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Successful Factors for Native and Community College Transfer Students in Engineering

Technology at a Four-Year University

A dissertation

presented to

the faculty of the Department of Educational Leadership and Policy Analysis

East Tennessee State University

In partial fulfillment

of the requirements for the degree

Doctor of Education in Higher Educational Leadership

by

Leendert M. Craig

May 2019

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Keyword: engineering technology, community college, transfer student

ABSTRACT

Successful Factors for Native and Community College Transfer Students in Engineering Technology at a Four-Year University

by

Leendert M. Craig

Students who attend community colleges often transfer to 4-year universities seeking to earn a degree typically not offered at the community college level. Tennessee has 2 programs: the Tennessee Promise and the Tennessee Reconnect programs that offer students tuition-free access to the state's community college system. Previous studies have been conducted to compare transfer students' performances to that of native students and typically compared the students in all disciplines. This study seeks to compare transfer students (students who enter the participating university with 40 or more credit hours) to native students (students who initially enrolled or transferred into the 4-year participating university with fewer than 40 credit hours) the engineering technology major (ENTC) to determine if transfer students are doing as well as or better than native students.

The present study used archival data from student records from fall 2008 through fall 2017. The data were provided by Institutional Research at the participating university. The dataset included 416 transfer students and 900 native students. Students were classified as transfer or native based on study criteria. They were then divided into subgroups by gender, Pell grant recipient status, first-generation status, 3000 and 4000 level GPA, high-school GPA, ACT composite scores, age, and whether the student graduated or not. The data were analyzed quantitatively seeking to find differences between the native and transfer students' graduation rates and

differences in the subgroups. The 3000 and 4000 level coursework GPA were examined for transfer shock.

There were significant differences between transfer and native students in graduation rates, percent who were first-generation, Pell grant recipient status, and age. Overall, graduation rates for transfer students were 38.8% and 21.8% for native students. The findings indicated that 48.8% of female transfer students persisted to graduation compared to 17.3% of native female students. Male transfer students and male native students graduated at a rate of 43.1% and 22.0%, respectively. There were no significant differences in 3000 and 4000 course level GPA, high-school GPA, or ACT composite scores between the two groups.

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DEDICATION

This dissertation is dedicated to my loving wife Rebecca for her tolerance while I pursued this project, to my sister Denise McClintick for all the support, and Christian Peterman for all the computer rebuilding and upgrading lessons.

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CHAPTER 1

INTRODUCTION

Many students begin their higher education journey at the community college level. In 2015 community college freshmen represented 54% of the freshmen enrolled in the Tennessee public higher education system (Tennessee Higher Education Fact Book, 2016). Nationally, 5.9 million students enrolled in public 2-year colleges in the 2016 fall semesters. Approximately 2.1 million were full-time students, and the other 3.8 million were part-time students. There were around 6.2 million students enrolled in all 2-year colleges. The percentage of full-time undergraduates who were enrolled in 2-year public colleges was only 20% (Ginder, Kelly-Reid, & Mann, 2017). Eighty-one percent of students who enroll in community college express a desire to earn a bachelor's degree or higher yet, after 6 years from initial enrollment, only 33% have transferred to a 4-year institution (Horn & Skomsvold, 2012). Of the 33% of community college students who transfer to a 4-year institution, 42% complete a bachelor's degree within 6 years. Of the initial cohort who entered community college, only 14% of them earn a bachelor's degree within 6 years (Jenkins & Fink, 2016). Following the creation of the Tennessee Promise program, that provides 2-year of free tuition to community colleges to Tennessee students, several colleges and universities that offered engineering degrees developed plans to help engineering students successfully transfer, with the goal being to bring transfer students graduation time and rates to a level comparable to native students (Goddard, 2018).

More than 30% of all college students transfer from the college they first-enrolled at to another institution at least once in their academic careers (Lederman, 2017). Students change institutions for many reasons including: their educational needs or goals can change, they may

decide they are unhappy with the institution they are attending, or their life has changed in a way that necessitates transfer, such as moving to a different place. Many students who begin at 2-year colleges may want to earn a higher degree than the college offers. This usually requires transfer to a 4-year institution. Students may also transfer because they want to study a subject that is not offered at the institution where they are currently enrolled. Transfer can be both difficult and expensive. Often when transferring student may not be able to transfer all of the credits they have earned at the institution they are leaving. Credits do not transfer for many reasons including: the schools may have different curricula, the courses the student has taken may not apply to the major at the receiving institution, and sometimes the student may have taken classes that they were interested in but were in a different field of study. When all of the student's credits fail to transfer time to degree can increase, and the student has spent time and money that will not count towards their degree. Typically students lose 43% of their earned credits when they transfer (Lederman, 2017).

Jaeger and Eagan (2009) posited the higher the number of credits the student earned pretransfer that are accepted at the post transfer institution the higher the student success rates. Eighty-two percent of students had all of their credits accepted graduated within six years, compared to only 42% of students graduating who were not able to transfer all of the credits they had earned (Doyle, 2006). The more credits the community college student earns pretransfer, the higher the probability of the student earning a bachelor's degree (Koker & Hendel, 2003).

To increase the rates of successful transfer many states and institution have implemented articulation agreements. Articulation agreements are formally structured agreements that allow students to take specific courses at the community college level that enable a seamless transfer to

another institution (Smith, 2010). Students who have completed their coursework at the community college level are typically guaranteed junior level status post transfer due to the articulation agreements in place, but this often does not happen (Ellis, 2013).

Many states have no state-wide articulation agreements that specify what coursework will transfer from a 2-year to a 4-year institution (Ehrenberg & Smith, 2004). Having articulation agreements in place should improve student transfer success (Patton, 2015). Community colleges were created to help more people have access to earning a 4-year degree by preparing students for transfer (Cohen & Brawer, 2003).

