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CURRENT RECRUITMENT STRATEGIES FOR PRE-SERVICE

TECHNOLOGY AND ENGINEERING EDUCATORS IN INDIANA

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A Dissertation

Presented to

The College of Graduate and Professional Studies

Department of Teaching and Learning

Indiana State University

Terre Haute, Indiana

_____

In Partial Fulfillment

of the Requirements for the Degree

Ph.D. in Curriculum and Instruction with a Concentration in Technology Education

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by

Megan McManus

December 2018

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ABSTRACT

Career and Technical Education is a significant part of many high school curricula. Technology courses offer hands-on learning and problem-solving skills to prepare students to be both college and career ready. The teachers who obtain a degree in this field are often referred to as Technology and Engineering Educators (TEE). TEE majors in the state of Indiana can choose from four-year programs at three different universities within the state. Indiana has seen a large jump in the number of TEE job openings over the past five years but is struggling to find candidates interested in majoring in the area. There is a shortage of TEE teachers in middle and high schools as well as a shortage of candidates majoring in this degree.

The purpose of this study was to review current recruitment methods in the state of Indiana for TEE programs. The 3 four-year institutions that offer the major were invited to participate in the study. Both university faculty and current TEE students had the opportunity to voice their opinions as to what they perceived and what they experienced when they were recruited into the major. Four faculty chose to participate in the survey, with three of them participating in the interview portion of this study. There were eight survey responses from students, and no students chose to participate in the interview portion of this study. Surveys were completed, and interviews were conducted with those who were willing to participate. Themes were analyzed and the following results were found: faculty and students both agreed that the most influential factor in choosing the TEE major was a current or former high school

teacher. Faculty work closely with current high school teachers since they are viewed as the best recruitment method. Faculty participants use mixed methods of recruitment such as volunteering at student events, posting flyers, sending emails, and hosting campus visits. Student participants indicated that these recruitment methods had little to no influence on their decisions to choose the TEE major. Participating faculty indicated that they give students individualized attention and help them to be successful in their coursework as a means of retaining them in the major; the student participants agreed that they remain in the major because of the individualized attention but also because they have an interest in the coursework.

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CHAPTER 1

INTRODUCTION

Career and Technical Education (CTE) is a significant component of the public high school system. Many students who take CTE courses are at-risk students who have low motivation or are at risk of dropping out (Auger, 2015). In its early years, CTE was known as vocational education and was specifically designed to prepare graduates for careers in different industry-specific areas (U.S. Department of Education, 2015). The current model of CTE has not strayed far from this initial purpose. CTE courses still prepare graduates for vocational work. Many CTE areas focus on the engineering aspect. Industry employers have stated that they are looking for workers who can problem solve, use the basic tools, and know the principles of the intended industry (Adams, 2014). CTE courses can provide career-ready skills for high school students, and over the last 10 years, more than six million students have realized these skills are necessary in the workforce and have concentrated in CTE courses during their high school careers (Conneely & Uy, 2009). CTE courses that focus on engineering and technology have many names, but throughout this document they will be referred to as Technology and Engineering Education (TEE) courses. Teachers who teach the engineering and technology branch of CTE hold degrees in TEE (Bureau of Labor Statistics, 2018).

Many high school students have realized that they will be better prepared with job-ready skills; therefore, CTE courses have seen large amounts of enrollment (Bradley, 2016). The problem has not become enrollment of students, but who is going to teach them. The number of TEE preservice teacher programs has dropped by 11% from the academic year 1990–2000 until the time of this study, and continue to be eliminated (Guarino, Santibañez, & Daley, 2006). The need for prepared and highly qualified teachers is critical, but pre-service teacher programs are also experiencing a shortage.

According to the *Occupational Outlook Handbook* (Bureau of Labor Statistics, 2014), it was predicted the fastest growing career would be career and technical fields, especially in healthcare, trade, and industry. In order to fill the growing need for career-ready individuals, the nation employed approximately 2.25 million new teachers between the years 1994 and 2004, and during that same time period of time, approximately 2.7 million teachers left the profession (Conneely & Uy, 2009). The projected outlook for TEE for 2012–2022, as given by the *Occupational Outlook Handbook*, is a growth of 9% due to the rise in the numbers of students and need for them to be taught new vocations that are rapidly changing (Bureau of Labor Statistics, 2014). Not only are we not replacing teachers as they leave, but we are experiencing a growing need for teachers, according to the Bureau of Labor Statistics (2014). Although there is a projected growth in the number of TEE teachers needed, it is possible that there will not be enough teachers to fill the openings given the attrition (Conneely & Uy, 2009).

There is currently a shortage of technology and engineering educators due to multiple factors. In 2009, a teacher shortage was evident, resulting from a rise of student enrollment in career preparation courses causing the need for more classes and thus more teachers (Conneely & Uy, 2009). A more recent factor is a decline in the number of TEE programs at the college

level that prepare new TEE teachers. During the industrial revolution, it made sense for there to be vocational teachers. Now it is less common to find colleges that offer TEE, and the ones that do seldom have a large number of students. For example, in 2008 when I began the journey to become a technology and engineering educator, my beginning courses had four to eight students total. Perhaps the biggest factor in the decline of TEE numbers is the difficulties all current teachers face, such as operating within No Child Left Behind requirements, accountability in testing across the curriculum, and the overall decline of the perception of teaching as a profession (Grissom, Nicholson-crotty, & Harrington, 2014; Strauss, 2015). Universities and colleges once received funding for TEE programs through the federal government, but some changes made by Congress occurred within the Carl D. Perkins Vocational and Applied Technology Act (Perkins IV) in 2006 which caused the funding to be reduced (Perkins Collaborative Resource Network, 2015). With previous funding from various sources, colleges and universities once were able to support CTE courses and TEE preparation; however, with less funding coming into the colleges now, many have elected to use the money toward general academic funding instead of directly funding TEE programs (Camp & Camp, 2007). In 2018, the U.S. Senate passed an update to the Perkins law, allowing states to set their own benchmarks for CTE programs (Kreighbaum, 2018). The previous law forced states to ask permission from the Department of Education before making changes within CTE programs. It is yet to be determined if this change will increase funding for programs.

A major push in the CTE community is to recruit from industry into teaching, allowing industry members to gain a state-required credential permitting them to teach in the area in which they specialize. Kate Kreamer, deputy executive director for Advance CTE stated, "Although alternative certification is increasingly a strategy states are using, it's obviously

insufficient in addressing the overall teacher shortage issue" (as cited in Quinton, 2017, p. 1). Quinton (2017) asserted that recruitment from industry can have its drawbacks because industrial jobs can pay three times as much as a beginning teacher's salary, and it is difficult for school districts to compete with that level of remuneration. Many teachers who have secured a teacher's credential do teach for a while and then return to industry where there are better benefits and more money without the stressors of being a teacher. Not only is there a struggle to retain alternatively credentialed teachers, the recruitment rates of traditionally credentialed TEEs have fallen.

Research Questions

Broadly, this study sought to understand if there was a significant decline of pre-service teacher enrollment into TEE programs in Indiana and what recruitment methods were being used to encourage enrollment into these specific majors. Specifically, the study was guided by the following questions:

1. What are the enrollment trends of technology education majors in higher education institutions in the State of Indiana during the period of 2012–2017?

2. What perceptions do TEE higher education faculty hold regarding methods that have proven effective in recruiting pre-service teachers into TEE programs at the post-secondary level?

3. What perceptions do TEE pre-service teachers hold regarding effective methods for recruiting pre-service teachers into TEE programs at the post-secondary level?

Purpose of the Study

This study can be categorized as basic research. The definition of basic research, according to Patton (1990), is to "investigate a phenomenon in order to get at the nature of reality

in regard to that phenomenon" (p. 152).   The phenomenon of this study was to explore the current state of pre-service TEE teachers and investigate how universities in Indiana have been recruiting those majors. This study followed qualitative and quantitative methods to find the extent to which recruitment efforts were or were not working in the universities and make suggestions based on the findings to help universities improve their recruitment efforts of TEE teachers.

Before researching current recruitment methods, the need for TEE teachers was established. Indiana faces a teacher shortage in multiple areas including that of TEE. The demand for highly qualified, licensed TEE personnel is apparent, but there is a shortage of supply (Indiana Department of Workforce Development, 2017). By establishing the need for TEE teachers, the research was able to continue to look into how they are being recruited in hopes to find methods that are or are not working to increase interest in this field of education.

This research study compared faculty and student perceptions of recruitment and retention methods at three universities in Indiana. The purpose of using these three universities was because they each offered a four-year degree program in the TEE major and would represent the largest populations of TEE students and faculty within the state. The goal of this research was to show faculty and university personnel what types of recruitment the students are encountering as they choose a major, as well as what factors significantly affected their choice to remain in the TEE discipline.

Significance of the Study

Career and technical education plays a dominant role in the middle and high school system (Jacob, 2017). Without technical-based classes, students do not obtain the skills needed for in-demand industries. Several studies showed that students who are considered at-risk often

choose technology-based courses as an outlet to use their hands-on abilities (Auger, 2015; Cohen & Besharov, 2002). Career and technical education courses prepare students with both college and career ready skills. Students are realizing they need the skills offered in CTE classes to succeed in both higher education and the workforce. There is a growing need for teachers in this content area, and we need to figure out ways to bring students into the TEE preparation pipeline. Graduating high school students with backgrounds in CTE are in high demand (Fensterwald, 2016), and if teachers are not found to fill positions within these classrooms, programs will face detrimental consequences, such as the closure of CTE courses in the school systems (Quinton, 2017).

Although there are many pathways to obtaining a CTE license, it has been concluded that completing a Technology and Engineering Education program at a four-year university is more beneficial to producing high-quality, better prepared teachers (Obenchain & Taylor, 2005). By researching the four-year institutions in Indiana, this study was able to examine what recruitment methods the faculty used and how those strategies were perceived by students.

This study intended to provide insight that should promote successful recruitment efforts in the field of pre-service Technology and Engineering Education within the state of Indiana. This study may be beneficial to faculty and universities in their attempts to grow TEE programs. By understanding the TEE shortage trend and how current programs are recruiting, future efforts can be focused on these aspects to increase enrollment of pre-service TEE teachers.

Definitions

- CTE: "Career and Technical Education are educational courses preparing youth, in this case high school students, for a wide range of high-wage, high-skill, high demand careers." (Association of Career and Technical Education [ACTE], 2015, p. 1)

- Vocational Education: ". . . educational training that provides practical experience in a particular occupational field such as agriculture, home economics, or industry." (Merriam-Webster's Collegiate Dictionary, 2003, p. 1435)

- TEE: Technology and Engineering Education is a degree in which completers can teach in the areas of pre-engineering, biotechnology, communications, vocational education, construction, manufacturing, transportation/power, and energy (International Technology and Engineering Educators Association, 2016).

Summary

CTE is a significant component of the school systems. Without hands-on-based courses, at-risk students have an increased risk of dropping out (Schargel & Smink, 2001). Employers in vocational areas look for future employees who have career-ready skills, such as problem solving, hands-on experience, and foundational skills (Adams, 2014). CTE prepares students with skills for future jobs as well as gives them rigorous coursework and college-prep skills for those students who are interested in seeking a post-secondary education (Bradley, 2016). Teachers who teach the engineering and technology branch of CTE hold degrees in Technology and Engineering Education (Bureau of Labor Statistics, 2018). The need for highly prepared and highly qualified teachers is critical, but there is a shortage within pre-service teacher preparation programs (Conneely & Uy, 2009). The purpose of this study was to investigate the extent of the TEE shortage in Indiana and compare perceptions of faculty and students in regard to recruitment methods. By establishing what recruitment methods were and were not working, post-secondary establishments can adapt and develop recruitment methods to increase TEE enrollment and potentially close the gap between demand and supply of technology and engineering educators.

CHAPTER 2

LITERATURE REVIEW

The purpose of this study was to identify if there is a shortage of TEE teacher candidates in Indiana, and how universities in Indiana have been recruiting those individuals. In order to situate the findings from this study contextually, and to form a basis for projecting recommendations for practice, a review of the attendant literature was needed. In service of that need, a review was conducted of the history of TEE, shortages of TEE teachers in the state and nation, pathways to licensure, need for TEE educators, and current recruitment efforts.

History of Technology and Engineering Education

Technology education holds deep roots in its original distinction of vocational education. Beginning during the Industrial Revolution, mentors would teach young "students" specific trades such as welding, construction, machining, and mill work (Washington State Department of Labor and Industries, 2018). These programs were known as apprenticeships where students would work under their mentors until they had successfully developed the attributes needed within the given trades to work on their own. At the point that school attendance became mandatory for all students, the choice to include what was considered to be the trades as a subject in the general education curriculum was debated (National Center for Education Statistics, 2018). In 1970, a philosophical change transformed the future for what is now known

as CTE (Volk, 1993). Changes were made to rename programs, restructure courses, and update

facilities resulting in the revolution from industrial arts to technology education.

The idea of technical education being integrated into general education curriculum was

and still is debated to this day. Proponents of technology education in schools included

Woodward who "insisted that students not be separated into thinkers and workers" (Tozer, 2013,

p. 58). In 1917, the Smith-Hughes Act, later replaced by the Carl Perkins Act, paved the way for

funding for CTE in the U.S. and initiated the monetary support by the federal government of

CTE classes in public education that continues to this day (U.S. Department of Education, 2006).

Those teachers who teach the CTE courses concentrating in manufacturing, construction,

communications, transportation and power/energy are now known as Technology and

Engineering Educators. The Bureau of Labor Statistics (2014) showed that, as of 2012, the field

of technology education employed 239,800 teachers, 85,400 of those were employed in

secondary education at the high school level, and the projected numeric change in employment

for 2022 of Career and Technical educators is 89,700 which is considered average. The

Occupational Outlook Handbook (Bureau of Labor Statistics, 2014) stated that a technology

teacher generally needs a bachelor's degree in the related field of which they are teaching.

State and National Shortages

Retention rates of teachers in general have been declining over the past several years,

causing shortages that must be filled (Strauss, 2015). There are several factors that are

contributing and have contributed to the overall shortage of teachers in many states and

communities. Research suggests that some of these factors include "a decline in teacher

preparation program enrollments, increasing student enrollments, and high teacher attrition rates"

(Sutcher, Darling-Hammond, & Carver-Thomas, 2016, p. 1). In 2009, the National Commission

on Teaching estimated a loss of one third of accomplished educators to retirement (Wilkin & Nwoke, 2009). In the time period of 2008–2010, the United States documented TEE as a high-need area for teachers (U.S. Department of Education, 2015). Again in 2016, the need was still present and persisted into the 2017 school year. A shortage of TEE was also seen across the Midwest and the rest of the United States (U.S. Department of Education, 2016).

A study conducted by Love, Love, and Love (2016) showed that TEE degrees awarded have dropped significantly in Indiana alone from 6,368 degrees being awarded in 1970 to only 245 being awarded in 2015. Chapman (2017) summarized a survey conducted by Indiana State University in which the teacher shortage in Indiana showed 94% of districts have a shortage of teachers in all areas. Within this report, 30% of districts were lacking science and technology educators to teach Project Lead the Way (PLTW) classes, which are most commonly taught by TEE teachers (Loughlin, 2017). PLTW courses follow a set curriculum and require that teachers be trained in each class before teaching it. PLTW courses are offered across the state of Indiana at many, but not all, high schools.

Although documentation from as early as 1998 is given in reports from the U.S. Department of Education (2016), there was no shortage shown for those years with regard to TEE. That is not to say that there was not a shortage. The lack of TEE showing in previous years comes from multiple name changes from industrial education, vocational education, CTE, and finally into TEE (Weingarten, 2015). TEE programs, whatever name was used, were not considered as part of the general education curriculum in 1998 and therefore were not included in teacher shortage documentation. The result of the current shortage now is that many teachers are retiring, and there are few to take their places (U.S. Department of Education, 2015). Factors specifically affecting TEE teacher shortages are "increased student demand for CTE courses,

increased state focus on CTE as a way to teach key employability skills, and a national increase in STEM fields" (Georgia Department of Economic Development, 2017, p. 1). Increased student demand for CTE courses means that more students are signing up for and taking CTE courses, and without teachers to teach these courses, those students cannot take the courses they wish to take. Students have increased interest in CTE courses because "these courses are a way to learn valuable skills for the future, students enjoy the hands-on aspects of these courses, and to learn or improve upon skills" (ACTE, 2013, p. 5).

According to a status study of career and technical education conducted in 2015, another factor contributing to the shortage of TEE teachers is a "decline in many TEE teacher preparation programs" (Fletcher, Gordon, Asunda, & Zirkle, 2015, p. 121). Fensterwald (2016) believed that the leading factor of the shortage is "the inability for teacher salaries to compete with private industry salaries in the same high-tech fields" (p. 2).

According to the National Association of State Directors of Career and Technology Education (NASDCTE, 2012), education and training were among the lowest percentile that saw a shortage of teachers in 2012; thus, they have the greatest need for teachers. This national shortage has affected technology educators as well as general education teachers. There has been a decline in funding from state and national governments towards technology-based classroom which has caused a lack of TEE candidates going into the field. Because of a lack of funding for TEE candidates themselves and their future classrooms, many have chosen not to enter the field.

