided their gender. It was found that the majority of respondents were female (see Table 1).

Table 1.
Gender demographics of survey participants

Gender	<i>f</i>	%
Male	21	44.7
Female	24	51.1
Non-Binary or Third Gender	2	4.3

Students also showed a wide range of years that they have been attending college. However, most students are within their first three years in the TEE undergraduate major (see Table 2).

Table 2.
Total number of years in college and number of years in the major that the student was currently completing

Current year in post-secondary education	<i>f</i>	%
1 st Year	7	14.9
2 nd Year	14	29.8
3 rd Year	13	27.7
4 th Year	6	12.8
5 th Year	5	10.6
6 th Year	1	2.1
10+ Years	1	2.1

Year currently being completed as a TEE major	<i>f</i>	%
1 st Year	16	34.0
2 nd Year	12	25.5
3 rd Year	13	27.7
4 th Year	6	12.8

4.2. TEECA Participation

For TEECA participation, there was a wide range of years and levels of participation (see. Table 3). There were 42 participants that completed the four items regarding TEECA participation. With the individual variables of years of membership, number of conferences attended, number of competitions participated in, and how often they attended chapter meetings, most participants showed little to no experience and low levels of participation.

Table 3.
TEECA Participation Variables

Number of years registered as a TEECA member	f	%
0	18	42.9
1	10	23.8
2	8	19.0
3	5	11.9
4	1	2.4

Number of conferences attended		
0	19	45.2
1	13	31.0
2	4	9.5
3	4	9.5
4	2	4.8

Number of competitions participated in		
0	20	47.6
1	11	26.2
2	5	11.9
3	1	2.4
4	2	4.8
5	1	2.4
6	2	4.8

How often student attended TEECA chapter meetings		
Never	20	47.6
Once per semester	4	9.5

Monthly	11	26.2
Weekly	7	16.7

For a summarized look at the participation in TEECA, participant responses were put into an ordinal scale. For each activity that a student had participated in, they were given one “point”. If participants did not have any level of participation, they would be assigned as a level 0 for participation. If students had participated in two of the activities (for example, attended conferences and competed in competitions but had not registered as a TEECA member or attended TEECA chapter meetings), they were assigned to a level 2. From this ordinal ranking, it was found that the majority of participants had either a high level of participation (level 4) or no participation (level 0; see Table 4).

Table 4.
Ordered TEECA Participation Levels

Ordinal Participation Level	f	%
0	16	38.1
1	2	4.8
2	3	7.1
3	1	2.4
4	20	47.6

4.3. Student Intentions

Participants were asked to rank their interest in teaching as well as their intentions to graduate from their major using a 5-point Likert scale. The students that participated in the study showed a high interest in teaching as well as high intentions to complete the major (see Table 5). It can be noted that there was one student that participated in the survey that indicated that they have interest in teaching, but did not plan on graduating from their TEE program.

Table 5.
Students interest in teaching after graduation and students' interest in graduating from their TEE program (n = 43)

	M	SD
Interested in teaching after graduation	4.63	0.85
Intentions to graduate within the TEE major	4.72	0.70

5. DISCUSSION

5.1. Sample Demographics

Of those that elected to participate in the survey, the majority of the participants were female. As females are not the majority of TEE students (Lester, 2010; Sanders, 2001), this data may not be representative of the population of TEE students as a whole. The current sample shows high intentions to pursue teaching as a career across all levels of participation in TEECA. However, the current sample size does not permit further analysis of relationships between student participation and student intentions that would lead to a reliable conclusion. To address this, the survey will be sent out to the programs an additional time in an effort to reach a sample size sufficient enough to appropriately evaluate the relationship between students' participation in pre-professional organizations and their intentions to continue in their program and pursue teaching as a career.

At this point, none of the participants in this study were completing more than 4 years in their program. As some of the participants may have transferred from another degree, the number of years in the program does not indicate how close to completion in their program the student is. For example, a student could have transferred from another degree program and is in their second year in the TEE program, but this could also be their fourth year of university studies. It may be informative in the future to look into how many years the students may have left in addition to how many years the student has already been enrolled in post-secondary education and their specific program.

Additionally, there are several TEE programs in the United States that are not solely education programs. Some programs are general Technology and Engineering Studies degrees that provide an option for certification or licensure in education, but it is not required for the degree. The interest shown towards teaching may indicate that the survey was mostly participated in by students pursuing the education route.

5.2. Participation Levels

Nearly half of the participants reported no participation in TEECA. While face-to-face interactions have been shown to be influential in students' choice to pursue TEE as a career, students may be limited with additional interactions as there are low number of students participating in conferences.

This also shows that TEECA is not being fully utilized as a resource to prepare students for a future in TEE. While programs differ in emphases and courses offered, TEECA is a national opportunity for students to make connections and find resources from across the country. Instead of looking toward opportunities offered by ITEEA and TEECA, it is possible that programs have more of an emphasis in other professional organizations such as the Association for Career and Technical Education (ACTE). However, ACTE does not have a pre-professional organization used to focus on pre-service teachers looking to teach CTE content in the future. They also do not have specific events or opportunities afforded to undergraduate students specifically.

5.3. Next Steps

After looking at the participation and the interest in continuing in their teacher education program and interest in teaching as a career, further analyses will help to investigate relationships between participation in TEECA and the value given to the career and interest in continuing in their undergraduate degree. Given the belief values explained in the FIT-Choice scale, continued investigation and analysis may help to inform further on the belief values (i.e., the utility of TEE, the individual's ability to teach the content, and the individual's expectation to perform well in the content area) that may or may not be increased through participation in TEECA for future TEE teachers. Additional interviews will be conducted and analysed to understand the influence of TEECA in student's intent to teach and continue in their TEE teacher preparation programs. The current sample size prevents the ability to claim any causation, but continued survey dissemination may help to support these analyses.

Further studies may help to inform what interactions lead to students' intentions to become a teacher or pursue a career in education. It is unclear if face-to-face interactions during post-secondary education are as influential as the influences experienced prior to post-secondary education. Additionally, as many undergraduate TEE programs differ in content, exposure to field experiences, TEECA affiliation, emphasis on teacher-licensing, etc., additional investigations may help to inform the TEE community on the effectiveness of current practices used for recruitment and retention. What have programs done to help build their program and for those that are programs that are industry focused but have a teaching track, how many students enrolled are going into education?

Understanding and knowing what current recruitment and retention strategies are being offered by various programs may help to build up programs that are struggling with recruitment or enrolment numbers. This information may also help to know how to best serve undergraduate students and understand what these future teachers may need for professional development and how professional organizations can best serve these educators.

Additionally, as ITEEA is seeking to bring the next generation of technology and engineering educators into the national community, there seems to be a gap in reaching out to teachers in pre-service programs. Additional investigations could help inform how to best reach out and include and best serve pre-service teachers leading to increased participation once they are practicing educators.

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