The necessity for the students to be able to transfer credits from the community college to a 4-year university is becoming more significant because some states are implementing free tuition programs at the community college level (House, 2018). Ensuring a well-educated workforce is a tool for economic development to help attract more industries and jobs to their states by increasing the number of students who have earned a college degree (Powell, 2018). For example, the Tennessee Promise scholarship program provides students with the funds to pay tuition for college they might not otherwise have. The program can help fund an associate degree at any of the state's 13 community colleges or 27 TCATs (Tennessee Centers of Applied Technology), or any other institution in Tennessee that offers an associate degree program. Providing financial support is only one of the critical provisions of the Tennessee Promise program. The program also provides students with a mentor who guides the student through their academic journey. Participants are also required to complete and document 8 hours of community service per term enrolled as well as maintain a 2.0 GPA. Tennessee has recently implemented the Tennessee Reconnect program that allows adults to earn an associate degree or

technical certificate tuition-free. The Tennessee Reconnect program may produce more transfer students (In Tennessee. 2018).

Transfer students often do not perform as well as native students in upper-level coursework (Carlen & Byxby, 2000). Two explanations are commonly used to explain the grade differences between these two groups of students. Aptitude of the community college students is one argument that faults the lower entrance requirements of the community college are partly to blame. If transfer students do not perform well at 4-year institutions community colleges may get labeled as unsuccessful in preparing students for vertical transfer (Dougherty, 1992). The second common argument is community colleges nurture and overprotect students. Nurturing may help ensure early success by increasing student confidence.

Students who first enroll in a community college show the most significant gains in intellectual and racial-ethnic diversity in their first year. The students averaged a .21 mean improvement in test scores that measured intellectual and racial-ethnic diversity over their 4-year counterparts after the first year. Students in their second year of community college show only a slight increase to .22 after the second year suggesting the most significant impact happens in the community college students first year (Pascarella & Terenzini, 2005).

Stopping out is a term commonly used when students leaves the institution they are enrolled in for a semester or more and later return to the institution they left. Stopping out delays the time to complete the degree and can threaten coursework completion because the student leaves the academic environment and there is a discontinuity in their learning. Differences in enrollment durations suggest that exclusively part-time students are more likely to stop out than full-time students (Chen, 2007). Receiving need-based financial aid reduces student stop-out

behavior (Bettinger, 2004). Coker and Porter (2015) suggested students who make a connection with a faculty member have a much higher probability of persisting. Multiple studies show a strong positive correlation between students who become involved in a student organization having a higher rate of persistence (Melguizo, Kienzl, & Alfonso, 2011; Wang, 2009).

Students who earn an Associate of Arts degree before transferring to a 4-year engineering technology program will have fewer credits that will apply than a student who enrolled in an Associates of Science program. A.S. degree programs usually have more credits that transfer and students who enrolled in a pre-engineering program will have the most credits that will transfer due to the differences in coursework (Kopko & Crosta, 2016). Students who earn an Associate of Arts degree before transferring to a 4-year engineering technology program typically earn 63 credit hours but only about 20 of those hours are designed for transfer, the remaining 43 credit hours are usually in a specific field that prepares the graduates for employment in that field such as aviation or plumbing that usually will not transfer into engineering technology (Northeast State, 2018). Associate of Science degrees have similar coursework. Students who earn an A.S. degrees often will have some credits that may not transfer in the absence of an articulation agreement. Community college students who follow the Tennessee Transfer Pathway curriculum also have the highest number of transfer credits apply (Alternative Transfer Pathways, 2018).

According to Wang (2009) students who enter a 4-year institution with a higher GPA from a community college had a better chance of completing a baccalaureate degree. Pretransfer GPA is associated with post transfer persistence and is consistently one of the most reliable predictors of baccalaureate attainment. A one-point increase in GPA increases students'

probability of earning a degree by a factor of 3.029 (Wang, 2009). Studies have shown students who begin their community college programs in remedial courses usually take more than 2 years to complete their coursework (Chen & Carroll, 2007).

Shapiro and Dunder (2017a) reported from 2010 to 2016 in the United States overall the 6-year outcomes for all students who started at 4-year public institutions were 62.43% total completion rate, with 49.46% completing at the university they initially enrolled in, 9.76% completing at a different institution somewhere in the U.S., 3.23% completing at a 2-year college somewhere in the U.S., 13.24% are still enrolled somewhere, and 24.33% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in the United States overall the 6-year outcomes for all students who started at 2-year public institutions were 39.29% total completion rate, with 26.67% completing at the college they initially enrolled in, 3.32% completing at a different institution somewhere in the U.S., 9.3% first completing at a 4-year university somewhere in the U.S., 6.65% subsequently completing at a 4-year university, 15.8% are still enrolled somewhere, and 44.9% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for all students who started at 4-year public institutions were 57.34% total completion rate, with 44.61% completing at the university they initially enrolled in, 9.1% completing at a different institution somewhere in the U.S., 3.63% completing at a 2-year college somewhere in the U.S., 13.86% are still enrolled somewhere, and 28.8% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for all students who started at