After facing a lack of funding, the next biggest hit to the TEE field has been the closure of vocational classes in public schools beginning 10 years ago (Theriault, 2013). The most frequent reason for public school vocational course closures is a decrease in TEE teacher

graduates; without qualified TEE teachers, programs cannot continue to operate, and public school students are placed in other courses, causing schools to shut down these types of classes. As current CTE teachers retire, school systems struggle to find replacements and often are forced to close programs when they cannot find anyone to fill the positions (Brown, 2012; Wilkin & Nwoke, 2009). From 2004 to 2008, there was an average of 306 technology education teachers graduating from programs in the United States every year. Fast forward to 2011, only 266 technology educators graduated from those same programs (Freeland, 2013), exhibiting an obvious decline in the number of TEE in the profession. In 2016, the U.S. Department of Education reported that 32 states in the United States. are experiencing shortages of CTE and TEE teachers the data showed that, over a 14-year period, there was a 25.85% decline in these specific positions. Freeland (2013) suggested that "the year 2020 is expected to produce the largest group of teacher retirements in the last six decades" (p. 2). Across America there were 30,791 TEE job openings for the 2017–2018 school year. In Indiana, the school year 2017–2018 produced a shortage of 864 teachers in TEE related positions (Indiana Department of Workforce Development, 2017). As of August 2017, the current enrollment of TEE majors was 46 students (Indiana Commission for Higher Education [ICHE], 2017).

Pathways to Career and Technical Education Licensure

Historically, the CTE field, especially vocational education, has had two pathways to certification or licensure. The multiple pathways can be attributed to its variety of subject disciplines. The two pathways are traditionally licensed and alternatively licensed, often referred to as a workplace specialist license.

A teacher who obtains a degree in a specific CTE area and who completes a teacher preparation program is considered to be traditionally licensed. It is referred to as traditional

because the people obtain their licenses in the same form as other educational studies. The requirements to obtain a traditional CTE license vary from state to state. The requirements for traditionally licensed teachers in Indiana include the following: bachelor's degree or higher, completion of a teacher preparation program such as student teaching, a passing score on the Indiana CORE Assessment, mentoring through the first year, and a portfolio review in the second year of teaching (Zirkle, Martin, & McCaslin, 2007). To create a more seamless transition from teacher preparation programs into schools, some states have developed partnerships with technical colleges to create a within-state pipeline of pre-service TEE teachers (California Community Colleges, 2006).

A teacher who is considered alternatively licensed is one who comes into teaching from industry. Alternative licenses rely heavily on work experience related to the fields they will teach. Some school communities, including the state of Indiana, invite military veterans to become alternatively licensed teachers and use their hands-on skills within CTE classrooms (U.S. Department of Defense, 2017). Various states participate in an incentive known as Troops to Teachers in which veterans are trained to become teachers after their service to our country (U.S. Department of Defense, 2017). This program focuses on training inactive soldiers to teach in the areas of math, science, special education, and other critical subjects, of which CTE is included.

Disabled workers who are no longer able to work in a trade or industry may be able to excel as TEE teachers (Office of Career and Technical Education, 2017). During a study conducted by Advance CTE (2016) "Several states reported having policies that certify industry experts to teach CTE courses part time" (p. 11). The path to becoming alternatively licensed varies from state to state and often within corporations of the same state. In Indiana, an

alternatively licensed teacher must complete what is called an Occupational Specialist Licensure (Zirkle et al., 2007). The initial certificate or licensure is awarded after the following criteria have been met: minimum of a high school diploma or GED, recommendation by the school district in which they are employed within a specific vocational area, and a fulfillment of work experience hours. The hours of experience needed range from 4,000 to 6,000, and these hours can, but are not required to, include completion of a 2-year degree, at least five years of work experience, a nationally accredited exam in the specific field, board training and evaluation, and/or an apprenticeship program (Zirkle et al., 2007).

Those educators who were not already considered qualified are offered training to become qualified. Many of those teachers who are alternatively certified still receive some type of pedagogical training through professional development or formal coursework before they receive full certification (Advance CTE, 2016). The downside to this type of preparation is that it is usually limited as compared to the amount of preparation training traditionally licensed TEE teachers obtain while receiving their degrees.

As stated in the study from the NASDCTE (2012):

In 2010, the percent of states with secondary initiatives to recruit and retain CTE teachers increased to 63 percent from 54 percent in 2008, and fell again to 54 percent in 2012. At the postsecondary level, State Directors indicated that CTE faculty recruitment and retention efforts also waned from 44 percent of states in 2010 to 29 percent of states in 2012. (p. 3)

The survey taken in 2010 showed that "states are still struggling to find CTE educators in many areas of high demand" (NASDCTE, 2012, p. 3). Much controversy has been underway regarding if teachers should be allowed to be alternatively licensed (Young-Hawkins, 1996).

Supporters of traditional teacher certification argue that understanding the professional side of education as well as obtaining subject-matter competency are key elements in improving the education of young minds. Therefore, alternatively certified teachers may lack the pedagogical skills that are normally acquired through four-year, pre-service teacher training programs (Young-Hawkins, 1996). "Studies have often shown that while teachers may leave the field because of low pay or social views towards education, another reason teachers choose to leave is student behavior" (Obenchain & Taylor, 2005, p. 7). "CTE requires highly knowledgeable educators who not only have experience in the field, but also pedagogical skills needed to be successful in the classroom" (NASDCTE, 2012, p. 3).

The Need for Technology and Engineering Educators

The Indiana Department of Workforce Development collects data from all Indiana CTE programs to devise the CTE Data Profile Report.   Data were collected from high schools that offer any type of career and technical education. The data being compared were data from the 2014–2015 school years to the 2015–2016 school years (Indiana Department of Workforce Development [IDWD], 2016). The data collected showed enrollment trends, performance trends in CTE areas and all academic areas, diploma attainment, college credit attainment, if students remained in CTE fields through college, demographics, and post-secondary performance (Indiana Workforce Development, 2016). This collection of data was distributed to CTE programs across the state in an effort to show data trends. The data suggested that the number of students in CTE was increasing, as well as their achievement levels in other courses after they have completed a CTE course. During their enrollment in CTE courses, many students have realized that they are gaining key employability skills, in a survey conducted by the ACTE (2013), 45% of students taking CTE courses said they experienced teamwork and learned how to

interact with employers; one out of two students interviewed stated that because of the valuable skills they were learning, they would pursue a career in the CTE area they are studying.

According to the IDWD (2016), the number of students enrolling in related fields in post-secondary education has also increased. Almost all areas of CTE saw increased numbers of dual-credit earners. Seventy percent of students who took an end of course assessment in TEE passed during the 2015–2016 school year in the state of Indiana. CTE courses are organized into career clusters, or comprehensive programs of study focusing on specific careers. Career clusters are developed by the National Career Clusters framework in conjunction with national CTE organizations (Advance CTE, 2018). TEE was the second highest enrolled career cluster with 35,000 students enrolling following behind Health Services (IDWD, 2016). Employers are saying "they can't find skilled workers with the right career training, while at the same time schools are being forced to shut down the exact programs that would give students career training" (Quinton, 2017, p. 2). The lack of qualified TEE teachers is causing high schools to cut CTE programs that would provide students with career ready skills.

In 2008, 2010, and again in 2012, the three pathways showing the most shortage of CTE teachers were the health sciences, STEM, and manufacturing. Two of the three pathways can be taught by licensed TEE teachers. Besides having the pedagogical skills necessary to teach in a lab-type environment, TEE teachers play other important roles in secondary education. One of those roles is teaching classes that serve a dual focus of higher education and workforce preparation.

In an article published in *Vocational and Adult Education*, the authors documented the high rates of high school drop outs in the United States and how those rates could be decreased by promoting at-risk students' enrollment into CTE courses (Cohen & Besharov, 2002). In

October 2005, the National Research Center for Career and Technical Education found that "students who add CTE courses to their high school curriculum are at a decreased risk of dropping out" (Schargel & Smink, 2001, p. 42); this study suggested that to keep students in school, the best course of action was for them to take one CTE course for every two academic courses. CTE was found to have five potential benefits to keep at-risk students in high school. These benefits were as follows:

> Enhancement of students motivation and academic achievement; increased personal and social competence related to work in general; a broad understanding of an occupation or industry; career exploration and planning; and acquisition of knowledge or skills related to employment in particular occupations or more generic work competencies. (Schargel & Smink, 2001, p. 43)

Another topic Cohen and Besharov (2002) insisted on is that CTE can not only encourage students to stay in school, but can also land them a job if they do not want to attend post-secondary education. Since the 1950's, a high school diploma has changed from being valuable to being the minimum requirement to obtain a job or enter into future education (Cohen & Besharov, 2002). Along with a high school diploma, employers are looking for people with hands on skills and technical training. When looking into supply and demand, "there has become an 'oversupply' of college-educated workers and a shortage of those with technical training" (Cohen & Besharov, 2002, p. 12). CTE helps students to obtain hands-on skills and technical training while completing their high school diplomas; because of its impact in students' lives, CTE should move to the forefront of education and is worth spending the funds and effort on recruitment (Cohen & Besharov, 2002).

Although attending college is a major focus for many students, some students do not desire to follow the path to college and prefer to enter the workforce directly after graduation. For those students who choose workforce over higher education, they can "expect higher wages if they enter with a CTE background" (Bartholomew, 2014, p. 8). The lack of TEE teachers has, according to Bartholomew (2014), "resulted in fewer students prepared to enter the industry upon leaving high school and in turn an industry shortage of skilled labor" (p. 8). Bartholomew (2014) stated, "If immediate action is not initiated the future of CTE will remain uncertain" (p. 11). He suggested,

> Studies should be conducted in an effort to identify ramifications from the dramatic decrease in CTE teacher education program graduates. Incentives for CTE teacher education programs should be drafted at the national and state level. National and international CTE organizations should focus concerned efforts on strengthening current CTE teachers and recruiting future candidates. The topics of teacher recruitment and retention should take center stage in conferences, publications, and goals. (Bartholomew, 2014, p. 11)

In 2017, the Indiana State of the State Address (2017) , "workforce development and CTE emerged as a strong priority" (p. 5); in fact, it was the second most highly referenced education topic falling only behind school financing. Supporting the statement made by the governor, "highly paid non-college jobs fall into one of the major occupational categories used by the U.S. Department of Labor" (Cohen & Besharov, 2002, p. 12); the occupations listed are those that fall under the umbrella of CTE at the high school level, which is taught by TEE teachers. According to Cohen and Besharov (2002), often, when non-college jobs require higher levels of skills and trianing, that training often comes from TEE teachers. If more TEE teachers are not produced,

the industrial workforce will suffer (National Network, 2016). CTE programs have been a source of future industry workers. According to Cohen and Besharov (2002), an increase in CTE/TEE teachers would increase the opportunities for to help high school dropouts and graduates without a college address to find good-paying jobs. CTE can enhance students' chances of finding jobs and potential careers.

According to Wanacott (2002), "Beginning teachers commonly receive the most difficult teaching and advising assignments, yet are expected to perform as expertly as experienced teachers" (p. 3). There have been drastic shifts in the skills CTE teachers need. Skills range from occupational skills, the ability to meet the needs of special populations, instruction that includes both academic and career related objectives, the ability to teach regular CTE classes along with work-based programs, and being able to prepare students for entrance into the workforce as well as post-secondary education (Wanacott, 2002). New teachers face many challenges, but those challenges are even greater for CTE teachers. These challenges have developed from changes in legislation, philosophy, policies, and practices. Teachers who are the best prepared are those who obtain full teacher preparation and licensure from teacher education programs (Wanacott, 2002).

Current Recruitment Efforts

The TEE teacher shortage has brought to light the need for recruiting future educators. TEE has dropped from being taught in 203 post-secondary institutions in 1970 to only 43 by 2015 (Rogers, 2015). The number of graduates with TEE degrees has also dropped from 6,368 in 1970 to only 245 in 2015, which has caused some institutions to stop offering TEE pre-service programs due to lack of enrollment (Rogers, 2015). From 2004 to 2008 there were an average of 306 technology education teachers graduating from programs in the United States every year.

Fast forward to 2011 and there were only 266 technology educators graduating from those same programs (Freeland, 2013) and in 2014 only 160. There is a decline in the number of TEE in the profession. Over a 14-year period, there was a 25.85% decline in teachers to fill open positions (Casselman, 2014). The fear, as put by Starkweather (1998) is that

> one of the biggest challenges being addressed by the association and the members of this field at this time is the promotion of technology education as a rewarding career choice. If not successfully addressed, we could witness the demise of technology teaching. (p. 45)

The research goes on to suggest that current recruitment strategies being used are "inadequate to meet the demand" (Scarcella, 2000, p. 1) of technology educators. New strategies need to be "effective recruitment techniques and factors that might influence students to enroll in undergraduate technology education programs" (Grey & Daugherty, 2004, p. 5). The panic, according to Freeland (2013), is "if schools cannot find technology education teachers to fill openings, school supervisors might discontinue those courses" (p. 5). This issue should come as no surprise as Dougherty (1998) cautioned it would happen almost 20 years ago when he wrote of "rhe urgent need to recruit, prepare, and retain significantly more teachers in technology education" (p. 22).

"Higher pay, reserved housing, student loan forgiveness, and alternative certifications have all been ideas of how to keep teachers in their positions and address the teacher shortage" (Freeland, 2013, p. 24). Some states have even begun using hiring practices such as offering sign-on and traveling bonuses for teachers willing to relocate out of state. States with a high cost of living, such as California, have boldly approached their teacher shortages and the high cost of living by developing teacher housing units for the city's educators (Park, 2016). In California

where teacher housing strategies have been used, they have worked to initially recruit teachers, but no information has been given as to if the teachers chose to remain in the field or the state after initial recruitment (Park, 2016).

The U.S. Department of Education has developed a grant under section 114c of the Perkin's Act to provide support for "state and local efforts to increase supply and quality of TEE teachers in states where shortages exist" (Office of Career and Technical Education, 2017, p. 2). The requirements to use these funds involve carrying out activities determined by the state to "increase recruitment and retention of high school TEE teachers" (p. 2). The recruitment activities used in the state of Indiana are:

> (a) establishing, improving, or expanding activities to recruit high school TEE teachers for programs that align to in-demand industry occupations, (b) establishing, improving, or expanding alternative routes to CTE licensure, and (c) establishing, improving, or expanding teacher induction and mentoring programs to better prepare new CTE teachers. (Office of Career and Technical Education, 2017, p. 3)

In a study conducted in 1998, current technology education students reported personal interest or hobbies (Wright & Custer, 1998) as the most influential factor in their decision to become TEE teachers. The most recent influential factor found in encouraging students to pursue TEE are current TEE teachers (Love et al., 2016). Researchers and TEE educators themselves, Love et al. (2016) believed that without current educators encouraging the future of TEE, many programs may face the reality of low enrollment, low budget, and potential closure. Love et al. interviewed current technology teachers who were producing future technology educators about their recruitment efforts. The teachers they interviewed suggested that it was "critical for technology educators to have a positive outlook about their job and teaching on a

daily basis so as to convey a positive message to their students" (Love et al., 2016, p. 12). The interviewees suggested keeping in touch with parents and making them aware of TEE career opportunities if their child was displaying an interest or possessed the skills needed to be a teacher. One teacher interviewed stated, "They (parents) were unaware that (TEE) was a career option" (Love et al., 2016, p. 12). Another suggestion given by the researchers was to give students the opportunities to be leaders within their high school classrooms and especially within the TEE classrooms. Students who had these opportunities were more likely to embrace the leadership role and find encouragement in teaching their peers. Love et al. suggested that "recruitment does not rest solely on the shoulders of practicing teachers. It should be approached as a collaborative effort . . . Together we can improve the declining enrollment trends of T&E teacher preparation programs" (p. 15). A suggestion from Freeland (2013) was to increase marketing efforts. The first step to increasing marketing efforts is to encourage students to become technology educators.

In an article in the *Technology Teacher* magazine, the attention was focused away from current topics of TEE (what are they, what is the curriculum, should they be elective or general education, etc.) and honed in on a much more important topic. As stated by Scarcella (2000), "The bottom line is that we need to find immediate and practical solutions to sustain and remedy the technology teacher shortage among the ranks of the profession" (p. 1). Scarcella suggested that "marketing and recruiting should be treated as a process and not just a single event" (p. 2). It is something that takes time and effort from those who are a part of it and does not stop once number rise; it should be continued to ensure a continuation of TEE teachers. The article covered three different approaches known as the professions approach, a new approach, and *the* new approach.

The professions approach is the immediate response-based approach—we realize we have a shortage and we need teachers now. Posters, flyers, mail letters, and other immediate quick responses are used to get the word out that the profession needs bodies. This method does not work well, according to Scarcella (2000), because once the enrollment of pre-service teachers raises the recruitment efforts stop because the immediate need is met. A new approach is a method of acceptance. It is when administrators, professionals, faculty, and staff accept the fact there is a need for recruitment. Having this support can increase enrollment itself because it becomes more accepted. The problem with this method is that is it just raising awareness, letting people know a shortage exists and that it is important but not physically doing anything to fix the problem. A mixture of both approaches is suggested by Scarcella (2000) and is known as the new approach. The Indiana Department of Education developed an approach it thinks will combine both efforts in a positive manner.