2-year public institutions were 39.9% total completion rate, with 28.08% completing at the college they initially enrolled in, 2.29% completing at a different institution somewhere in the U.S., 9.54% first completing at a 4-year university somewhere in the U.S., 6.85% subsequently completing at a 4-year university, 10.6% are still enrolled somewhere, and 49.5% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for students exclusively enrolled full-time who started at 4-year public institutions were 80.81% total completion rate, with 66.29% completing at the university they initially enrolled in, 8.21% completing at a different institution somewhere in the U.S., 1.86% completing at a 2-year college somewhere in the U.S., 3.72% are still enrolled somewhere, and 15.47% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for students exclusively enrolled part-time who started at 4-year public institutions were 17.42% total completion rate, with 15.64% completing at the university they initially enrolled in, 1.1% completing at a different institution somewhere in the U.S., 0.68% completing at a 2-year college somewhere in the U.S., 5.31% are still enrolled somewhere, and 77.27% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for students enrolled in a mix of part-time and full time who started at 4-year public institutions were 39.32% total completion rate, with 23.34% completing at the university they initially enrolled in, 10.53% completing at a different institution somewhere in the U.S., 5.45% completing at a 2-year college somewhere in

the U.S., 23.65% are still enrolled somewhere, and 37.03% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for students 20 years old or younger who started at 4-year public institutions were 59.06% total completion rate, with 45.44% completing at the university they initially enrolled in, 9.74% completing at a different institution somewhere in the U.S., 3.89% completing at a 2-year college somewhere in the U.S., 14.21% are still enrolled somewhere, and 26.72% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for students over age 20 but less than 24 year old who started at 4-year public institutions were 43.29% total completion rate, with 34.32% completing at the university they initially enrolled in, 6.23% completing at a different institution somewhere in the U.S., 2.74% completing at a 2-year college somewhere in the U.S., 14.13% are still enrolled somewhere, and 42.57% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for all students 24 years of age or older who started at 4-year public institutions were 47.35% total completion rate, with 41.25% completing at the university they initially enrolled in, 4.49% completing at a different institution somewhere in the U.S., 1.62% completing at a 2-year college somewhere in the U.S., 10.53% are still enrolled somewhere, and 42.11% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for women who started at 4-year public institutions were 66.01% total completion rate, with 46.28% completing at the university they initially enrolled in, 10.69% completing at a different institution somewhere in the U.S.,

4.05% completing at a 2-year college somewhere in the U.S., 14.04% are still enrolled somewhere, and 24.93% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for men who started at 4-year public institutions were 54.2% total completion rate, with 43.53% completing at the university they initially enrolled in, 7.46% completing at a different institution somewhere in the U.S., 3.21% completing at a 2-year college somewhere in the U.S., 14.39% are still enrolled somewhere, and 31.4% not enrolled anywhere (Shapiro & Dunder, 2017a). Radford, Berkner, Wheelless, and Shepherd (2010) found the median time for a student to earn a bachelor's degree when initially enrolled at a public 4-year institution was 55 months, compared to 63 months for students who initially enrolled at a community college.

Factors identified as positively affecting community college students obtaining associate degree include students with high GPAs and students who are financially dependent on their parents. Students with a lower probability of obtaining an associate degree tend to be older students, single parents, or individuals who had not declared a major (Jaeger & Eagan, 2009). Research (e.g. Cotton & Wilson, 2006; Townsend & Wilson, 2006) has shown faculty-student interaction, especially when it is outside of the classroom, is often a positive predictor of cognitive development, academic achievement, and most importantly student satisfaction with the college experience.

Wang and Wickersham (2014) indicated vertical co-enrollment increases the student's likelihood of completing a bachelor's degree in 4 years. Vertical co-enrollment is when a student is simultaneously enrolled in both a community college and a 4-year institution. Being

co-enrolled gives the student the flexibility to enroll in more courses as well as being able to enroll in classes that may not be offered every semester or may only be offered at times that conflict with other class times the student needs to take. The study also indicated vertical co-enrollment increases the student's likelihood of completing a bachelor's degree, and vertical co-enrollment had a consistent significant and positive association with attainment and persistence in obtaining a baccalaureate degree.

Nationally 49% of all the students who earned a bachelors degree in the 2015-2016 academic year at a 4-year institution had previously been enrolled in a 2-year public institution in the previous 10 years. In this time frame Texas had the highest percentage of bachelor degree earners who had previously attended community college at 75% (Snapshot Report, 2017). Over 11% of those students had taken longer than 10 years (Woo, Greene, & Matthews, 2012). It appears stop out had accounted for a large percentage of the time from entry until completion of the students who had taken more than 6 years to complete (Yue & Fu, 2017).

In 2015 more first-time degree and certificate-seeking students enrolled in 4-year public institutions (1,190,426) than in 2-year public institutions (1,029,032) nationally. Higher first-time enrollment in a 4-year university was also the case in 2014 and 2013. Historically, beginning in 1969, 2-year enrollment had been higher than 4-year enrollment in public institutions, except for 2007 (Digest, 2016).

Elapsed time to degree is affected by two factors, those external to the institution and those that pertain to the student experiences at the institution (Yue & Fu, 2017). There is still not a clear understanding of the factors that affect time to degree. Literature tends to focus on student demographics, academic preparation, and first-term performance for predicting the

length of time a student will take to reach graduation. Knight and Arnold (2000) posited lengthened time to graduation is the fault of the institution, but others (e.g. Adelman, 2006; Mourad & Hong, 2011) argue it is influenced by the decisions the students make.

Community colleges offer opportunities for students wishing to seek a 4-year degree who may not have been able to gain entrance to a 4-year institution without improving some skills (Brint & Karabel, 1989). They can also offer easier access for nontraditional students who may have reasons for not being able to live in a college dormitory (Berkner & Choy, 2008). Students who have the best chance of successful vertical transfer and subsequent persistence to a 4-year degree are those who are full-time students, possess high GPAs, have financial assistance from their families, declare a major that is designed to transfer, and who were advised adequately (Mellow & Heelan, 2015).

Statement of the Problem

Because of the current policy in Tennessee that provides students with free 2-year tuition at state-run community colleges and similar programs being implemented around the country, the number of transfer students is likely to grow significantly. Tennessee has also begun the Tennessee Reconnect program that will also provide adults with free 2-year tuition at state-run community colleges that may also increase the number of transfer students as they begin to graduate (Tennessee Promise, 2018).

With the implementation of the Tennessee Promise and the Tennessee Reconnect Program, more students may first-enroll in community colleges. The necessity for the students to be able to transfer credits from the community college to a 4-year university is becoming more significant (Tennessee Promise. 2018). While previous studies have been conducted on

community college students' performance after they transfer to a 4-year university, relatively few studies have been conducted on community college students who transfer into engineering technology majors at a 4-year institution. The focus of this study is students enrolled in an engineering technology major. Therefore, the purpose of this study was to determine whether transfer students are doing as well or better than native students in the ENTC programs at a participating 4-year university.

Research Questions

The following research questions guided this study.

Research Question 1

Is there a significant difference in the graduation rates between native and transfer students in the ENTC program at the participating university?

Research Question 2

Is there a significant difference in the GPAs of students for 3000 level ENTC courses between native and transfer students at the participating university?

Research Question 3

Is there a significant difference in the GPAs of students for 4000 level ENTC courses between native and transfer students at the participating university?

Research Question 4

Is there a significant difference in the proportion of students who are first-generation between native and transfer students at the participating university?

Research Question 5

Is there a significant difference in high school GPAs between native and transfer students enrolled in the ENTC program at the participating university?

Research Question 6

Is there a significant difference in ACT composite scores between native and transfer students enrolled in the ENTC program at the participating university?

Research Question 7

Is there a significant difference in the number of students who are nontraditional aged between native and transfer students enrolled in the ENTC program at the participating university?

Research Question 8

Is there a significant difference in the proportion of students receiving Pell grants between native and transfer students enrolled in the ENTC program at the participating university?

Research Question 9

Is there a significant difference in the proportion of female students between native and transfer students enrolled in the ENTC program at the participating university?

Research Question 10

Is there a significant difference in the graduation rates between female transfer and female native students in the ENTC program at the participating university?

Research Question 11

Is there a significant difference in the graduation rates between male transfer and male native students in the ENTC program at the participating university?

Significance of the Study

Numerous options exist for students who wish to get a degree as inexpensively as possible. Now that many Tennessee students have the option of free tuition at community colleges, many students may choose to begin their quest for a bachelor's degree at a community college. First-time enrollment in a community college when the ultimate goal is a bachelor's degree can significantly delay time to degree (Melguizo, Kienzl, & Alfonso, 2011).

The findings could help universities better understand native and transfer students and the differences between them. The findings may also provide new insight that will help with the student advisement process. For example, a better understanding of native and transfer students may be useful for creating improved course content. Previous studies on native and transfer students in general have been conducted, but relatively few studies have examined specific majors and relatively few have examined engineering technology students. This study will add to the current body of knowledge about engineering technology transfer students. The results may be useful to engineering technology programs.

Because not all paths through college to a bachelor's degree are equal for all concentrations, the present study identifies differences between native and transfer students seeking a bachelor's degree in the engineering technology concentration. It is not known how transfer students' retention and graduation rates compare to those of native students, at the participating university.

Definitions of Terms

Many of these terms are commonly used in academia but can also have more than one definition. The definitions given here are to clarify how they are used for this study.

Native student: a student who first enrolled in the participating 4-year university (D'Amico, Dika, Elling, Algozzine, & Ginn, 2014).

Engineering Technology Concentration (ENTC): Engineering technology concentration courses at the 4-year participating university.

Traditional aged student: a student who first enrolls before their 24th birthday (Adelman, 2005).

Nontraditional student: a student who first enrolls on or after their 24th birthday (Adelman, 2005).

Transfer student: a student who first enrolled in an institution other than the 4-year participating university, typically a community college (Carini, Kuh, & Klein, 2006).

Limitations and Delimitations

This study was limited by degree to which the theoretical framework is appropriate for determining the differences in student performance if differences exist. It was assumed the methodology adequately addressed the research questions. It was also expected the statistical tests were suitable and contained the ability to distinguish differences in the variables if differences exist.

Because transfer student success was measured by comparing their 3000 and 4000 level ENTC GPAs and graduation rates to native students' scores in the same construct, the results were limited by the native students' performance and this definition of student success. The

results of this study was limited by the ability of the quantitative analysis procedures used to be able to identify statistical significance and relationships if they exist accurately.

It was assumed the instructors in the 3000 and 4000 level ENTC courses grade both the native and transfer students' performance by the same standards. Some students may get passing grades in both their 3000 and 4000 level ENTC courses but not graduate. Completion is the ultimate goal of most students but not all, so not knowing if the student's goal was completion is a limitation. This study may not be generalizable to other populations.

Transfer students who enter the participating 4-year university with fewer than 40 hours of transfer coursework will be considered native. The study is designed to compare native against transfer students, and the typical transfer student who had completed a degree at a community college will have approximately 44 or more hours that will transfer. If a student transfers after completing just the core classes that will transfer, they will also enter with approximately 44 credit hours. Because these students with a completed degree and their equivalents are the students being compared to their native counterparts, students with fewer than 40 hours of transfer credits will not be counted as transfer because they will take 2000 level courses at the university.

The first several years of data collected was during a deep economic downturn that probably raised student attrition rates because their families may not have been able to pay the tuition. Because this happened in the early years of the data collection period and engineering technology students typically take more than 4 years to complete the graduation rates of the 4-year university students may have been skewed by this event.