In 2016, the Indiana Department of Education created a task force to focus on recruitment of technology educators. This task force realized the immediate need for more technology educators and created plans to recruit 10 new TEE teachers per year (Reinhart, 2017). The Indiana Department of Education also planned to connect with business and industry members to help fill open positions at the high school level and created a marketing campaign to promote the TEE brand. The task force created recruitment materials to be used by high school and college educators in the form of handouts and posters. The recruitment posters and handouts were eye-catching and gave information to help recruit students. The task force created lesson plans that fit into career research units revolving around technology and engineering education. The lesson plans were easily incorporated into many TEE classrooms. They allowed for editing to fit classroom needs. They could be revamped easily to fit recruitment fairs at the college level. The

task force marketing campaign included a social media outlet that encouraged teachers to post innovative projects and opportunities given to them. All documentation created by the Indiana DOE recruitment task force could be used at the secondary and post-secondary levels. In previous years, the Council on Technology Teacher Education created a similar resource supplying teachers with lesson plans, student materials, and online activities revolving around technology education as a career (Childress, 2000).

Another current recruitment method is that of scholarships. Many organizations offer scholarships to help students afford the rising cost of a college education. In the United States, the Student Loan Forgiveness Program offered to eliminate student loans if a teacher taught in a low-income school for four years (U.S. Department of Education, 2015). The TEACH Grant program offered $4,000 to students who agree to serve as full-time teachers in high need areas, which included TEE (U.S. Department of Education, 2015).

Many states have turned to financing as a method to recruit TEE teachers. In California approximately $1.5 billion was spent over a five year period to improve technologies within CTE areas. The new technologies included drone technology, bioengineering, and digital arts (Fensterwald, 2016). The goal was not only to increase student interest but also increase teacher interest in much-needed, high-tech courses. One school in Philadelphia received a $5.7 million grant to update vocational education courses into a career center as a recruitment method to increase student enrollment and in turn increase the number of TEE teachers in the state, enrollment of both students and teachers improved, but the district still has a shortage of TEE and continues to look for better forms of recruitment (Hangley, 2015).

According to a study by McKee (2002) conducted at the University of North Texas, factors contributing to low recruitment rates of TEE candidates include but are not limited to:

inadequate pay, lack of administrative support, student related issues, and workplace conditions.

In addressing the critical issues facing technology and engineering education, Wicklein (2004) found that among those surveyed, "recruitment of high school students and of pre-service teachers into teacher education programs was the highest rated critical issue determined by current technology educators" (p. 7). The author put together the top five critical problems facing TEE in 2004, and the top-ranking issue was consistently the recruitment of TEE pre-service teachers. He described this as a serious problem for the entire profession of technology education. If technology education is going to hold its appropriate place within the school curriculum, it is going to happen from a combined effort of all technology educators at each step of the process. He also alluded to the fact that if recruitment efforts are not put in place, we will see a rapid decline and potential dismemberment of technology education at the high school level. The numbers shown in Wicklein's research suggested that the most pressing concern of current educators is the decline and sometimes complete lack of future TEE teachers. He suggested more research be conducted into recruitment efforts of TEE.

Summary

Vocational education has changed names throughout its time within the educational system but the core values have always remained. Today what is known as CTE prepares students in the skills of technology, innovation, design, and engineering using a hands-on format. Enrollment in secondary education courses is increasing, and there is a high demand for teachers. TEE pre-service teacher preparation programs at the post-secondary level prepare highly qualified teachers to fill positions in the secondary school classrooms. Nationally there is a shortage of TEE educators coming from teacher preparation programs. TEE has been documented as a high need area for teachers (U.S. Department of Education, 2015). The state of

Indiana follows this trend. Current recruitment efforts have been studied to find a solution to the

TEE shortage, but remain "inadequate to meet the demand" (Scarcella, 2000, p. 1). It has been

suggested that further research be conducted into recruitment efforts of TEE (Wicklein, 2004).

CHAPTER 3

METHODOLOGY

The purpose of this study was to identify current enrollment trends of TEE teacher candidates and how universities in Indiana have been recruiting those individuals. Individuals within TEE programs and faculty members were queried to compare and contrast recruitment methods. Purposeful sampling techniques were used and both quantitative and qualitative data collected. The study occurred throughout the first four months of the 2018 calendar year and included surveys of TEE faculty and students and interviews of TEE faculty. Institutional Review Board approval was granted from each university prior to contacting people within that university. Informed consent was received from each participant in the study, and data were appropriately stored.

Identifying current enrollment trends and researching recruitment methods are an important aspect toward answering questions about supply and demand for TEE pre-service teachers. The national teacher shortage has affected TEE, and as a result, schools struggle to find highly qualified TEE teacher candidates. By researching current recruitment methods, the goal was to ascertain what is working and what is not working in order to re-vamp recruitment efforts to grow enrollment numbers in TEE programs. In order to meet the purposes of the study, the following research questions were formed.

Research Questions

1. What are the enrollment trends of technology education majors in higher

   education institutions in the State of Indiana during the period of 2012–2017?

2. What perceptions do TEE faculty hold regarding methods that have proven

   effective in recruiting pre-service teachers into TEE programs at the

   postsecondary level?

3. What perceptions do TEE pre-service teachers hold regarding effective methods

   for recruiting pre-service teachers into TEE programs at the post-secondary level?

Credibility of the Researcher

Before and after collecting data for this study, I reflected on my role as a researcher.

Patton (1990) stated that "an analyst's effort at uncovering patterns, themes, and categories is a

creative process that requires making carefully considered judgements about what is really

significant and meaningful in the data" (p. 406). Survey questions and interviews can be

interpreted differently based on the knowledge of the researcher. "The quality of the information

obtained during an interview is largely dependent on the interviewer" (Patton, 1990, p. 279). I

have a perspective of this research that allowed me to investigate thoroughly the data and

interpolate findings relative to this research study, as well as interviewing participants during

similar research. I conducted the research with faculty and students in TEE majors at three

universities in Indiana. I obtained my TEE bachelor's degree in 2012 from an Indiana university

and have been teaching in the field for five years. I am a licensed TEE in the state of Indiana, as

well as an adjunct faculty member at a university in a sub-department of the field. I have built a

rapport with the faculty members who served as gatekeepers at each university through various

recruitment and volunteer activities prior to conducting my research. They are familiar with me

and my passion for finding successful recruitment methods for TEE majors. To further attest to my credibility, I was invited to participate in a recruitment organization by the Indiana Department of Education.

Patton (1990) suggested that before conducting data analysis, a process called Epochè should be used. This process represents when a researcher looks inside to become aware of personal bias and to eliminate the potential of Type I and Type II errors. The first step of the process is to eliminate preconceptions with regard to the topic at hand. The next step of the process is to investigate the phenomenon from a fresh or open viewpoint. In order to do this, I maintained a focus on my findings and did not include my personal opinions or thoughts while collecting and analyzing data. I focused solely on what data were collected and what that data stated with regard to this study specifically.

I felt it was important to reassure participants during the interview process of my credibility and my intentions of this research. Using illustrative examples in my questioning process, I informed the people I interviewed that I have heard both good and bad things with regard to recruitment methods and was solely interested in obtaining information in what that participants' experience had been like in regards to recruitment. By providing this information during the interview process, I helped to ensure the participants' responses were truly their feelings and opinions, therefore validating my interviews.

Although my involvement may seem biased, I can verify that my goal behind this research was to seek out what recruitment methods are being used throughout Indiana and the extent to which those methods are working. My intent was not to develop or suggest recruitment methods to be used. To ensure creditable and reliable inquiry, I followed rigorous techniques described in the data collection and analysis sections and follow suggested methods to gather

high-quality data. With the data, I then carefully analyzed the findings and paid close attention

to validity, reliability, and triangulation (Patton, 1990). I fulfilled my obligation to be

methodical in reporting sufficient details of the collection and analysis of data in order to allow

others to judge the quality of the findings of this study.

Because of my knowledge of the field and experience in both being recruited and

developing recruitment methods, I can be considered a credible researcher who has analyzed the

data using appropriate methods, and I was able to discern between what recruitment methods are

implemented and what methods are actually working to recruit future TEE students.

Research Design

Patton (1990) suggested studies can be strengthened through triangulation of

methodologies, or using multiple methods to study a single phenomenon as well as analyst

triangulation or the use of multiple analysts to review findings. This study used a mixed-

methods approach of both quantitative and qualitative research. Quantitative analysis was

conducted using descriptive statistics from the data collected by the ICHE. These public records

provided factual information regarding the hypothesis of a TEE teacher shortage in the state of

Indiana. Other quantitative data included a thematic analysis garnered from surveys completed

by current pre-service TEE candidates and faculty at three universities in the state of Indiana.

Qualitative data was collected in the form of open-ended question telephone interviews from

faculty volunteers. The interviews were conducted after the surveys in order to allow

participants to voice their full opinions as well as prevent restrictions of their views. The study

reviewed enrollment data from 2012 to 2017 that were provided by the ICHE and surveyed

opinions about recruitment from current pre-service TEE candidates and the faculty within those

departments. The participants and sites had been selected on the basis that they are the most

central to the TEE recruitment phenomenon.

Population

The target population of this study was current pre-service TEE candidates enrolled in courses at three universities in Indiana and the faculty at these post-secondary education facilities. The enrollment for the 2017–2018 academic year at the chosen universities was 46 TEE majors. The three universities chosen were Ball State University, Indiana State University, and Purdue University. The three universities were chosen because they are the only universities in Indiana that offer a Technology Education Bachelor's degree (Reinhart, 2017). Other colleges in Indiana, such as Ivy Tech, offer an associate's degree in a similar field and IUPUI offers a master's degree in TEE (Universities.com, 2017); however, Ball State University, Indiana State University and Purdue University are the only three universities where a student can obtain a bachelor's degree in Technology Education.

Program names differ between colleges but the field of TEE remains the same. Data regarding enrollment trends of TEE majors in higher education were collected from the ICHE. The entire population of TEE majors at all three universities were invited to participate in the surveys and interviews with currently enrolled pre-service TEE majors and faculty members. The samples focused on recruitment methods at the post-secondary level.

Instrumentation

In research, surveys are used to "describe trends and determine individual opinions about issues" (Creswell, 2005, p. 82). The survey that was used sought to describe trends of recruitment methods at the universities and determine faculty and student opinions about those methods that are being used. A cross-sectional survey design was used to examine current attitudes and practices of recruitment methods as well as a group comparison between the

attitudes, beliefs, and opinions of those recruitment methods between faculty and students. Upon receiving the surveys, qualitative survey interviews were conducted using open-ended questions in which I listened to and recorded comments of the interviewees via a telephone interview.

An online, Qualtrics survey was distributed to all professors of TEE at the three chosen universities. The survey sought to obtain information regarding current recruitment efforts that their programs are using and perceived student reactions to those efforts. Another Qualtrics survey was distributed to enrolled TEE pre-service teachers. This survey contained open-ended and Likert-type scale questions regarding student demographics and perceptions of recruitment methods at their respective universities. This survey asked students what activities recruited them into their major and what their reasons are for continuing in the field. Both professors and students had two weeks to complete the surveys. The survey instrument is based off of a study regarding TEE recruitment and retention in Indiana conducted by Harris (2008) and was used with permission. This previous study was conducted using the survey on the same population of TEE faculty and students at Ball State University, Purdue University, and Indiana State University. This instrument was adapted from a study conducted by Grey and Daugherty (2004). The literature has suggested recruitment methods that have worked, such as housing initiatives, involvement in Technology Student Organizations, working with current TEE teachers at the high school level, etc., and these methods are listed within the current survey to see if universities have had success with marketed recruitment methods (Freeland, 2013; Love et al., 2016). An area was added for universities to discuss other types of recruitment methods they have developed on their own. Open-ended and discussion-based questions were added and then followed by telephone interviews to gain more insight into the data that had been collected through the surveys.

Data Collection

Quantitative Data

This study worked closely with professional development organizations in the field, as well as the Indiana Commission for Higher Education (ICHE), in order to collect enrollment data. The ICHE was used to obtain data from the years 2012 to 2017, while professional development organizations such as the Engineering/Technology Educators Association (E/TEI) and the Association for Career and Technical Education (ACTE) helped to provide contact information for current professors at the three universities. The ICHE provided data regarding graduation rates in all areas of Indiana post-secondary students. From this database, I was able to narrow my search to reflect only TEE graduates and the years 2007 to 2017. The IDOE also has a database of current educators in each field of study. I used that database to search how many of those TEE graduates remained in the field from the proposed years to see if there was a significant teacher shortage. Data were analyzed to see if there was a significant decline in TEE enrollment from the years 20012 to 2017.

Qualitative Data

Surveys. Data were also solicited from faculty members and pre-service teachers within the field of technology. In order to reduce sampling error, all faculty and students in TEE at all three universities were invited to participate in this research study (See Appendices A & B). Before distributing surveys, I obtained permission from the three universities. After obtaining permission from the universities, I used emails provided by the dean of the colleges in which the TEE major was housed. The invitation was sent via email and included a cover letter with information of the study's intent, information regarding how information would be protected, as well as an informed consent for participants if they chose to participate.

The primary focus of the surveys was to ascertain the current recruitment methods at

Indiana universities and if those recruitment methods were working. I created a survey using Qualtrics, an online survey tool used at Indiana State University. During the survey, each participant answered a series of questions which remained the same for each participant. The results of the questions were then analyzed (See Appendices C & D).

The quantitative method mentioned previously provided the breadth of the data, whereas a qualitative approach provided a more in depth and detailed explanation of the research (Patton, 1990). For this reason, upon completion of the surveys, I interviewed three faculty members from two different universities Although students were also invited to participate in the interview portion of the study, none chose to participate.

Interviews. Green, Camilli, Elmore and American Educational Research Association (2006) stated that "a well conducted study can benefit from having multiple sources of evidence to ensure that the study is as robust as possible" (p. 30). In qualitative research, the intent is to develop in-depth exploration of a central phenomenon (Creswell, 2005), in this case the recruitment methods of TEE majors at universities in Indiana. The primary data collection came from surveys of the faculty and students enrolled in TEE majors, but the purpose of qualitative interviewing in evaluation was to understand better how the programs were viewed; therefore, surveys were followed up with phone interviews of a purposeful sample. The convenience sample consisted of two faculty members from one university and one faculty from a different university.

"An interview is viewed as a conversation between the interviewer and interviewee, in which the interviewer asks questions and the interviewee responds accordingly" (Esterberg, 2002, p. 54). "The purpose of interviewing is to find out what is in and on someone else's mind. We interview people to find out from them those things we can't observe" (Patton, 1990, p. 196).

In order to build trust with the interviewees and to allow for them to be comfortable enough to elaborate on their feelings of recruitment, it was imperative for the interviewer to be non-judgmental and use active listening methods. The intent was to make the interviews conversational. As the researcher, I shared information with the participants about myself in order to establish understanding. Conducting the interviews in this manner permitted me to put interviewees at ease and allowed for an ideal interviewing environment.

Interviews were conducted via phone due to travel constraints. I believe that a phone interview was able to provide an appropriate atmosphere to obtain further detail into the survey responses. An interview protocol was developed that contained instructions for the process of the interview, the questions to be asked, and a space to take notes on the responses. By creating this protocol, I knew exactly which questions needed to be asked and was able to assure that each interviewee was asked the same set of questions. Because the data were used for qualitative evaluation purposes, it was more creditable to collect the same information from everyone who was interviewed, thus reducing the likelihood of the interview data be rendered invalid (Patton, 1990). The interview protocol can be found in appendices E and F. I conducted open-ended interviews with three faculty members which lasted roughly 20 to 30 minutes each.

A recorder was used to capture the raw data of the interviews used during analysis. According to Patton (1990), "There is no substitute for this data" (p. 347). In addition to increasing the accuracy of the interviews, a recorder allowed me to be more attentive during the interview process; simple notes were taken during the interview to help in later analysis and to remind myself of key words and phrases used by the participants.

At the beginning of the interview, I obtained further consent from the interviewee to participate and advised them that a recording would be taking place to ensure that I could

transcribe their answers accurately. Participants could choose not to be recorded in which case the interview would take place with notes instead of recording; however, all participants agreed to be recorded as they were interviewed. During the interview, experience/behavior questions were asked as well as opinion/values questions aimed at obtaining a better understanding of each participant's opinion of the recruitment methods being used and if they think those methods are of value. Some background questions were asked to relate respondents to each other. For example, faculty members were asked if they design recruitment methods at their campuses. At the conclusion of the interview, I was courteous and professional and informed the interviewee how to access findings after the data were analyzed if they wished. Directly after the interview, I checked to make sure the recorder was functioning properly and immediately reviewed key points from the interview. The essential data from interviews is to have transcriptions verbatim (Patton, 1990), and therefore I ensured that as I transcribed the interviews, I was writing the exact words of the interviewees.

Data Analysis

I analyzed data both quantitatively and qualitatively. I conducted a preliminary exploratory analysis to obtain a general sense of the data, collect ideas of emerging themes and trends, and consider if more data were needed. After the preliminary analysis, I conducted the in-depth analysis of each research question. Data collected from the ICHE were analyzed to determine the extent to which there is or is not a TEE teacher shortage in Indiana. Faculty and students were surveyed and interviewed to gain their perspectives on the methods of recruitment on their campuses and the extent to which those methods were or were not working. Faculty and student opinions were then compared.