This study was delimited by the theoretical framework that was chosen for the research. This study was also delimited to engineering technology students who enroll in 3000 and 4000 level ENTC courses at the participating university.

Overview of the Study

Chapter 1 contains the introduction to the study, statement of the problem, and the research questions. Limitations and delimitations of the study were also stated. A list of definitions provided clarification for terms that may not be common or may have multiple interpretations. Chapter 2 is a review of the literature. Chapter 3 presents the research methodology. The research questions and null hypothesis are defined. Chapter 4 is a summary of the demographics and examines the results of the data analysis. The outcomes of the data analysis are presented as descriptive, along with charts and tables. Chapter 5 contains a summary of the results of the research and examines the findings for each of the research questions. Conclusions reached by the researcher along with recommendations for potential future studies are discussed in Chapter 5.

CHAPTER 2

REVIEW OF LITERATURE

Students have been transferring from community colleges to universities for many years. With the implementation of new programs in Tennessee such as the Tennessee Promise and Tennessee Reconnect, they are raising awareness of opportunities for students to earn a degree, with the promise of free tuition at any of the states 2-year colleges, greater numbers of students are enrolling. Students' may choose to transfer to a 4-year university at some point in their academic journey. While there are many paths that can be taken to earn a bachelor's degree, the optimal path to a bachelor's degree in engineering technology is currently unknown.

Transferring to a 4-Year Institution

Some students who attend a community college are taking courses in preparation for transfer to a 4-year institution. Often students are faced with the choice of early transfer or taking classes that will not transfer for the major they wish to pursue at the 4-year institution to obtain an associate degree. Taking additional courses may not be feasible for many of the low-income community college students. Other students may want to complete the 4-year degree as soon as possible and obtaining the associate's degree is not their primary reason for attending a community college. Some studies (e.g. Cohodes & Goodman, 2013) have found that many students do not understand the financial implications of choosing one institution over another resulting in detrimental effects on their academic outcomes.

Entrance at the community college level is often the first postsecondary education thousands of students in the United States receive. Community colleges provide many students with an option that may help them begin their academic journey, ultimately seeking a bachelor's

degree or higher (Berkner & Choy, 2008). Community colleges train students for careers, but also prepare students for transfer into 4-year institutions. Community colleges provide opportunities for students without other postsecondary options. The nonselective open-door admission policies found at most community colleges allow entrance for students who may otherwise never have been admitted to higher-education (Guarasci & Cornwell, 1997). Students often take core classes at a community college, anticipating transferring the credits to a 4-year institution (Mellow & Heelan, 2008).

More than 30% of all college students transfer from the college they first-enrolled in to another institution at least once in their academic careers regardless of whether they first-enrolled in a 2-year or 4-year institution (Lederman, 2017). There are many reasons students change institutions: their educational needs or goal change, they may be unhappy with the present institution, or life mandates change. Students enrolled at a 2-year college may want to earn a higher degree than the college offers, this requires transfer to a 4-year institution. Students may want to study a subject that is not offered at the institution where they are currently enrolled. Transfer can be difficult and expensive. When transferring the student may not be able to transfer all of the credits they have earned from the institution they are leaving. There can be many reasons credits will not transfer: the schools may have different curricula, the courses the student has taken may not apply to the major at the receiving institution, and sometimes the student may have taken classes that they were interested in but were in a different field of study. When the student's credits fail to transfer time to degree increases, and the student has spent time and money that will not count towards their degree. The average student losses 43% of their earned credits when they transfer (Lederman, 2017).

Many community colleges have an open-door policy that allows anyone with a high-school diploma or a GED to be admitted (Rao, 2005). Some universities have nonselective admissions policies. Nonselective admission does not mean they accept anyone but differs from open-door policy admissions in that they still have minimum admission standards the student must meet to be admitted although the requirements tend to be less demanding than at a selective university. Freshmen at the participating 4-year university must have a 2.3 GPA or a 19 ACT/980 SAT (Office of Admissions, 2017). Selective colleges often have lower admission rates than most institutions because they often have more applicants than they can admit. Aside from meeting the minimum requirements and having the necessary GPA for admission they also consider extracurricular activities, community service, along with other experiences the student may have (The Admissions Game, 2018). Students who first enroll in a community college can transfer to a more academically selective 4-year institution than they would have been able to enroll in immediately following high-school (Pascarella & Terenzini, 2005).

According to Shapiro et al. (2017b) public institutions in 19 states over 5% of starting cohorts graduated from an institution in another state. In 4-year private nonprofit institutions the number of states members of cohorts graduated from that were different from the state they initially enrolled at climbed to 30. Nationally 44.8% of students who started at a 4-year institution completed within 6 years. Of the 2-year students 36.2 % completed a degree nationally (Shapiro et al.b). Gonzalez (2012) reported that 60% of 4-year bachelor's degree-seeking students transfer at least once before earning a degree.

Kopko and Crosta (2016) found a significant, positive correlation between earning a transfer-oriented associate degree such as an Associate in Arts (A.A.) or an Associate in Science

(A.S.) and the probability the transfer student would earn a bachelor's degree within 6 years of transferring. However, they did not find any effect on the student who earned an Associate of Applied Science (A.A.S.) students earn, typically meant for direct labor market entry. This distinction is important when analyzing the degrees influence on the student earning a bachelor's degree because these degrees are all not equal in predicting a student's successful completion (Kopko & Crosta, 2016). Kolonder (2016) reported income can affect bachelor attainment rates for 2 to 4-year transfer students. Nationally only 36% of transfer students completed a B.A. degree within 6 years after transfer but 44% of middle- and upper-income students completed in the same time frame.