To answer the first research question, the data from the ICHE was sorted to determine if

there was a statistical significance of TEE teachers enrolled in Indiana universities from 2012 to 2017. The data were then analyzed using both SPSS and Microsoft excel software in which a *t*-test was run to find statistical significance. In this instance, the alternative non-directional hypothesis was that there was a decline in TEE graduates from the state of Indiana from the years 2012 to 2017 with a significance level of .01. Upon data collection, a *p*-value was calculated, degrees of freedom calculated, and a one-tailed test of significance was run as well as the previous mentioned *t*-test.

To answer the last two research questions, the data from the faculty and student surveys were analyzed using descriptive statistics of mean, median, and mode. Variance and standard deviation were calculated. The surveys were conducted using Qualtrics software. Questions were based on a Likert-type scale as well as a few open-ended questions. The open-ended questions were examined for themes. Each person was asked the same series of questions. A numeric score was assigned to each response category of the survey questions. A continuous scale was used to consistently score the Likert-type scale questions; the categorical scales were used in which higher categories of information received higher numerical values. A codebook was created to be used to make sure consistent responses were being collected from the survey instrument. After survey analysis, the data were reviewed to look for missing data and ensure clean data. Data were inspected for scores that were outside of the accepted range by being visually inspected by me; the sort case function was also used within SPSS to help spot out of range or missed case numbers. In the event of missing data, SPSS was used to substitute a value for the missing scores; this value was the average for the question from all study participants.

After descriptive statistics had been analyzed and a frequency distribution graph developed, descriptive statistics were collected in order to draw conclusions about the

differences between faculty perceptions and student perceptions in regard to recruitment methods being used. When analyzing the quantitative survey data, descriptive statistics were used to describe trends in the data.

Once all data were collected, I followed the suggestion of Patton (1990) to make four transcript copies of all qualitative data collected. The purpose of creating four copies was to allow me to have a master copy for safe keeping and three copies for various analyses. The three copies were used as following: one copy was used throughout the analysis, one was written on, and one was cut apart to chunk to create themes and codes for analysis. The culminating activity after data collection was data analysis and the presentation of findings. The challenge was to make sense of the data collected, identify significant patterns and determine what the data revealed.

Upon completion of the surveys, the willing academic participants were contacted to set up interviews. The interviews were conducted over the phone, and after transcribing the interview and re-reading the transcriptions at least twice, I performed a cross-case analysis by dividing the text into segments of information. I looked through all of the field and interview notes and made comments to assist with coding. Upon notation of the transcripts and field notes, I then began to label the segments into a priori codes, or codes that have been pre-set (Impact, 2007) based on my subject knowledge and expertise and the general questions being asked on the surveys and throughout the interviews. I did not close my findings off to only a priori codes but allowed for emerging codes to be added as the data was developed if there was a need. Guba (1978) suggested to extend, bridge, and surface the data. I used this process to build on items of information already known (extend), the a priori codes, make connections among different items (bridge), and finally use that bridge to propose new information or emerging codes (surface).

Using pre-set and emerging codes, I then reduced overlap and redundancy of the codes by using the constant comparative method in order to further analyze emerging themes within the interviews. Inductive analysis was conducted in which the patterns, themes, and categories came from the data (Patton, 1990). Finally, I collapsed the codes into themes with a goal of five to seven themes. Similar views, events, beliefs, and perspectives were classified under one comprehensive category/theme (Corbin & Strauss, 2008). Those themes were then analyzed using descriptive statistics such as frequency, percentage, and variance. I created a table that was used to help organize the materials. Materials were organized by type and by themes. The data were hand-analyzed due to the small database. I read the data and marked them by hand, dividing them into parts or themes by cutting and pasting sentences onto cards and grouping those cards into similar themes.

Once all data had been analyzed, I interpreted the findings and added them into the research findings section. Interpretation goes beyond stating the descriptive data. During interpretation of the data, I attached significance to what was found, offered explanations of those significances, drew conclusions, and made inferences. I also offered extrapolations, or modest speculation, for further research based on the data that was found. I followed the suggestions of Patton (1990) and made clear the differences between the descriptions found within the data and the interpretation of those descriptions.

Ethical Considerations

As a researcher and a secondary school teacher, I am aware that I am in a position of responsibility and trust. Therefore, it is my promise that while carrying out this research, I have observed the highest possible ethical standards. Before data collection, I performed a risk assessment to determine what ways, if any, the interviews and surveys would put participants at

risk. There was no risk foreseen with the surveys and interviews. I maintained the highest

integrity at all times regarding data gathering by assigning numbers to survey responses and

interviews during the process of analyzing and reporting data to protect their confidentiality. I

obtained informed consent for both surveys and interviews. I have only reported state

enrollment data that is in the public domain and only shared the data I collected through the

research findings section of this research. I avoided plagiarism and fully acknowledged the work

of others to which I have referred my report. I have reported my findings honestly and

truthfully. I consider the research project worthwhile and of benefit to students, communities,

and universities.

CHAPTER 4

RESULTS

This chapter examines the qualitative and quantitative results of the research study. The three research questions are presented within this chapter along with each question's corresponding results. The research questions were:

1. What are the enrollment trends of technology education majors in higher education institutions in the State of Indiana during the period of 2012–2017?

2. What perceptions do TEE faculty hold regarding methods that have proven effective in recruiting pre-service teachers into TEE programs at the postsecondary level?

3. What perceptions do TEE pre-service teachers hold regarding effective methods for recruiting pre-service teachers into TEE programs at the post-secondary level?

To answer the research questions quantitatively, data were collected from the ICHE to evaluate the hypothesis of a teacher shortage in Indiana. Additionally, quantitative data included an analysis of surveys completed by current pre-service TEE faculty members and students from the three universities. Qualitative data were gathered in the form of open-ended question telephone interviews from samples of faculty.

The data from the ICHE showed that there was in fact a shortage of TEE teachers in the state of Indiana and that shortage is projected to continue into the year 2024 (ICHE, 2017). During the quantitative and qualitative research of faculty and students, certain themes emerged. The general demographics of students were similar with most being male and at the senior or graduate level of their education. All students surveyed were Caucasian, and all faculty indicated that the majority of the TEE population was Caucasian as well. The most common courses taken in high school by current pre-service teachers were engineering and drafting/CAD-based courses. In terms of recruitment, faculty indicated that mass media was not being used, and students indicated that the use of mass media had no influence on their choice to pursue a TEE major. Both faculty and students showed that the most influential factor in recruiting TEE majors was current teachers in the field. Retention methods that faculty believe to be keeping students in the program was the individualized attention given to students in the major, while students stated that their own personal interest and success in coursework was the main factor influencing their decisions to remain in TEE programs.

Results

Research Question 1

The first research question was: What are the enrollment trends of technology education majors in higher education institutions in the state of Indiana during the period of 2012–2017?

Enrollment. The enrollment of TEE majors in the state of Indiana has dropped during the period of 2012 to 2017. Figure 1 illustrates the drop of TEE enrollment in the state.
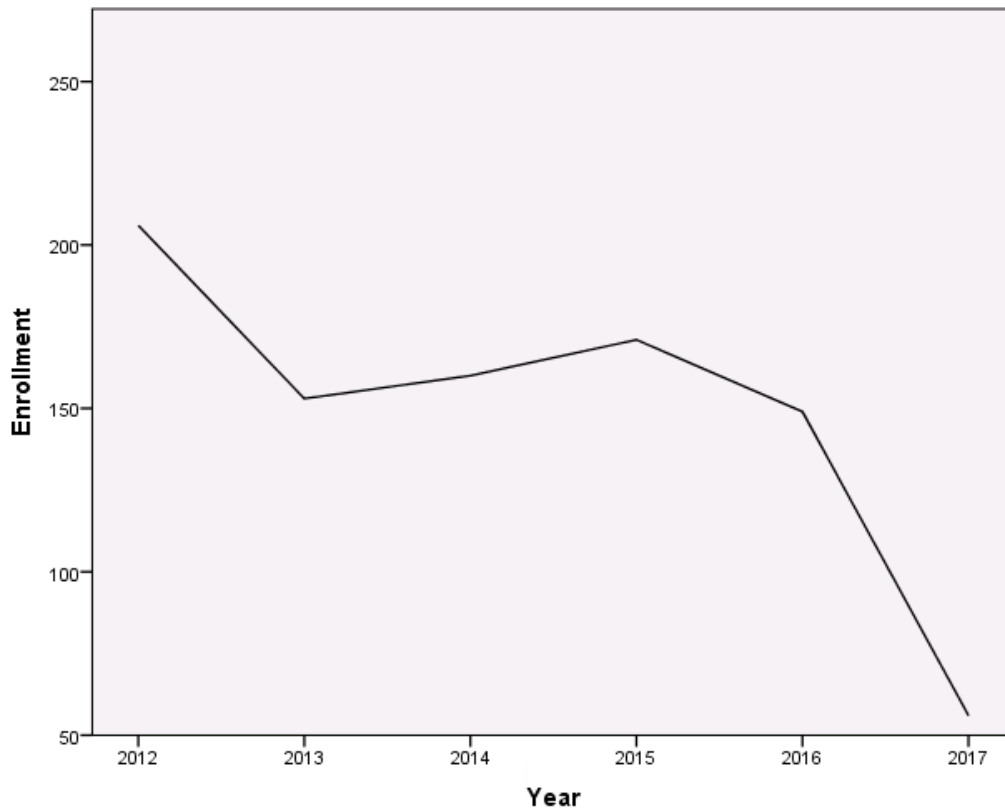
Figure 1. Indiana TEE higher education enrollment trends by year.

In 2012, 206 students enrolled in TEE programs within higher education institutions in the state of Indiana. In 2013, those institutions enrolled 153 students. The year 2014 saw a rise in TEE enrollment as it went up slightly to 160. Another rise came in 2015 with an enrollment of 171, while in 2016, enrollment dropped to 149 students. A dramatic drop in enrollment of TEE majors occurred in 2017 with only 46 students enrolled.

Job openings. The years 2012 to 2017 saw a rise and fall of job openings for TEE teachers. Figure 2 illustrates the number of job openings throughout the course of these years. In 2012, 398 job openings were posted in the state of Indiana for TEE Education majors; that number jumped to 447 in 2013. By the 2014 school year, 436 openings were available. In 2015, there were 409 positions, and in 2016, a total of 360 positions were available for TEE teachers. Data collected from the IDWD showed that in 2017 there were 246 job openings for TEE

majors. TEE openings included positions in middle school through post-secondary schools. The

projected number of openings in 2024 is expected to be 350. On average, 34 new job openings

in this specific career field occur annually within the state of Indiana.
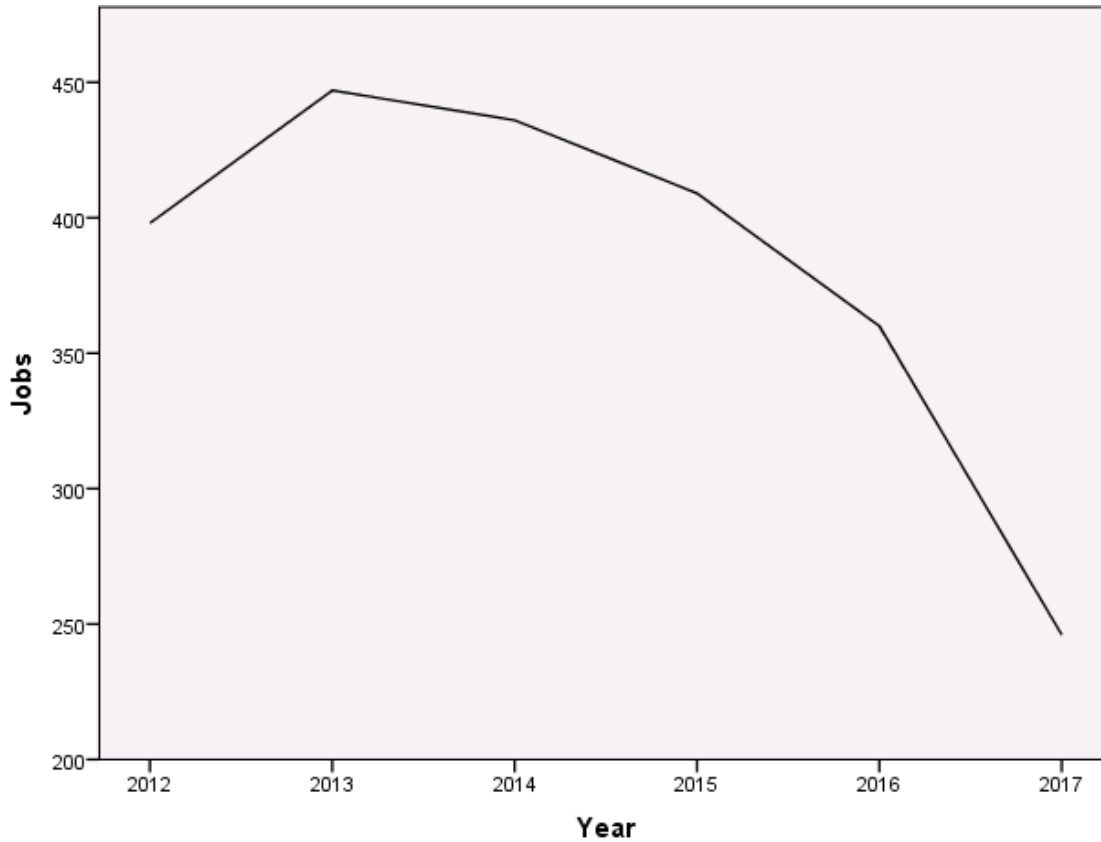
Figure 2. Indiana TEE job openings by year,

Summary of Findings for Research Question 1

The enrollment trends and corresponding teacher position openings in TEE show that

there is a teacher shortage. The year 2017 saw 246 job openings in the state of Indiana but only

46 students enrolled within the TEE major who could ultimately become teachers. Table 1

illustrates the statistical analysis on the teacher shortage data. A *t*-test was completed to compare

enrollment and job openings in the state of Indiana from 2012 to 2017. The number of students

enrolled in Indiana TEE preparation programs are significantly less than the reported teacher

openings in the field, $t(9) = -6.43$, $p < .0001$. The year 2017 saw an enrollment of 46 TEE

majors, yet there were 246 job openings for those specific careers. The projected number of job

openings in 2024 is 350. These data show that there is a shortage of technology education

teachers in the state of Indiana.

Table 1

T-test of TEE Enrollment and Teacher Openings

	Mean	SD	*p*
TEE Enrollment	149.16	50.04	.00012
Teacher Openings	382.66	73.63	

Note: Five years of academic year data 2012–2017.

Research Question 2

The second research question asked: What perceptions do TEE higher education faculty

hold regarding methods that have proven effective in recruiting pre-service teachers into TEE

programs at the post-secondary level?

Quantitative findings. Of the nine faculty invited to take the recruitment survey, only

four participated. The data collected represents a 44% response rate of the intended population

for the state of Indiana. The demographic information gathered from the faculty surveys show

that of those universities that participated, the general population of TEE pre-service teachers

was very similar. When surveyed, faculty were asked which groups were the majority in each

category; no concrete numbers were given. No assumptions can be made regarding the

following beyond that percentages are over 50% of the population. All faculty surveyed

indicated that the majority of their TEE population consisted of graduate-level students. None of

those surveyed had an undergraduate majority within their programs. Similarly, all survey

respondents indicated that the majority of their TEE population was made of male students.

None of the programs indicated a majority of female students. Seventy-five percent of the

students in attendance at the universities surveyed were above the age of 26, with only 25%

being between the ages of 21 and 23. In terms of ethnicity, the faculty members indicated that

the majority of the student population enrolled in TEE in the state of Indiana were Caucasian.

In terms of what recruitment methods had been used on campus, faculty members

indicated that the majority of their recruitment came from means other than those listed on the

survey. Faculty responded that they most commonly used methods such as scholarships, tables

at conferences, representation at technology and college fairs, writing articles in local media,

word of mouth, and the department website. The second most frequently used method of

recruitment was a tie between flyers and email blasts. Table 2 shows both the frequency and the

percent of which recruitment methods were chosen by faculty.

Table 2

Frequency of Recruitment Methods Reported by Faculty

	Frequency	Percent
Flyers	3	15.8
Email Blast	3	15.8
Advising to General Population	2	10.5
Attending High Schools	2	10.5
TSA Judging	2	10.5
Other	7	36.8
Total	19	100.0

In terms of the most influential methods of recruitment (as perceived by the faculty), the

support of current teachers and the university website were suggested to be the most influential

in recruitment of technology education majors within the state of Indiana. The support of current

teachers had a mean of 3.25 on a 4.0 scale and a standard deviation of 0.96, while the

institutional website had a mean of 3.0. Beyond those methods, faculty perceived other forms of

university support ($M = 2.75$), work mass media such as TV and newspapers ($M = 2.66$), and current students in the program ($M = 2.75$) to also be influential. Outreach events (Technology Student Association [TSA] competitions, FIRST robotics competitions, and Technology and Engineering Education Collegiate Association [TEECA] events at conferences) with a mean of 2.50 were perceived to be the same level of influence as previous teachers. Methods that had no perceived influence on the recruitment of TEE majors in the state of Indiana were high school athletic coaches ($M = 1.25$), local and national government efforts ($M = 1.00$), and the ability of the university programs to contact high school students' parents ($M = 1.25$). Table 3 shows the measures of central tendency for the influence-based questions.