Many community colleges also offer remedial classes for students who need to improve in some subjects so they can earn a degree or admittance into a major they were not able to qualify for before taking these courses (Shaw & London, 2001). Community colleges usually have low tuition rates and flexible schedules and are located in places that tend to be more convenient for the student. They tend to serve many first-generation students and those who hold full-time employment. Community college students can often live at home and avoid the expense of room and board (Cohen & Brower, 2003). Community colleges are often primary institutions of higher education that deliver higher-education to the underserved population (Shaw & London, 2001).

It is arguable whether taking as many classes as possible before transferring could potentially save the student money, but it is only valid when all the credits will transfer. Presently it is not clear what the optimal strategy for a student who begins at a community

college is. The answer could be: each student is on a different path making the student advisement process a valuable tool for students' success, and it is a tool that needs to be re-examined (Crook, Chellman, & Hollad, 2012). A report by the National Student Clearinghouse Research Center (2017) research team concluded only 64% of students who transferred from a 2-year institution to a 4-year institution actually earn an associate degree before transferring (Shapiro et al., 2013).

Engineering technology (ENTC) is a Science Technology Engineering and Math (STEM)-related field. Transfer students in STEM-related fields are socialized at many levels at both community colleges and universities. The socialization process impacts the academic and social adjustment of transfer students. Understanding the adjustment experiences of transfer students in STEM-related fields is vital to ensure successful transfer from the 2-year college to the 4-year institution. This understanding is essential to identify ways to socialize the STEM transfer students to improve their odds of being successful after the transfer (Jackson & Lanaan, 2015). Pascarella and Terenzini (2005) reported first-enrolling in a 2-year college instead of a 4-year university decreases the probability that high-ability minority students will persist in the fields of mathematics, science, and engineering careers, all of these are STEM-related fields.

Vertical Transfer

The transfer function of community colleges is of vital importance to maintaining open access to higher education by providing lower level coursework that can be used to obtain a baccalaureate degree for students who are ineligible for admission to a 4-year university immediately after high-school. The open-access policy of community colleges allows students

access to postsecondary education (Laanan, 2001). “A study of community-college students found those who had more exposure to part-time teachers were less likely to transfer to 4-year universities” (Frederickson, 2015, para.19).

Some researchers assert community colleges serve as a diversion, that may channel students into vocational programs and weaken their educational progress by providing flexibility of attendance and part-time enrollment (Grubb, 1991). Critics of community colleges have declared the vertical transfer mission a failure and contend enrollment reduces a student’s likelihood of obtaining a baccalaureate degree (Brint & Karabel, 1989; Dougherty, 1992; Pascarella & Terenzini, 1991). The limited research available on credit accumulation and earning a degree at a 2-year institution has shown students who do complete a degree are 40 times more likely to transfer to a 4-year institution than those who have not (Roksa & Calcagno, 2010).

Transfer Students

Identifying the demographics of community college students is challenging considering they are individuals who come from many different walks of life, have different levels of academic abilities, and probably are desiring outcomes that meet their individual needs. Middleton (2012) concluded based on the literature the demographic makeup of many community colleges has higher percentages of students who are women, nontraditional students, and racial minorities when compared to average 4-year institutions. This demographic can then be broken down into degree-seeking students, certificate-seeking students, students taking classes to transfer credits, and some who just need to learn something that is new to the student, such as a computer program. They can be students directly from high school, returning to school

after being in the workforce, returning veterans, and potentially anyone old enough to attend. Identifying the students can be a daunting challenge, identifying ways to help the students succeed is probably a more useful goal. According to the National Center for Educational Statistics (2018b), since 1990 the number of community college students who either attained a certificate or degree or had transferred to a 4-year institution within five years of initial enrollment has been steadily declining. In the period from 1990-1994: 37.6% of students attained a degree while 23.3% transferred to a 4-year institution either with or without attaining a degree first. In the period from 1996-2000, this number had declined to 32.9% of students attained while the number of students who transferred to a 4-year institution either with or without attaining a degree first held steady at 23.3%. In the period from 2004-2008: 26.4% of students attained a degree while 21.1% transferred to a 4-year institution either with or without attaining a degree first (Horn & Skomsvold, 2012). Fifty-five percent of community college students in Tennessee attend part-time (Community College Graduation Rates, n.d.).

Students can have a variety of reasons to attend classes in higher education. Often the job the student wants will require a bachelor's degree. However, everyone who attends college does not have their sights set on a 4-year degree. Students will often take classes to improve on a weakness they may have whether it is brushing up on math skills or they need to learn to work a particular computer program. They may be seeking a certificate to qualify for employment in a particular field. Students may need to obtain a particular credential to qualify for a promotion. Often jobs have minimum qualification requirements the student does not meet, and they take classes to learn what they need to know to meet the jobs minimum requirements so they can obtain employment. Some students may need to take a specific class or several classes to

advance their career goals. Other students may actually want to earn an associate's or a bachelor's degree. Many employers need skilled workers, and they support some of the institution's programs that teach students the specific skills that fulfill the employer's needs. Some students who are highly motivated want to transfer and earn a bachelor's degree. They tend to be realistic in their expectations and dedicated to reaching their goal. They are aware that the baccalaureate degree is essential to their career goals or graduate school plans (Ellis, 2013).

Students who earn an Associates of Arts degree before transferring to a 4-year engineering technology program in Tennessee will have very few credits that will be accepted. The A.A. degree has different coursework than an A.S. program and some of the courses may not transfer. Students who instead enrolled in an Associates of Science program will have more credits that will transfer, and students who enrolled in a pre-engineering program will have the most credits that will transfer, but even then, some credits required for the A.S. degree may not transfer (Crook et al., 2012).