Table 3

Measures of Central Tendency for Influential Recruitment as Perceived by Faculty

	Mean	Median	Mode	St. Deviation
Previous Teachers	2.50	2.00	2.00	1.00
University Support	2.75	2.50	2.00	0.95
Mass Media	2.66	3.00	3.00	0.57
Website	3.00	3.50	4.00	1.41
Current Students	2.75	2.50	2.00	0.95
Social Media	1.50	1.50	1.00 2.00	0.57
Outreach	2.50	2.50	2.00 3.00	0.57
Current Teachers	3.25	3.50	4.00	0.95
Principals	1.75	2.00	2.00	0.50
Counselors	2.25	2.50	1.00 4.00	1.73
Coaches	1.25	1.00	1.00	0.50
Local Government	1.00	1.00	1.00	0.00
National Government	1.00	1.00	1.00	0.00
Parents	1.25	1.00	1.00	0.50
Other	3.00	3.00	3.00	0.00

Note: Other had a high mean, but the choices indicated were highly disparate. As measured on a 4-point scale.

With regard to retaining students within the pre-service TEE majors, the most perceived influential method of retaining students was the individualized attention given to students within this particular major ($M = 3.75$), and the relationships faculty develop with students ($M = 3.75$). Faculty relationships with students can be seen as an extension of the individualized attention. The remaining options were also viewed as relatively important in students retention: the content with the TEE courses ($M = 3.50$), small class sizes within the major ($M = 3.25$), and the overall reputation of the program ($M = 3.25$). Interestingly, faculty perceived that students' own success in coursework ($M = 2.50$) was the least influential in retaining students in the program. Table 4

shows the measures of central tendency as reported by faculty in regard to the methods that are retaining students in the TEE major.

Table 4

Measures of Central Tendency for Faculty Perceptions of Factors Influencing Retention

	Mean	Median	Mode	St. Deviation
TEECA Involvement	3.00	3.00	3.00	0.81
Small Class Sizes	3.25	3.00	3.00	0.50
Student Relationships	3.00	3.00	3.00	0.81
Job Outlook	3.00	3.00	3.00	0.81
Faculty Relationships	3.75	4.00	4.00	0.50
Individualized Attention	3.75	4.00	4.00	0.51
Reputation of Programs	3.25	3.50	4.00	0.95
Lab Facilities	3.00	3.00	3.00	0.81
Course Content	3.50	3.50	3.00	0.57
Success in Coursework	2.50	2.50	2.00 3.00	0.57

Note: As measured on a 4-point scale.

Qualitative findings. The second research question, "What perceptions do TEE faculty hold regarding methods that have proven effective in recruiting pre-service teachers into TEE programs at the postsecondary level?" was also answered through qualitative methods. Three faculty members were interviewed regarding their perceptions of what has proven to be effective recruitment methods for their universities. Faculty were asked various questions relating to recruitment efforts on their campuses as well as what methods were helping to retain pre-service teachers in their TEE programs.

After transcribing the interviews, five emerging themes were found pertaining to recruitment methods. Faculty believed the most useful recruitment tool they have are current

TEE teachers in the middle and high schools. Their next biggest recruitment tools were on-campus visits, followed by the ability to offer scholarship money, and finally the various types of advertising in which they have participated. Along with the themes of recruitment strategies are the problems that recruitment efforts are facing, which are discussed as well.

Current teachers. Professor X summed up his/her opinion of current TEE teachers in the following statement:

> Our approach right now is to maintain a good relationship with the current high school teachers. We let the teachers know we don't have the numbers right now and if they know that their program is going to expand or they are going to want to hire somebody it's going to take us four years to get you somebody so send them to us now and we will get them back to you with a degree in hand.

In order to maintain a positive relationship with current teachers, one university offers professional development days for current teachers, while others visit classrooms to maintain a healthy relationship with the current technology teachers within their local communities. Other methods have been to visit high school classrooms to offer PLTW certifications and some faculty work as industry partners with the high school teachers. Faculty and current teacher relationships are kept intact as the current teachers are seen as the "strongest continuing candidate" (Professor Y) to influence students to become technology educators. Professor Y stated "Current teachers help, there is such a problem getting good teachers. We need more warm bodies coming through the institutions." During professional development days, high school teachers are invited to the university as a way to give back to current teachers. The professional development days are free to current teachers. They receive educational experiences and faculty talk to them about recruiting future TEE teachers.

Previous strategies have been to keep the dwindling number of pre-service teachers a

secret.   The problem became that as more and more teachers were needed, the universities had

to tell principals and current teachers that there were no students in the pathway. Professor X

explained:

> Administrators are trying to harvest good students who are interested and excited and
>
> they are trying to encourage them to go into teaching, trying to give them teaching
>
> experiences such as a teaching assistant in the classrooms and then suggesting that they
>
> will hire them back in four years after they complete a teacher education degree. They
>
> are trying to really generate their own.

University faculty began to challenge principals and current technology teachers to send them

one student a year. In return they would produce a TEE from the major after four years who was

prepared to take on the needs in the secondary schools. Professor Z stated:

> (We) have communicated with schools, alumni, or partner teachers, if they have anyone
>
> interested to direct them to the college. We try to support their programs at the high
>
> school level by printing posters and flyers to help influence students.

University professors indicated that they do a lot of outreach events in the schools and

work closely with program alumni and other current technology educators to encourage future

students to go into TEE programs. As stated by Professor Y "I feel that teacher influence is the

best, and there is research behind that. Teacher influence is the best way to recruit future

technology educators."

Campus visits. According to Professor Y, on their campus "actual campus visits are the

best so far." The other two professors indicated that beyond using current teachers, on-campus

visits have been successful as a recruitment method. All universities represented mentioned that

they do some type of campus visit days and most commonly referred to them as preview days. Preview days were described as a time where interested high school students and transfer students are brought to campus, given a tour of the entire campus and then shown the labs and classrooms of the TEE program, and some universities even offer students a free lunch in which they can sit and talk with current TEE students about their experiences. At one university, the TEE faculty try to make the on-campus tour as inclusive as possible as described by Professor X:

> We do on-campus visit days so we try to recruit students who might be interested to come visit campus. [We] setup a campus tour and our own individualized tours. Students get to observe a couple of teacher education classes, talk to professors and students over lunch, as well as do a full campus tour. In the past our department head had some extra money and was able to pay for some students to travel to campus to do an individualized visit like that.

One university focused on accepted students specifically, where high school seniors who have been accepted to the university are shown around campus and allowed to meet and talk with program faculty and shown the TEE labs. Other strategies have been to invite high school teachers to bring entire classes to campus for a day; students rotate through different activities that the current TEE majors were working on, allowing the high school students to see if this was a degree program students would be interested in pursuing.

When asked how campus tours were set up, most participants mentioned that they worked closely with their campus admissions office and would receive calls from admissions when they received a student who was interested in the TEE major. While campus tours are considered a passive approach, a more active approached has been used by other university faculty members. Two faculty participants said they had tried open houses where all of the

program faculty would attend and local high school students were invited to come and learn about the program and the university as a whole, the students who came to the open houses and showed an interest would be invited back to participate in a campus tour.

   Scholarships. Another key recruitment tool used by faculty was scholarships. As stated by Professor Y "Money talks." Professor Y went on to explain that anytime a program could offer scholarship money or pay for students to visit campus, it was more enticing to future students. One university gave out $17,000 in scholarship funds with $1,100 specifically for technology education majors. Money is a big factor in recruitment as indicated by all three participating faculty members. Sometimes a decision is made by high school students to attend a specific university because of the amount of scholarship money received. Professor X gave an example: "We had a student who was from Iowa who was interested and excited, but when the rubber hit the road, she saw the tuition bill and she decided not to come."

   Tuition is a factor in recruitment and limits the geographical locations students choose to attend college. All professors interviewed teach at Indiana state schools. Some surrounding state institutions offer in-state tuition to regional out-of-state students, while others do not. Professor Y mentioned that students in some counties in Ohio are offered in-state tuition if they come to that specific Indiana university, whereas other states such as Iowa charge more in out of state tuition. Professor X mentioned that other states pay their licensed teachers more so students come to Indiana for their degree for cheaper tuition but return to Illinois for a larger paycheck once they obtain their license.

   Professor Z mentioned that although money and scholarships are a good recruitment tool, they do have their drawbacks: "We have given out small scholarships over the last couple of years, but students could use that scholarship money and then transfer to another major after a

period of time, so I am not sure how positive that was." Professor Y mentioned that scholarship committees often set a minimum number of applicants, and if those numbers are not met, the scholarship is not awarded. Some scholarships require students to stay in Indiana to teach and some students do not want to make that kind of commitment.

  Other advertising. Other forms of recruitment that have been used to bring in future TEE have been different forms of advertising such as posters, flyers, and advertisements on community and campus buses. Mailings have become less common but are still sent out to potential future students. Professor Y mentioned that his or her institution mails information to potential students in Indiana as well as the surrounding states to which they offer in-state tuition. The Indiana Recruitment Task Force has worked with university professors and current technology teachers to develop lesson plans for current and future teachers to use and have mailed those lessons. Another way that professors described that they advertise their programs is by setting up booths at various events. These events vary based on each university. One university focuses on attracting students from outside their department by attending *Become a Teacher Day* in Indianapolis as well as attending recruitment fairs on campus. Another university focuses on high school technology student associations (TSAs) and finding various ways to host events, judge events, or participate in general. For instance, two of the three universities participate as volunteers at the Indiana Super Mileage Engineering Challenge. The universities bring their current pre-service TEE majors and help to run the event each year at Lucas Oil Raceway Park in Indianapolis. Other TSA events the universities participate in include FIRST robotics, vex robotics, and TSA leadership events. Faculty believe these alternative methods of advertising are working to recruit TEE candidates.

In order to gain more insight into the recruitment methods used on Indiana campuses, interview participants were asked who at their campus or program does the actual recruiting. All responses were very similar in that a hierarchy was in place at each university. University-level recruiters would recruit for the university as a whole and make mention of each program briefly during presentations. College-level recruiters present on the specific colleges within the university and go more in depth into the programs at their specific college. Department-level recruiters focus on their specific department within the colleges. The next step would be a program-specific recruiter that would focus solely on recruitment for the TEE program. None of the interviewees confirmed that they had this level of recruiter; instead, the program-specific recruitment responsibilities fell onto the faculty members themselves. All interviewees stated that the faculty in their department work together to do different recruitment events, such as conferences and working as liaisons for the program, but that the majority of the recruitment work falls onto the program head.

When talking about recruitment, many items were described as a hindrance to those efforts. The biggest factor to overcome when recruiting students is the current stigma that faces teachers and education. During the interview, Professor X had this to say about the stigma that is facing education:

> I asked three student teachers to pull aside students in their classes as ask them how many of them thought about being a tech ed teacher and how many are going to and if they are not then why. The response was that a lot of students thought about teaching, and a lot of them thought about being a tech ed teacher but at that time almost all of them replied that their own teachers discouraged them from becoming teachers. I thought that was really disappointing.

Professor X went on to describe that education as a whole is not seen in a positive light currently, and students are being discouraged from going into any education field. Both local and national governments were putting their efforts into education, and sometimes it was not turning out in a favorable manner for current teachers. Lots of changes have been made at both the state and national level in regard to education, and student learning has been promoted. In theory student learning as a focus in education is a good idea, but how it was played out in the classroom was not well done. Teachers became discouraged about teaching and were telling students "don't go into teaching" (Professor X).

At the same time, technology education was facing changes in order to keep up with the demand of students. More teachers were needed, but none were coming from the universities, so an emergency certification process was developed. Professor X described this process as "you could get any degree you want and then get the emergency certification and all of the sudden, overnight, you're a teacher!" When asked about the emergency certification process, Professor Z stated, "That's not a good way to do it. You get teachers in the short term but in the long term it just upsets those teachers who have the tech ed degree." Professor Y noted that not only do licensed teachers get upset about the emergency certification process, but after so long, teachers with an emergency license and no education background get burnt out and leave the profession or go to a higher paying job. Because of the stigma facing education and the methods of emergency certification, current technology educators are getting discouraged, and that discouragement is relayed to their students, causing them not to pursue careers in TEE and could potentially be one of the major factors of the technology teacher shortage. Another factor that could be contributing to the lack of interest in TEE majors is the diminishing number of

programs in high school; students are not coming from a technology program or did not have technology-based classes as electives, so students do not know that TEE exists as a career field.

One university faced a particularly different hindrance; the program is housed within the education college whereas the other two universities house their programs with the technology college. When asked to describe the difference, the professor said that they would prefer their program to be in a technology college as opposed to the teachers college because they would be closer to similar majors, and when searching for a TEE major, prospective students search within the technology colleges for a technology education major.

Another factor that can hinder recruitment efforts is the ability to offer classes online. All three faculty noted in their surveys that the majority of their student body was at the graduate level. When asked why, the response was that graduate programs in the field are available online and therefore have a farther reach geographically to obtain students. Even though universities have both program-level and department-level recruiters, these positions can have a negative impact on student relations and cause recruitment to struggle. Professor X explained that at his or her university, recruiter positions have high turnover rates and that recruiting is often about building relationships. Professor X went on to give an example that if a university has someone come in for two years and leave, then another person for two years and that pattern continues, it makes it hard for a recruiter to establish a relationship with a high school or college student. Along with the retention rate of recruiters, another factor that they face is that many recruitment positions at the department level are part time and have a limited amount of time that they can do recruitment-based work. Another limitation to TEE programs is the retention rate of students.

Retention. The second portion of interview questions was in regard to retention. Faculty were asked how they keep TEE majors in their programs. Three emerging themes became

present in regard to retention strategies at each university: community involvement, a student-centered approach, and faculty efforts.

All participating faculty indicated that they build a sense of a community within the TEE major. Professor Y stated, "We are small and we have more of a personal feel to our program. Everybody knows everybody and its helpful." Faculty went on to describe how potential students are told that within the TEE programs a sense of community exists and that students will be a part of a close-knit group. Many of the programs are so small that students take a majority of their major courses together and work on projects as teams as well as compete in organizations such as TEECA. Professor X explained:

> During the time they are with us, we try to foster a sense of community. We have a lab space that is rather big. [The] first faculty in the door unlocks it, and the last faculty out the door locks it, and we tell our students whenever there isn't a class in there, it is their space. They can gather there to study, work together, schedule classes, or just hang out.

All three campuses are considered large campuses, and faculty try to drive home the fact that since TEE is such a small program, their students will become close knit within a big university. They have somewhere to belong and something to belong to that is a part of their major and future career. The students become a part of the TEE community and have others to turn to who are going through the same courses and student teaching experiences.

One university faculty described that faculty take their time in making sure that the program is really student-centered. Faculty do this by giving students opportunities that many other larger majors cannot or do not offer. At one university in Indiana, the TEE program hosts a study abroad program. The program is a trip to Sweden for the TEE majors. Sweden is the founding area of the profession and technology education is required at every grade level.

University faculty take students to the country to visit schools and see how they integrate technology education. Indiana students are able to work with current teachers as well as TEE majors in Sweden to gain father insight on how to integrate technology into the classroom. This study abroad trip gave students a different perspective on technology education and lets them become immersed in a culture that pushes for technology educators.

Along with study abroad opportunities, other student-centered opportunities include the efforts to hire undergraduate students into research. Professor X stated that "almost all of our undergraduate students are hired onto some type of research or development project with us on campus. Why would they want to leave if they are getting paid to work on projects?" These various student-centered opportunities allowed students to enrich their education beyond the major itself.

It is the faculty at these universities who put the community-based atmosphere and student-centered opportunities into motion. The faculty make sure that students are receiving a positive experience in the TEE major. At one university, faculty go beyond teaching and make sure that students have a positive experience, including the student teaching placements. Many education majors have a placement office that calls school districts and offers to send a student teacher, and if they are accepted, the student is placed there. If the student shows up to their placement and it is a bad fit from day one, it is too late. One TEE department sits down and brainstorms if a placement will be a good fit for their students. The faculty take into consideration what individualized attention a student might need and if the host teacher is able to help the student have a positive experience. Faculty members go and actually visit a potential placement and host teacher to see the facility and make sure that the host teacher and the school

are willing to take on the challenges that a student teacher might face so that the university faculty know that the student teacher will have a good experience. Professor X stated:

> We try to make them successful at student teaching by doing our best to ensure a good fit between student teacher and their placement. Other departments do it differently, and I doubt they put in the level of care that we do.

Another university faculty member described that his or her program has the longest field placement on campus for student teachers. Faculty had determined that the more experience students have, the more successful the students will be. At this university, students are placed for 16 weeks in order to allow for a full immersion experience. Student teachers start at the same time that the high school students start, so if the high school or middle school in which they are placed starts a week before the college semester starts, they are still expected to be in that classroom student teaching at the beginning of the high school or middle school semester. Following the high school schedule allows student teachers to learn how to orient a classroom at the beginning instead of coming in part of the way through. Professor Y mentioned "If a student teacher doesn't learn how to set the tone for their classroom, they won't be successful when they are on their own." This level of care when placing student teachers and giving them a full immersion into a high school classroom are how faculty make sure that their TEE students are going to become successful teachers upon graduation.

Methods to try. The final question asked during the interview process was what methods faculty would like to try in regards to recruitment or retention of TEE majors. One method that one professor would like to try is to have current students be more engaged in the recruitment process. TEE programs do a lot of volunteering for organizations but sometimes do not have the capacity to send students out during those volunteer hours to talk to high school students and

actually recruit for the major. Another idea was to establish a STEM certification and have TEE

majors STEM certified. So many schools are promoting STEM or STEAM (Science,

Technology, Engineering, Art, and Math), and the faculty members think it would be helpful for

recruiting to offer some type of STEM certification along with the TEE license. Working with

community colleges and other program areas to develop different routes for TEE majors was also

an idea. One route that was proposed was to find a way to incorporate a transition between high

school and college. This transition might be in the form of a dual credit course for high school

students to take while in secondary school and gain credits toward the TEE major. Although

dual-credit programs exist within each university, none have tried a program specific dual credit.

All participating professors indicated that if they had the opportunity to offer more money, it

would help to recruit more students into the program.

Summary of Findings for Research Question 2

All faculty participants indicated that their student bodies consisted mostly of graduate-

level male students. They also indicated there was very little diversity in their student population

with all participating faculty identifying Caucasian as the ethnicity of the majority of their

enrolled students. The faculty stated that the support of current faculty, high school teachers, and

counselors were the major factors that influenced students to choose the TEE major, although

most often TEE was not the student's first choice but instead tended to recruit their current

students from another engineering or education major. The concept of changing majors seemed

to be similar at each university and commonplace. During their interviews, faculty stated that

they often see students who were struggling or not doing well in related majors such as

engineering or education come to TEE as opposed to majoring in TEE as incoming freshmen.

Retention methods that faculty believe to be working in their programs are the individualized

attention given by faculty to students within the major and the efforts of faculty to develop a

sense of community and ensure a positive student teaching experience. Faculty have many ideas of how to improve recruitment and retention in their programs, but money seems to be the biggest factor preventing new methods from being tried.

Research Question 3

What perceptions do TEE pre-service teachers hold regarding effective methods for recruiting pre-service teachers into TEE programs at the post-secondary level?

Quantitative findings. Forty-six students were invited to participate in the survey from the three participating universities. Of those 46 students, only eight chose to participate in this study. The data collected represented a 17% response rate of the intended population for the state of Indiana, which is very low. A breakdown of the probable causes for this low response rate can be found in Chapter 5. The demographic information gathered from the student surveys showed that of those students that participated, the general population of technology and engineering educator pre-service teachers is similar. Four of the participating students indicated that they were a senior within the TEE program. Only one sophomore and one junior participated; the remaining students chose not to disclose their current class standing. The majority of respondents indicated they were male, with only two female participants. Sixty-two percent of the students were between the ages of 21 and 23; one student selected the choice of over 26, the remaining students chose not to disclose their age. In terms of ethnicity, all of the students that participated in the study were Caucasian. The most common career of the fathers of those enrolled in TEE majors was some type of engineering (37%). There was not a common career for occupations of students' mothers, but none of the students indicated that their mother was in a career related to technology or engineering. A majority of the responses indicated that their parents were retired from the workforce.

In regard to recruitment, only one student responded that his or her first choice of major was TEE. The remaining responses showed that students had chosen to major in something else and later switched to the TEE major. Twenty-five percent of students indicated they had switched to TEE from another engineering major, while only 12% switched from another education major. The remaining 62% switched to TEE from an undeclared major.

As indicated in Figure 3, the most common technology courses participating students had taken in high school was a drafting/CAD class. The second most common course was an engineering course with communications and manufacturing courses following. The least common courses that were taken were transportation and construction courses. One student indicated a course other than those listed and that course was welding.
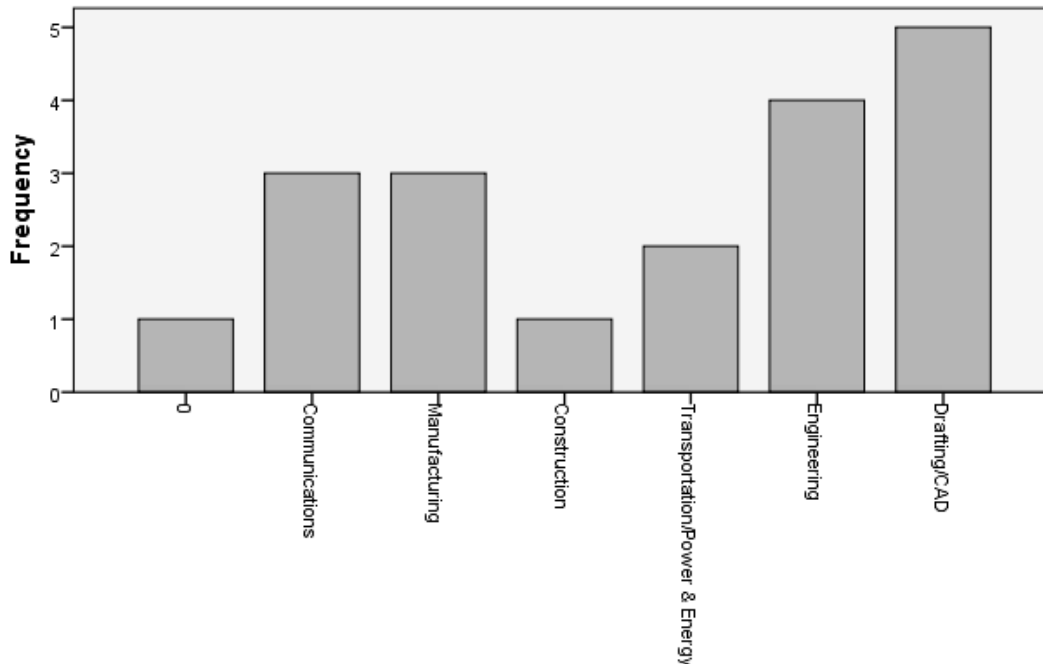
Figure 3. High school technology courses taken by TEE student respondents. O = other.

A different type of technology curriculum, PLTW, has a very specific set of course listings. As indicated in chapter 2, PLTW courses are courses offered in some high schools across the state and are focused on engineering in different areas. It is possible that students could have taken both regular technology courses and PLTW courses during their high school career. Figure 4 shows the PLTW courses taken in high school by students.
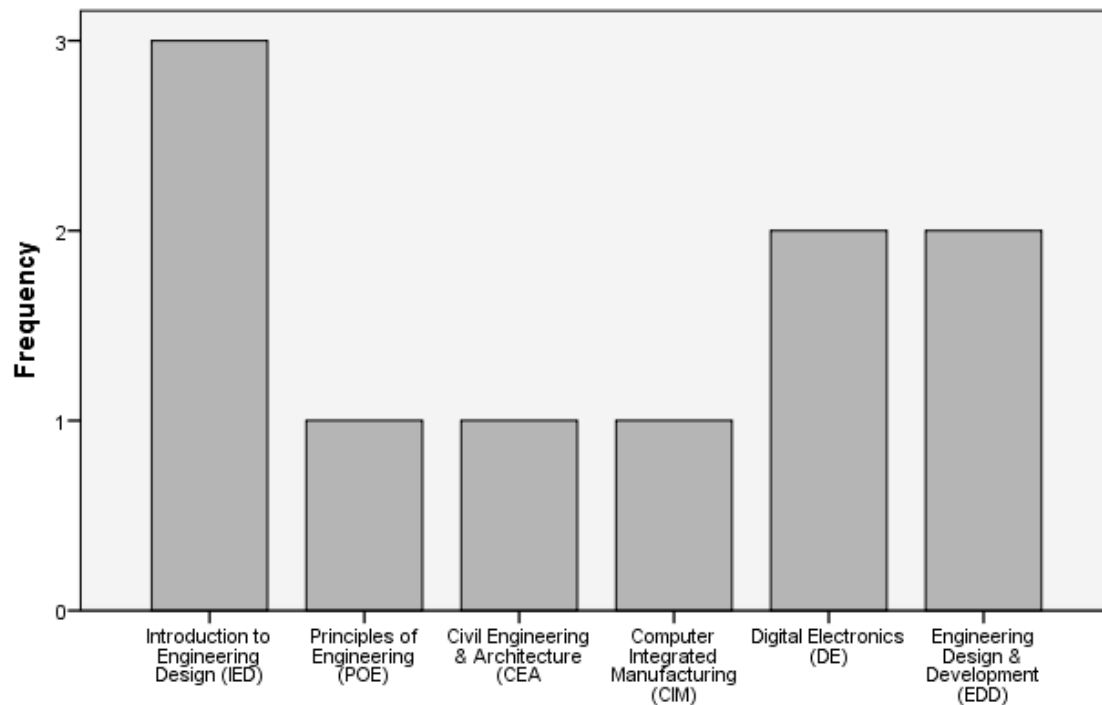
Figure 4. High school PLTW courses taken by TEE student respondents

As shown in Figure 4, most students who participated in the PLTW program took the Introduction to Engineering Design (IED) course. This course is often the first course taught in the PLTW pathway. The second most common courses were Digital Electronics (DE) and Engineering Design and Development (EDD), with the third most common courses being Principles of Engineering (POE), Civil Engineering and Architecture (CEA), and Computer

Integrated Manufacturing (CIM). Of the students who took the survey, none of them had taken

Aerospace or Bio Technical Engineering offered through PLTW.

When asked what influenced students to choose the TEE major, the most influential

factor identified was a personal interest in the topic ($M = 3.66$). Previous teachers were also

identified as a strongly influence ($M = 3.50$). All but one participant indicated that they were

strongly influenced into the TEE major by a former teacher. The least influential factors to

enroll in the TEE major, as identified by the TEE students, were mass media ($M = 1.00$), high

school counselors ($M = 1.00$), and a college friend ($M = 1.00$). All students said that mass media

such as recruitment videos, flyers, and pamphlets had absolutely no influence on their choice to

pursue a TEE major. High school principals ($M = 1.50$), coaches ($M = 1.50$), a visit by the

university to the high school ($M = 1.16$), relatives ($M = 1.16$), high school friends ($M = 1.16$),

and other TEE students ($M = 1.16$) were also perceived to have little influence on a student's

choice to enroll in the major. The following factors had a somewhat influence on student's

decision to major in TEE: university faculty, university website, current TEE students, parents,

siblings, and relatives. Table 5 is an accumulation of the student responses to what has

influenced them to obtain a TEE major.

Table 5

Measures of Central Tendency for TEE Student Responses to Factors that Influenced Enrollment

	Mean	Median	Mode	St. Deviation
Visit to School from Univ.	1.16	1.00	1.00	0.40
Faculty	2.66	3.00	1.00	1.36
			3.00	
			4.00	
Mass Media	1.00	1.00	1.00	0.00
University Website	1.80	2.00	1.00	0.83
			2.00	
Current TEE Student	1.16	1.00	1.00	0.40
Past Experience	2.50	2.50	1.00	1.64
			4.00	
Outreach Activity	2.16	2.00	1.00	1.32
Previous Teacher	3.50	4.00	4.00	1.22
Principal	1.50	1.00	1.00	1.22
Counselors	1.00	1.00	1.00	0.00
Coach	1.50	1.00	1.00	1.22
High School Friend	1.16	1.00	1.00	0.40
College Friend	1.00	1.00	1.00	0.00
Parents	2.33	2.00	1.00	1.50
Siblings	1.83	1.00	1.00	1.32
Relatives	1.16	1.00	1.00	0.40
Personal Interest	3.66	4.00	4.00	0.51

Note: As measured on a 4-point scale.

When asked why students have remained in the major, there was not a single factor that stood out as the strongest factor that retained students in TEE. The factors that received the most responses for retaining students were an interest ($M = 3.66$) and success in course work ($M = 3.50$). Following those, the most common factors were a positive job outlook ($M = 3.00$), positive relationships with faculty ($M = 3.00$), and one-on-one attention from faculty ($M = 3.00$). The least influential factor in retaining students in the TEE major was involvement in TEECA ($M = 2.16$), which is a college level student organization that hosts competitions at the regional

and national level. Another factor that appears to have had absolutely no influence on a

student's decision to stay in the TEE major was the reputation of the program (M = 1.83). Table

6 shows the measures of central tendency for the student responses regarding the factors that

influenced student retention.

Table 6

Measures of Central Tendency for Student Responses to Factors that Influenced Retention

	Mean	Median	Mode	St. Deviation
TEECA	2.16	2.00	1.00	1.20
Small Class Sizes	2.33	2.00	2.00	1.03
Relationships w/ Other TEE	2.83	3.00	3.00	1.16
Job Outlook	3.00	3.00	3.00	0.63
Relationships w/ Faculty	3.00	3.00	3.00	0.63
Individualized Attention	3.00	3.00	3.00	0.63
Program Reputation	1.83	1.50	1.00	1.16
Lab Facilities	2.66	3.00	1.00 3.00 4.00	1.36
Interest in Coursework	3.66	4.00	4.00	0.51
Success in Coursework	3.50	2.50	3.00 4.00	0.54

Note: As measured on a 4-point scale.

Qualitative findings. Of the 46 students invited to take the survey, none of them chose

to participate in the interview portion of this research. Potential reasons for this lack of

participation can be found in the conclusions section.

Summary of Findings for Research Question 3

Of the students who participated in the survey, the majority were between ages 21 and

23. All but one student participant indicated that they were male, while all of them were of

Caucasian ethnicity. The most frequently chosen occupation of pre-service teachers' parents was in an engineering field. The majority of students did not choose TEE as their first choice as a college major but instead chose some type of engineering and later switched to the TEE major. The most common courses they took in high school were drafting/CAD and engineering-based courses both PLTW and non-PLTW. Their biggest influence in choosing TEE was a high school or middle school teacher. Students indicated that high school administration and coaches had absolutely no or very little influence in the decision to enroll in a TEE major. When asked what kept them in the TEE major, the strongest influence came from an interest and success in the coursework.

Research Questions Summarized

Three research questions were presented at the beginning of this research study. They were:

1. What are the enrollment trends of technology education majors in higher education institutions in the State of Indiana during the period of 2012–2017?
2. What perceptions do TEE faculty hold regarding methods that have proven effective in recruiting pre-service teachers into TEE programs at the postsecondary level?
3. What perceptions do TEE pre-service teachers hold regarding effective methods for recruiting pre-service teachers into TEE programs at the post-secondary level?

To address the first question, it does appear that there is a shortage of Technology and Engineering Educators in the state of Indiana. A statistically significant difference in the demand for TEE and the number of students enrolled showed that there is a need for TEE majors in the state, $t(9) = -6.43$, $p < .0001$.

Second, the faculty at each university perceived that the recruitment methods they are using are scholarships, tables at conferences, and word of mouth. They indicated that they feel the most influential method of recruitment are current TEE teachers and alumni of their universities. Their perceived reasons for students remaining in the programs are the small class sizes and individualized attention given to students through positive relationships with faculty within the department.

Finally, students indicated that their first choice of major was not TEE but that they had come from other departments into TEE. The majority of the students took drafting/CAD courses or engineering based courses in high school, and once they decided to switch into the TEE major, the most influential factor were their previous high school teachers. Students indicated they stayed in the TEE major because of success in the coursework and an interest in their studies. The comparison of faculty perceptions and student experiences will be explained in the next chapter in regards to recruitment methods throughout the state of Indiana.

CHAPTER 5

DISCUSSION

While this study faced some significant limitations in terms of participation in the survey
and interviews, the data that were obtained do demonstrate that national trends are also a concern
in Indiana. Furthermore, survey and interview data support the literature in terms of what may
be considered to be successful. Insights on the data and relevant literature are provided.

Discussion of Results

Teacher Shortage

There is a national decline in the United States of enrollment of teachers in teacher
preparation programs (Sutcher et al., 2016). The data showed that Indiana follows that decline
with TEE and that there was a significant difference between the demand and the supply for
Technology and Engineering Educators. In 2012, there were 398 job openings for TEE teachers,
while there were only 206 enrolled in the major across the state of Indiana. The year 2017
showed 246 job openings and only 46 enrolled majors. Indiana on average has 34 job openings
in the technology education field per year. From 2012 to 2017 a drop was seen in the number of
openings. The five-year period lost 152 openings, although this drop could be somewhat from
TEE majors entering into the field; there were only 149 students in the majors, and it is
reasonable to assume that not all 149 graduated during that time. The probable cause of the drop
in job openings is that secondary education programs were eliminated. In 2013, vocational

classes in public schools were being shut down due to a decrease in TEE teacher candidates

(Theriault, 2013). This shut down has continued across the state and across the country.