Student motivations are an essential part of the learning process, and they directly influence outcomes (Ellis, 2013). Students come to college with a wide range of desires and expectations that shape the quality, timing, and duration of the learning process. Experiences and campus culture can have powerful impacts on student motivations and opinions. It is of extreme importance that student motivations are understood to be able to improve mentoring and the learning experience. Previous research showcases how student outcomes can differ depending on the motivations and previous experiences of students (Coker & Porter, 2015). Jeager and Eagan (2009) studied students in their first year at a community college who had

earned at least nine credit-hours and had declared an intent to earn an associate degree. Out of this group of students 19% of the students actually earned a degree.

Predictors of Student Transfer Success

Historically student grade point average (GPA) has been used as a predictor of student transfer success because it is typically used in research, thus streamlining examining transfer when the number of credit hours earned is similar between native and transfer students. The most successful students post transfer are typically those who were enrolled in rigorous high school academic programs and then enrolled in college academic programs. They choose an appropriate associate degree to pursue that would facilitate transfer, declared an appropriate major early on, and were advised correctly on courses that would transfer into the major they were going to pursue their baccalaureate degree in (Mellow & Hellan, 2015).

Middleton (2012), while attempting to identify predictors of student transfer success, found results that showed a low positive relationship between 23%-26% after transfer. The study concluded pretransfer GPA is not the best predictor, but it can be useful when considering the other factors along with it.

Students who entered a 4-year institution with higher GPAs from a community college have a better chance of completing a baccalaureate degree. A one-point increase in GPA increases students' probability of earning a degree by a factor of 3.029 (Wang, 2009).

Carlen and Byxby (2000) concluded transfer students who earn good grades at community colleges do well at senior college work except for students who enter the business or science disciplines. Often community college students are faced with the choice of early transfer

or taking extra classes that will not transfer for the major they wish to pursue at the 4-year institution to obtain an associate degree. Taking additional courses may not be feasible for many of the low-income community college students (Cohodes & Goodman, 2013). Kopko and Crosta (2016) found a significant positive correlation between earning a transfer-oriented associate degree such as an Associate in Arts (A.A.) or an Associate in Science (A.S.) and the probability that the transfer student would earn a bachelor's degree within 6 years after transferring to a 4-year university. However, they did not find any effect from the student who earned an Associate of Applied Science (A.A.S.) typically meant for direct labor market entry. This distinction is important when analyzing the influence on the student earning a bachelor's degree because these degrees are not equal in predicting a student's successful completion.

Transfer students who have shown success described common barriers to their achievement. They cited less than optimum advising, out of date materials on the receiving institution's websites, and broken website links (Ellis, 2013). Deliberate and personalized interaction between students and faculty should become an academic strategy for helping transfer students adjust to the receiving institution (Reaser, 2008). Research on student retention has suggested many factors that are external to the institutional environment may affect student persistence. Some of these factors could be a lack of financial aid, health problems, family needs, or the student's job requirements. These and other factors could lead to students stopping out or dropping out permanently (Yue & Fu, 2017). Student retention is a problem for most institutions in the United States, and efforts to stem attrition will only become more critical as more at-risk transfer students enroll. At-risk students tend to drop out permanently or stop out at higher rates than the rest of the student population, that may have negative implications for

higher education (Merriam & Caffarella, 1999). Because community college students may be behind in academic skills and they may possess other at-risk factors, they can present additional challenges to retain them until completion or prepare them for transfer (Burnett, 2001).

Vertical Co-enrollment

Wang and Wickersham (2014) examined students in postsecondary who were vertically co-enrolled and whether they attained a bachelor's degree. Vertical co-enrollment describes students who enrolled in both 2-year institutions and also at a 4-year university simultaneously as entering freshman. Their study had a population that had a 6.2% of vertically co-enrolled students. The findings indicated vertical co-enrollment increases the co-enrollee's probability of completing a bachelor's degree in 4 years. Their study also showed vertical co-enrollment had a consistent significant and positive association with attainment and persistence in obtaining a baccalaureate degree. Students can use vertical co-enrollment to increase their curriculum options, flexibility, and implement cost savings.

Factors Associated with Community College Students Obtaining a Bachelor's Degree

In 2014 about 7.3 million undergraduate students (42%) were enrolled in community colleges in the US, the latest statistic offered by the Community College Research Center (Patton, 2017). Conferral of degrees is one function of community colleges, but the completion of an associate degree often will lead students to 4-year institutions where they continue their education (Quigley & Bailey, 2003).

Pretransfer GPA is associated with post transfer persistence and is consistently one of the most reliable predictors of baccalaureate attainment (Wang, 2009). Roksa and Calcagno (2010) found students who have earned an associate degree are 40 times more likely to transfer, and

students who have earned at least 48 credits are 15 times more likely to transfer when compared to students who have not met either of these benchmarks.

The more credits the community college student earns pretransfer the higher the probability of the student earning a bachelor's degree (Koker & Hendel, 2003). There is also evidence the higher the number of credits the student earned pretransfer that are accepted at the post transfer institution are positively associated with higher student success rates. Eighty-two percent of students who had all of their credits accepted graduated within 6 years, compared to only 42% of students graduating who were not able to transfer all of the credits they had earned. Considering the number of credits earned pretransfer is associated with higher rates of bachelor's degree attainment, we might expect students who are earning an associates pretransfer would also be positively associated with a higher probability of attaining a bachelor's degree, but there is little evidence to support this hypothesis (Doyle, 2006).