States respond to teacher shortages in many different ways. Because there is a decline in

candidates coming from TEE preparation programs in the state of Indiana, many schools have

turned to emergency licensing and workplace specialist licensures to fill much-needed

technology teacher positions. As mentioned in the literature review, these types of licenses often

see a higher turnover of teacher than traditionally licensed teachers. According to the Indiana

Department of Education (2018), "An Emergency Permit is issued at the request of a school

district in a content area for which the district is experiencing difficulty staffing the assignment

with a properly licensed educator" (p. 1). With a teacher shortage in regard to TEE, schools have

an easier time obtaining an emergency license for a person to teach in various areas of

technology. Some schools in Indiana turn to workplace specialist licensing if they can find

qualified candidates. A workplace specialist license is granted to individuals who wish to teach a

specific vocational area that they have had work experience in (Indiana Department of

Education, 2018). The number of hours or years worked to be considered for a workplace

specialist license varies across the state. Many TEE positions are being filled with emergency

permits or workplace specialists due to the decrease in candidates who have completed a teacher

preparation program. Although some positions are being filled, there are still too many job

openings in the field, and some schools who cannot find, or choose not to use, a willing

individual to obtain an emergency permit or workplace specialist licensure are forced to shut

down their technology programs (Quinton, 2017).

Prepared and experienced TEE teachers are difficult to find, causing limited access to

CTE and vocational courses. In an effort to address the teacher shortage, Congress has

reauthorized the Perkins Act (Kreighbaum, 2018). The reauthorization supports evidence-based strategies to recruit qualified TEE teachers as well as retain them in the field. States and districts will be able to expand their efforts and use Perkins funding to do so without the previous need to gain approval from the federal level (Cardichon, 2017). The hope is that this process will allow schools to find their own methods of recruitment and retention for these much-needed teachers. To address this shortage, the research was conducted to learn more about what recruitment methods are and are not perceived to be working within the state.

Student Demographics

The descriptive statistics showed that faculty perceived the majority of their enrollment were Caucasian males at the graduate level. The majority of students enrolled in TEE majors in the state of Indiana are Caucasian males over the age of 23 (ICHE, 2017). It is interesting to note that students who participated in the survey indicated that they were sophomores and juniors in the program, while faculty indicated the majority of their enrollment came from graduate level students. The reason for a high number of graduate students, as stated by Professor Y, was because of the ability for graduate students to take courses online. The enrollment of graduate students can come from around the world, while the undergraduate programs can only reach those willing to come to the college campuses in person. Programs were asked to provide contact information for both graduate and undergraduate students, but it is not possible to confirm if graduate student contact information was actually provided.

Students enrolled in the TEE major who responded to the survey indicated that they took similar courses in high school, and a majority of those courses were in drafting/CAD or engineering based courses. These courses are among those that TEE teachers would teach after graduation once hired into middle and high schools. Faculty indicated that the majority of students in the pre-service TEE major came from other departments; similarly, students indicated

that their first choice was not TEE but instead they had come to TEE from engineering and education majors. Faculty perceive this shift of major to come from students who were not achieving well in engineering courses. During one interview, Professor X said that students commonly enroll in engineering majors, and when they do not perform as highly as expected, they flock to another major in a similar area, and TEE fits into that similar area. The same applies to students who switch from a general education major into TEE. Once in TEE, students find that they remain in the major because they have success in their courses as well as a general interest in the field. Parents had little-to-no influence on their student's decision to enter into TEE; it is possible that is because parents do not realize that TEE is a career option (Love et al., 2016).

Recruitment Methods

Descriptive statistics were used to draw conclusions about the commonalities and differences between faculty and student perceptions of recruitment methods. Faculty indicated that the recruitment methods they used most frequently were scholarships, tables at conferences, representation at technology and college fairs, and local media. Scarcella (2000) noted during his research that these immediate response tactics would not work, and although these methods are being used on campuses, the students indicated that they were not the most influential when helping them to choose a TEE career. All students indicated that mass media had absolutely no effect on their choices to pursue TEE, which indicated that although universities often use mass media and tables at conferences, it is more effective if faculty focus their efforts on things that are more influential to student recruitment. The most common reasoning that mass media has no influence on student recruitment is because universities are turning to social media to replace mass media in advertising. Students no longer look at flyers and watch videos from the university website, but instead, it is more common for students to check social media pages for

up-to-date information (Carini, Hayek, Kuh, Kennedy, & Ouimet, 2003). Faculty also focus on

campus visits for potential future students. The visits that work the best are those that cater to

showcasing the TEE programs. Campus visits need to go beyond a tour of the university and

take students into the TEE labs, allowing them to interact with current students and faculty.

Recruiting students who are struggling in other majors is also a successful tool. Students who

participated in the survey indicated that TEE was not their first choice of major and that they had

been recruited into TEE from another major. The faculty state that they most commonly bring

students from engineering and education majors. Students who switch to TEE from other majors

tend to be more successful in the program than their previous programs, which is why they stay

in TEE. Both Professor X and Professor Y believed this could be because the coursework is

different and allows for kinesthetic learners to excel or because the students find that they do

enjoy the teaching aspect while they can still do the hands-on, project-based work.

　　During the interview, Professor X discussed a study that had been done whereby high

school students were asked why they did not want to become technology educators. Professor X

relayed that an overwhelming number of students admitted it was because their own teachers

discouraged them from becoming teachers.

　　The most influential method to recruit TEE students as reported by students were current

high school teachers, which is the same result that was found by Love et al. (2016). Both faculty

and students indicated that current teachers are the biggest reasoning for students to enter into

TEE, though faculty mentioned that some students they had spoken to were actually discouraged

from teaching by their former teachers because of the hardships that are facing teachers today.

Faculty lean on current high school teachers to talk to their students and promote the program.

High school teachers are on the front lines of the future for the TEE profession, and without their

support TEE could be in major trouble. One university gives back to their current teachers for all

of their efforts by giving current high school teachers professional development days; this idea of

giving back to teachers to encourage them to inspire their students to pursue technology

education degrees is one way that one Indiana university helps keep a positive relationship with

current teachers. In the same way faculty perceived that current high school teachers were the

most influential in student's decision to choose TEE, they also showed that counselors played a

large part in that decision as well.

Students, however, responded differently. Student responses showed that school

counselors had absolutely no influence on their decision to enroll in the major. The fact that

students felt that school counselors had no influence on their decisions to choose TEE as a

college major is disheartening because the counselors are the ones who work closest with

students to build class schedules and ensure students are enrolled in appropriate college prep

courses (Our Lady of the Lake University, 2018). Counselors build a relationship with their

students and guide them through their high school careers. If counselors are not advertising for

TEE, there must be a reason, and Professor Y believes the potential cause is that the counselors

themselves do not realize that TEE is an option. Another reason that counselors are not

promoting TEE as a career option was alluded to by a faculty member during the interview

process, and that reason is because technology programs in high schools are diminishing. Since

students do not have opportunities to take those types of classes, a correlation cannot be drawn

between courses and potential career paths. All faculty and students agreed that athletic coaches,

principals and other school staff were of no influence to them when choosing a TEE major.

More can be done to educate all secondary school staff on TEE programs.

Professor Y stated that "money talks," and the other faculty who participated in the interviews agreed. Programs that offer scholarships become more enticing to future students, thus a suggested recruitment method would be to offer TEE specific scholarships. One university already does this and experienced a turn-over with their students. The scholarship states that students must major in TEE, but after their first year of courses they switch to a different major. Potential ways to fight this matter would be to offer scholarships to juniors and seniors in TEE programs. The state of Indiana offers scholarship assistance to those majoring in education majors (U.S. Department of Education, 2015), but students must remain in Indiana to teach after graduation, and that is a commitment that some are not willing to make before their career even begins. The cost of out-of-state tuition for students coming from outside of Indiana is high, making it harder for students who do not live in Indiana to attend universities in the state. Some universities in Indiana offer out-of-state students scholarships or offer them in-state tuition. For example, Ball State University offers residence of certain western Ohio counties tuition at the price of in-state tuition (Ball State University, 2018). Money often plays a factor in a graduate's decision to find a place of employment after graduation. Faculty at all participating universities gave several examples of their recruitment methods; Scarcella (2000) suggested recruitment be an ongoing process, and the faculty who participated in this research are continuously trying new methods to not only recruit but also to retain TEE majors.

Retention Methods

Faculty believe that the most influential factor contributing to the retention of TEE students is the individualized attention given to students within the programs. Faculty described a variety of methods they use to make sure students are successful in the program. Faculty develop a sense of community between students in the major and allow them their own lab space to work together for projects. One university hires students to help with research, while other

universities take the time to make sure student teachers placements are a good fit. This individualized attention has somewhat influenced students' reasoning for remaining in the program, but students showed that their main reason for continuing in TEE programs was their own success and interest in the coursework. Although students did not feel that the individualized attention given to them and the efforts of the faculty to ensure a good experience were the most influential, it could be deduced that without faculty efforts, students would not be succeeding as well in their courses or could lose interest if they did not have the individualized attention and relationships they have with the program faculty. A study conducted at Elon University found that students who remain in a major are more likely to do so if they feel a sense of community within that major. Likewise, students' overall satisfaction with their educational experiences is highly correlated with community (Springer, 2002). Both students and faculty shared the common positive influence of faculty members as a reason for students to stay in the major. Students realize that the faculty at their respective universities are working for their benefit and to help them succeed, while faculty believe that the time and effort they put into building relationships with students has helped to retain students in the major. In a study conducted by Wright and Custer in 1998, students were interested in becoming TEE majors because they had a personal interest in the subject; much like that study, students who participated in this research indicated that they remain in the TEE major because they have a personal interest in the material.

<div align="center">**Limitations and Delimitations**</div>

This study involved an online survey that was sent to nine faculty and 46 students enrolled in pre-service TEE programs in Indiana. Of the nine faculty invited to participate in the

study, only four chose to take part in the survey, and three agreed to an interview. Out of 46

students, only eight chose to participate in the survey, and none agreed to an interview.

Since the 1950's, response rates to surveys of any method have been falling (Cook,

Heath, & Thompson 2016). More researchers have turned to using online surveys for their

research, but recent studies have shown that online surveys also tend to have low response rates.

In a study conducted by Nulty (2008) research showed that "in general online surveys are much

less likely to achieve response rates as high as surveys administered on paper" (p. 302). On

average, online surveys generally produce a 33% response rate (Nulty, 2008). In a study

conducted by Krosnick in 1999, it was found that "research has shown that surveys with very

low response rates can be more accurate than surveys with much higher response rates" (p. 540).

This research had a limited number of participants, and the response rate was 21%; although the

response rate may seem small, it is likely that the responses are more accurate. The population

was limited to a small population size because of the number of enrolled TEE pre-service

teachers, but the size of the sample that participated was much smaller than the researcher had

hoped. Multiple factors could have caused the low response rates, such as students being

uninterested in participating in the survey or they did not check their email when the survey was

sent.

Surveys were delimited to only those students and faculty in Indiana universities that

offer a four-year bachelor's degree program in TEE. This data may not be a true indicator of the

recruitment methods happening on a larger scale.

Recommendations for Future Research

The biggest limitation facing this study was the limited number of participants.

Participants were either uninterested in taking an online survey or did not receive the survey. In

a study conducted for Research in Higher Education, researchers found that many students who seldom use their email accounts were not aware that they were invited to participate in a study (Carini et al., 2003). It is possible that disinterest or lack of knowledge of the survey caused a low response rate from potential participants. Future research being conducted should be conducted in a face-to-face manner, avoiding the surveys as response rates are so low.

As the data suggested, current teachers are the most influential in recruiting students into the TEE major. Professor Y's statement that "teacher influence is the best way to recruit future technology educators" suggests that more research should be conducted into how to continue to encourage teachers to recruit future teachers, potentially by conducting professional development sessions as the universities have tried. Along with researching how to encourage current teachers, more research could be conducted into how universities are using principals and counselors to spread the word about careers in technology education.

Another suggestion for future research would be to look into the licensing processes and benefits in other states. The state of Illinois has higher tuition rates but larger salaries for educators, causing students to obtain their degrees in Indiana but leave for Illinois after graduation (Illinois News Network, 2016). Along with that, research could be conducted to compare in-state and out-of-state tuition for those states with large TEE enrollment to see if that is a factor in the low enrollment within the state of Indiana.

Research could be conducted further into the teacher shortage as it pertains to TEE. This research would need to cover more areas than just a single state. A major factor that could be causing the teacher shortage is the stigma that is facing education (Cores, 2013). Research could explore that stigma and how to reverse it in order to have more students interested in pursuing an education degree.

A final suggestion for future research is to look into the lack of females in the TEE degree. All students surveyed and all faculty show that the majority of the TEE population are male. Research could be conducted into this phenomenon and how to better focus recruitment methods on female and other non-traditional students.

Implications for Practice

It is clear from this research and others that the shortage of TEE majors in the state of Indiana needs to be addressed (IDWD, 2017). Throughout the study, faculty and students both indicated that current teachers are a key to successful enrollment of TEE majors. In order to continue to grow programs, current teachers need to recruit from their classes. One university gives back to current teachers and has had a lot of success. Giving back and encouraging current TEE teachers will help to increase future TEE enrollment (Springer, 2002). Teachers who do not like their jobs and are not happy in their career fields will not encourage students to follow in their footsteps. If universities give back to their current teachers through professional development and support, they may see an increase in recruitment from those teachers (Love et al., 2016). One university faculty member who participated in this study partners with current teachers at the high school level through industry partnerships and PLTW certifications; these are some examples of how universities can give back to current teachers.

Another way to increase student enrollment in TEE is to better inform administrators, counselors, and parents that TEE is a career option (Love et al., 2016). The students who participated in this study responded that principals, counselors, and parents had little-to-no influence on their decisions to major in TEE. Universities can work better to inform administrators and parents of the opportunities available to students if they choose to enroll in TEE. By presenting the current numbers in demand for these teachers and explaining all of the

pathways that TEE majors are able to teach, faculty can give administrators, counselors, and parents a better understanding of the field and the demand for TEE teachers.

A final suggestion, as made by faculty, is to find more financial support for future TEE candidates. Scholarships, student loan forgiveness, and higher pay are only some ways to encourage students to enroll in TEE. Research shows that teacher recruitment/retention is influenced by salary (Clotfelter, Ladd, & Vigdor, 2010; Feng, 2009; Hanushek & Pace, 1995). School districts in the past have also increased funding in the technology departments to give teachers better materials and support with which to teach, such as the school district in Philadelphia that updated its program into a career center to attract more students and in turn more teachers to the area (Hangley, 2015). The most recent update to the Perkins CTE law has allowed for states to have more control over CTE money and its distribution, whereas previous laws have required the approval of the Department of Education (Kreighbaum, 2018). Current TEE faculty feel that this change will allow for states to make better decisions when it comes to CTE funding. From faculty interviews it was indicated that offering certifications and credentials to TEE students and current teachers beyond their teaching license can be another way to increase enrollment of future teachers.

Summary

In summary, this study is intended to inform and encourage faculty and administrators about the current recruitment methods occurring across the state of Indiana in regard to TEE. The results of this study indicate that there is a high demand for technology educators and a low supply at the university level. Faculty and students agreed that the most influential factor in recruiting students into the TEE major are current secondary teachers. Students who enroll in TEE took technology-based classes in high school, and the teachers they had combined with an

interest in the coursework are what brought them to enroll in the TEE major. The faculty at each university are working hard to give individualized attention to each student once they are enrolled to ensure that they succeed in their course work. Students remain in the courses because they are successful. In order to continue to enroll TEE majors, universities must continue to work with current middle/high school teachers and support the college students enrolled in the major.

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APPENDIX A

Cover letter to professors to participate

Indiana State University

DATE

Dear Faculty Member:

A shortage of Technology and Engineering Education teachers in the public schools is a problem in our profession that has been present for several years. In an effort to understand effective ways to respond to this shortage, this research is seeking input from your students relative to various recruitment and retention efforts in Technology and Engineering Education (TEE).

The online surveys pose questions pertaining to recruitment and retention in your TEE programs. All information in this study will be anonymous and participation is completely voluntary. In addition, all participants must be at least 18 years of age.

If you choose to participate in this study, please read the disclaimer beginning the survey. This survey is anonymous. Your responses will not be identified with you personally, nor will anyone be able to determine which university you work for. At the conclusion of the survey will be the opportunity to volunteer for a brief phone interview, if you choose to participate you will be taken to a second survey in which interview information will be collected. Surveys should be completed by April 2, 2018

To participate in this survey please follow this link:
https://qtrial2015az1.az1.qualtrics.com/jfe/form/SV_8vamw84YfOBXDw1

If you have any questions about this research project you can contact Megan McManus at (812) 251-3300 (Megan.McManus@indstate.edu). If you have concerns about the treatment of research participants, you can contact the International Review Board at If you have any questions about your rights as a research subject, you may contact the Indiana State University Institutional Review Board (IRB) by mail at Indiana State University, Office of Sponsored Programs, Terre Haute, IN 47809, by phone at (812) 237-3088, or e-mail the IRB at irb@indstate.edu. The IRB has reviewed and approved this study, reference number:1140332-3 .

If you would like to obtain the results of this study, please contact Megan McManus. Preliminary data analysis is expected to be completed during the spring semester of 2018. Thank you in advance for assisting with this very important research project.

Sincerely,

Megan McManus
Ph.D. Student
Curriculum and Instruction
Indiana State University

APPENDIX B

Letter to students

**Indiana State
University**

Date

Dear Future Technology and Engineering Educator:

As you are aware, there is a shortage of technology and engineering education teachers in the public schools. This is not a new problem in our profession, but one that has been present for several years. In an effort to fill this shortage, we are seeking your input in relation to various recruitment and retention efforts in technology and engineering education.

The attached survey poses questions pertaining to your demographic information and experiences/perceptions in relation to recruitment and retention in technology and engineering education programs. All information in this study will be anonymous and your participation is completely voluntary. This survey is anonymous and no one will know whether you participated in this study. At the conclusion of the survey you will be asked if you would like to volunteer for a brief telephone interview. If you choose to participate you will be directed to an interview questionnaire. Your responses from both surveys will not be identified with you personally, nor will anyone be able to determine which school you attend. All participants must be at least 18 years of age. If you choose to participate, please complete this questionnaire by April 2, 2018.

The survey can be found at the following link:
https://qtrial2015az1.az1.qualtrics.com/jfe/form/SV_1QXcdEfFHKaNkA5

If you have any questions about this research project you can contact Megan McManus at (812) 251-3300 (Megan.McManus@indstate.edu). If you have concerns about the treatment of research participants, you can contact the International Review Board at If you have any questions about your rights as a research subject, you may contact the Indiana State University Institutional Review Board (IRB) by mail at Indiana State University, Office of Sponsored Programs, Terre Haute, IN 47809, by phone at (812) 237-3088, or e-mail the IRB at irb@indstate.edu. The IRB has reviewed and approved this study, reference number: 1140332-3.

Thank you in advance for assisting with this research project.

Sincerely,

Megan McManus
Ph.D. Student-Curriculum and Instruction
Indiana State University

APPENDIX C

Faculty survey on Qualtrics

Technology and Engineering Education Recruitment Efforts-Faculty

SECTION I - Demographic Information

Directions: *Please indicate which of the following best describes your student population within the major.*

1. What class has the biggest enrollment?
   - ☐ Freshman
   - ☐ Sophomore
   - ☐ Junior
   - ☐ Senior
   - ☐ Graduate Student

2. What is your current student average age?
   - ☐ 18-20
   - ☐ 21-23
   - ☐ 24-26
   - ☐ Over 26

3. What is your current student average gender?
   - ☐ Male
   - ☐ Female

4. What is the ethnicity of the majority of your students?
   - ☐ African American
   - ☐ Asian American
   - ☐ Caucasian
   - ☐ Hispanic American
   - ☐ Native American
   - ☐ Other (please specify) _____

SECTION II – Recruitment and Retention

Directions: *Please indicate which of the following best describes your experiences in recruitment for technology and engineering educators.*

7. Do you choose recruitment methods for Technology and Engineering Education? *If you answer no, please go to number 8. If you answer yes, please go to number 9.*
      ☐ Yes   ☐ No

8.   If you are not in charge of recruitment efforts for your department please list who/ what organization is on the line below.

_____

9. Which of the following recruitment methods have you tried at your facility? *Check all that apply.*

      ☐ Flyers
      ☐ Email blast
      ☐ Advertising to general population
      ☐ Attending high schools
      ☐ TSA judging
      ☐ FIRST robotics judging
      ☐ Housing incentives
      ☐ Other _____
      ☐ None

10. If you chose "other" in number 9, please describe your recruitment efforts on the line below:

Directions: *Please indicate, by checking the appropriate box below, to what degree **each** of the following items influence your Technology Engineering Education recruitment efforts.*

Which factors influence your recruitment efforts?	Absolutely No Influence	Somewhat Influenced	Highly Influenced	Strongly Influenced
Ability to attend local high schools				
University support				
Ability to work with Mass media (*recruitment videos, flyers, and/or pamphlets*)				
University Technology and Engineering Education web site				
Current students				
Social Media				
Outreach involving technology education extra-curricular or co-curricular activities. *TSA, FIRST Robotics, LEGO League, Skills USA, etc.*				
High school or middle school teacher				
High school principal				
High school guidance counselor				
Athletic coaches				
Local government efforts				
National government efforts				
Ability to contact high school Parents/Guardians				
Other:				

Directions: Which of the following factors are used to retain Technology and Engineering Education majors? *Please indicate, by checking the appropriate box below, to what degree **each** of the following items influence your retention efforts in the Engineering/Technology Teacher Education Program.*

Which factors help you to retain students in the major?	Absolutely No Influence	Somewhat Influenced	Highly Influenced	Strongly Influenced
Involvement in TECA				
Small class sizes				
Relationships with other students in the major				
Positive job outlook (*high placement rates*)				
Positive relationships with Technology and Engineering Education faculty				
One-on-one attention from university faculty				
National reputations of university faculty and program				
Laboratory and/or classroom facilities				
Interest in course content				
Success in course work				
Other:				

Would you like to be contacted for a 20-30 minute recorded telephone interview to elaborate on your responses? *If you answer yes, please provide your email to be contacted to set up an interview time.*

    ☐ Yes   ☐ No

    Email:

Please Return This Survey No Later Than January 21, 2018

Thank you for completing this survey
If you have any questions please contact:

Megan McManus
Indiana State University
Ph.D. Curriculum and Instruction Program
Myers Technology Center, Room 101

Terre Haute, Indiana 47809

812-251-3300
Megan.McManus@indstate.edu

APPENDIX D

Student survey on Qualtrics

Technology Engineering Education Recruitment Survey-Students

SECTION I - Demographic Information

Directions: *Please indicate which of the following best describes your demographic information.*

1. What is your current class standing?
    - ☐ Freshman
    - ☐ Sophomore
    - ☐ Junior
    - ☐ Senior
    - ☐ Graduate Student

2. What is your current age?
    - ☐ 18-20
    - ☐ 21-23
    - ☐ 24-26
    - ☐ Over 26

3. What is your gender?
    - ☐ Male
    - ☐ Female

4. How do you define your ethnicity?
    - ☐ African American
    - ☐ Asian American
    - ☐ Caucasian
    - ☐ Hispanic American
    - ☐ Native American
    - ☐ Other (please specify) _____

5. Please list the primary occupation of your father or male guardian on the line below.
_____

6. Please list the primary occupation of your mother or female guardian on the line below.

_____

SECTION II – Recruitment and Retention

Directions: *Please indicate which of the following best describes your experiences in technology and engineering education.*

7. Did you choose Technology and Engineering Education as your college major as an incoming?
   Freshman? *If you answer no, please go to number 8. If you answer yes, please go to number 9.*
   ☐ Yes   ☐ No

9. If Technology and Engineering Education was NOT your first college major, please list the major or majors you studied prior to switching to Technology and Engineering Education on the line below.

_____

9. Which of the following courses were you enrolled in during high school? *Check all that apply.*

Technology Education	**Project Lead the Way**
☐ Communications	☐ Introduction to Engineering Design (IED)
☐ Manufacturing	☐ Principles of Engineering (POE)
☐ Construction	☐ Civil Engineering & Architecture (CEA)
☐ Transportation/Power and Energy	☐ Computer Integrated Manufacturing (CIM)
☐ Bio Technology	☐ Digital Electronics (DE)
☐ Engineering	☐ Aerospace (AERO)
☐ Drafting/CAD	☐ Engineering Design & Development (EDD)
☐ Other _____	☐ Bio Technical Engineering (BE)
☐ None	☐ Other _____
	☐ None

Directions: *Please indicate, by checking the appropriate box below, to what degree **each** of the following items influenced your decision to become a Technology and Engineering Education Teacher.*

Which factors influenced you to pursue this major?	Absolutely No Influence	Somewhat Influenced	Highly Influenced	Strongly Influenced
Visit to my high school from the university				
University faculty				
Mass media (*recruitment videos, flyers, and/or pamphlets*)				
University Technology and Engineering Education web site				
Information about the major from a student who was majoring in engineering/technology teacher education				
Past experiences in technology education courses				
Past experiences in technology education extra-curricular or co-curricular activities. *TSA, FIRST Robotics, LEGO League, Skills USA, etc.*				
High school or middle school teacher				
High school principal				
High school guidance counselor				
Athletic coach				
High school friend				
College friend				
Parents/Guardians				
Brother or Sister				
Relatives who are not my parents or sibling				
Personal interests or hobbies				
Other:				

Directions: Aside from being your future career choice, which of the following factors are most influential in your continuance in the Technology and Engineering Education Major? *Please indicate, by checking the appropriate box below, to what degree **each** of the following items influence your decision to continue in the Technology and Engineering Education Program.*

Which factors encourage you To continue in this major?	Absolutely No Influence	Somewhat Influenced	Highly Influenced	Strongly Influenced
Involvement in TECA				
Small class sizes				
Relationships with other students in the major				
Positive job outlook (*high placement rates*)				
Positive relationships with Technology and Engineering Education faculty				
One-on-one attention from university faculty				
National reputations of university faculty and program				
Laboratory and/or classroom facilities				
Interest in course content				
Success in course work				
Other:				

Would you like to be contacted for a 20-30 minute recorded telephone interview to elaborate on your responses? *If you answer yes, please provide your email to be contacted to set up an interview time.*

    ☐ Yes   ☐ No
    Email:

Please Return This Survey No Later Than January 21, 2018

Thank you for completing this survey
If you have any questions please contact:

Megan McManus
Indiana State University
CIMT-Ph.D. Program
Myers Technology Center, Room 101

Terre Haute, Indiana 47809

812-251-3300
Megan.McManus@indstate.edu

APPENDIX E

Interview Protocol for Faculty Interviews

Project: CURRENT RECRUITMENT STRATEGIES FOR PRE-SERVICE
TECHNOLOGY AND ENGINEERING EDUCATORS IN INDIANA
     Time of interview:
     Date:
     Place:
     Interviewer: Megan McManus
     Interviewee Number:
     Position of Interviewee: (1) faculty
     [turn on tape recorder and test it]

As you are aware, there is a shortage of Technology and Engineering Education teachers in the public schools. This is not a new problem in our profession, but one that has been present for several years. In an effort fill this shortage we are seeking input from you relative to various recruitment and retention efforts in Technology and Engineering Education (TEE). This interview will pose questions pertaining to recruitment and retention in your TEE programs. All information in this study will be anonymous and participation is completely voluntary. In addition, all participants must be at least 18 years of age. This interview will last between 20 and 30 minutes.

You are asked to participate in a research study conducted by Megan McManus and Dr. Susan Powers, from the Curriculum and Instruction at Indiana State University. This study is being conducted as part of a dissertation. Your participation in this study is entirely voluntary. Please read the information below and ask questions about anything you do not understand, before deciding whether or not to participate.

You have been asked to participate in this study because you are enrolled in or a faculty member of a technology engineering teacher preparation program within the state of Indiana and have preliminarily agreed to participate in an interview regarding current recruitment efforts at the university in which you reside.

PURPOSE OF THE STUDY
The purpose of this study is to inquire about the current pre-service technology and engineering educator shortage and investigate how three universities in Indiana have been recruiting those majors. The teacher shortage could be due to insufficient recruitment efforts. This study intends to find the extent to which recruitment efforts are or are not working in the universities and make suggestions based on the findings to help universities improve their recruitment efforts of these specific teachers. This study will be beneficial to faculty and universities in their attempts to grow TEE programs. By understanding the TEE shortage trend and how current programs are recruiting, future efforts can be focused on these aspects to increase enrollment of pre-service TEE teachers.

PROCEDURES

If you volunteer to participate in this study, you will be asked to do the following things:

Volunteers will complete a short survey in which individual information such as email and telephone number will be recorded and kept confidential. After submission you will be contacted by Megan McManus via email to set up a time for a phone interview.

At the beginning of the phone interview volunteers will be asked again to consent to a recorded telephone interview. If you choose to participate from this point forward the interview will be recorded and all interview information will be kept confidential. The interview will consist of questions regarding current recruitment methods and strategies as well as the interviewee's perceived outcomes of these efforts.

POTENTIAL RISKS AND DISCOMFORTS

There are no known risks if you decide to participate in this research study. There are no costs to you for participating in the study. The information you provide will be used to research current recruitment strategies being used for TEE majors at Indiana universities. The interview will take about 20-30 minutes to complete.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

The information collected may not benefit you directly, but the information learned in this study should provide more general benefits and insight into recruitment methods for future TEE pre-service teachers.

CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of coding participant's information to prevent any identifying factors. Data will be stored onto an external hard drive and kept protected. The information will not be released to any other party for any reason. Only the researcher will have access to the recorded files. Files and data will be destroyed three years after the results have been published.

PARTICIPATION AND WITHDRAWAL

You can choose whether or not to be in this study. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind or loss of benefits to which you are otherwise entitled. You may also refuse to answer any questions you do not want to answer. There is no penalty if you withdraw from the study and you will not lose any benefits to which you are otherwise entitled.

IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about this research, please contact Megan McManus, 1200 Lower Sandford Rd. West Terre Haute, IN 47885, by phone at 812-251-3300, or email at Megan.McManus@indstate.edu. If you wish to contact the faculty sponsor, Dr. Susan Powers you can do so via email at Susan.Powers@indstate.edu or call 812-237-2307.

RIGHTS OF RESEARCH SUBJECTS

If you have any questions about your rights as a research subject, you may contact the Indiana State University Institutional Review Board (IRB) by mail at Indiana State University, Office of Sponsored Programs, Terre Haute, IN 47809, by phone at (812) 237-3088, or e-mail the IRB at irb@indstate.edu. You will be given the opportunity to discuss any questions about your rights as a research subject with a member of the IRB. The IRB is an independent committee composed of members of the University community, as well as lay members of the community not connected with ISU. The IRB has reviewed and approved this study.

If you choose to participate in this study and confirm that you are at least 18 years of age, please give your consent at this time.

Questions:
1. What recruitment methods have been used at your campus?
2. Are you in charge of recruitment methods at your campus?
3. What factors influence your recruitment efforts?
4. What methods do you use to retain students in the TEE major if any?
5. What recruitment methods do you feel work best on your campus?
6. Are there any recruitment methods you feel should be implemented on your campus? If so what are they?

Thank you for participating in this interview. As a reminder if you choose to withdraw from this study please let me know now.

APPENDIX F

Interview Protocol for Students

Project: CURRENT RECRUITMENT STRATEGIES FOR PRE-SERVICE
TECHNOLOGY AND ENGINEERING EDUCATORS IN INDIANA
     Time of interview:
     Date:
     Place:
     Interviewer: Megan McManus
     Interviewee Number:
     Position of Interviewee: (2) student

[turn on tape recorder and test it]

As you are aware, there is a shortage of Technology and Engineering Education teachers in the public schools. This is not a new problem in our profession, but one that has been present for several years. In an effort fill this shortage we are seeking input from you relative to various recruitment and retention efforts in Technology and Engineering Education (TEE). This interview will pose questions pertaining to recruitment and retention in your TEE programs. All information in this study will be anonymous and participation is completely voluntary. In addition, all participants must be at least 18 years of age. This interview will last between 20 and 30 minutes.

You are asked to participate in a research study conducted by Megan McManus and Dr. Susan Powers, from the Curriculum and Instruction at Indiana State University. This study is being conducted as part of a dissertation. Your participation in this study is entirely voluntary. Please read the information below and ask questions about anything you do not understand, before deciding whether or not to participate.

You have been asked to participate in this study because you are enrolled in or a faculty member of a technology engineering teacher preparation program within the state of Indiana and have preliminarily agreed to participate in an interview regarding current recruitment efforts at the university in which you reside.

PURPOSE OF THE STUDY
The purpose of this study is to inquire about the current pre-service technology and engineering educator shortage and investigate how three universities in Indiana have been recruiting those majors. The teacher shortage could be due to insufficient recruitment efforts. This study intends to find the extent to which recruitment efforts are or are not working in the universities and make suggestions based on the findings to help universities improve their recruitment efforts of these specific teachers. This study will be beneficial to faculty and universities in their attempts to grow TEE programs. By understanding the TEE shortage trend

and how current programs are recruiting, future efforts can be focused on these aspects to increase enrollment of pre-service TEE teachers.

PROCEDURES

If you volunteer to participate in this study, you will be asked to do the following things:

Volunteers will complete a short survey in which individual information such as email and telephone number will be recorded and kept confidential. After submission you will be contacted by Megan McManus via email to set up a time for a phone interview.

At the beginning of the phone interview volunteers will be asked again to consent to a recorded telephone interview. If you choose to participate from this point forward the interview will be recorded and all interview information will be kept confidential. The interview will consist of questions regarding current recruitment methods and strategies as well as the interviewee's perceived outcomes of these efforts.

POTENTIAL RISKS AND DISCOMFORTS

There are no known risks if you decide to participate in this research study. There are no costs to you for participating in the study. The information you provide will be used to research current recruitment strategies being used for TEE majors at Indiana universities. The interview will take about 20-30 minutes to complete.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

The information collected may not benefit you directly, but the information learned in this study should provide more general benefits and insight into recruitment methods for future TEE pre-service teachers.

CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of coding participant's information to prevent any identifying factors. Data will be stored onto an external hard drive and kept protected. The information will not be released to any other party for any reason. Only the researcher will have access to the recorded files. Files and data will be destroyed three years after the results have been published.

PARTICIPATION AND WITHDRAWAL

You can choose whether or not to be in this study. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind or loss of benefits to which you are otherwise entitled. You may also refuse to answer any questions you do not want to answer.