Ehrenberg and Smith (2004) found no significant correlation between earning an associate degree pretransfer and earning a bachelor's degree post transfer. A similar study compared native to transfer students found earning an associate degree pretransfer was not significantly related to earning a bachelor's degree (Bailey & Weininger, 2002). The findings of both of these studies could have been influenced by not all credits earned to obtain the associate's degree transferred to the 4-year institution, that literature has shown can negatively impact the probability they will earn a bachelor's degree (Doyle, 2006). A national study conducted by researchers at the American Council on Education found students who transferred before earning an associate degree were more likely to have all of their credits earned transfer into the 4-year institution (Palmer, Ludwig, & Stapleton, 1994).

According to Jaeger and Eaton (2009) students who enrolled in community colleges that have a higher percentage of minority students are significantly less likely to an associate degree. A 10% increase in minority students resulted in an average 1% decrease in probability students would earn an associate degree. The decrease in probability could be the result of more students seeking a professional certificate, or the institution may be less able to attract high-quality faculty, due to funding constraints or other reasons (Jaeger & Eaton).

Financial Aid

Jaeger and Eaton (2009) found financial aid had a significant and substantial impact on students' likelihood of earning an associate degree. Students who received financial aid were 3% less likely to earn a degree than their peers who did not receive financial aid. The study also found for each additional \$100. of financial aid the student received increased the probability of the student earning an associate degree by 1%. This small amount of additional financial aid is probably the difference between having the money to buy books, required computer programs, food, and necessary supplies.

Full-time enrolled students who are financially independent and attend a public community college are the most likely to receive financial aid when compared to any other type of student who attends a public community college. Fewer than 2% of the students attending public community colleges receive merit-based financial aid, compared to 15% of students who attend independent, not-for-profit, 4-years institutions and receive merit-based financial aid.

Technology has allowed students who live in remote areas to improve their education but can also leave out members of the low-income population as financial aid rules are more restrictive for distance education courses. Financial aid is typically any program designed to

assist students financially in attending postsecondary institutions. To encourage students to transfer from a 2-year to a 4-year institution some states provide incentives such as financial aid, guaranteed transfer, or priority admission (Smith, 2010).

Articulation Agreements

Articulation agreements are commonly created to facilitate the vertical transfer process for students who desire to transfer from a community college to a 4-year institution. There has been a significant increase in the number of states with articulation policies over the last 10 years showing that state legislatures and governing boards of higher education have recognized a need for them. They can be the result of statewide policies that mandate the creation of a process for the transfer of lower division coursework and the development of common core that guarantees the transfer of general education coursework. Often it will guarantee a student can enter the 4-year institution at the junior level as long as they attend an institution in the same state (Smith, 2010).

At the 4-year participating university there are regulations that must be met for the articulation agreement to be honored. The student must apply for participation in the articulated program while enrolled at the 2-year institution. The 2-year institution must note on the student's transcript the associate degree was completed according to the transfer plan for admission to the 4-year university program (Specific, 2019).

Many states have no state-wide articulation agreements to specify coursework that will transfer from a 2-year institution to a 4-year institution. Having detailed list of courses that will transfer from a 2-year institution to a 4-year institution and the agreements being honored at the 4-year institution would make the advising of potential transfer students more efficient and

would ensure the credits earned by the students would transfer. Explicit articulation agreements would help ensure students are better prepared for transfer as well as help improve the transition process into the receiving institution (Ehrenberg & Smith, 2004).

Ellis (2013) identified conflicting opinions as to whether articulation agreements increase the transfer rate of community college students to 4-year universities. The increase if there even is one can be too small to measure with confidence or may vary from year to year masking the articulation agreements effect (Lasota & Zumeta, 2016). Increasing the number of transfer students should not be the primary reason to have an articulation agreement. Preparing the students for successful transfer by ensuring they do not lose any more credits earned than necessary would be a more useful strategy (Roksa & Keith, 2008). Whether or not all of the students earned credits transfer or not can affect students' attitudes regarding the receiving institution as well as the community college they attended. Many of the successful transfer students had the best understanding regarding whether their earned hours would transfer, and the credits that would be accepted and why the others would not. These students understood they would lose hours as the result of changing majors, taking coursework that was not part of the degree requirements, obtaining a technical associate of arts or sciences degree, completing multiple degrees, or taking hours beyond the transfer limit. The successful students had fewer regrets about losing the hours and were grateful for the community college experience that allowed them to learn different fields of study while expanding their knowledge in areas of personal interest. Transfer students who reported higher levels of distress over the loss of hours when agreements like the Core Curriculum, Texas Common Course Numbering System (TCCNS), and articulation agreements were not recognized. They were displeased when they

had not been appropriately advised at the community college regarding the selection of courses, resulting in their having to retake courses at the receiving institution with no rational reason, or no reason at all was given for the coursework not being acceptable (Ellis, 2013).

Crook, Chellman, and Holod (2012) stated existing research is not conclusive as to whether articulation policies increase student transfer rates. Bahr, Toth, Thirolf, and Massé (2013) do not support the idea articulation policies increase student transfer rates. Ogilvie (2014) stated there had not been many papers studying the impact articulation policies have on student performance after transfer especially in engineering disciplines. Crook et al. (2012) found students who had earned an A.A. or A.S. degree had a 6.9% increased probability of earning a bachelor's degree when compared to transfer students who had not earned a degree pretransfer. This result did not apply to students who had earned an A.A.S. degree. They posited earning the A.A. or A.S. degree equates to an additional semester of full-time work the students have completed.

Although many states have articulation agreements in place between their community colleges and public 4-year institutions, admissions officers at the 4-year institutions are often concerned transfer students frequently have difficulties when trying to adjust to the rigorous academic demands of their institutions. When community college transfer students are not well prepared academically, this can create the need for additional support, that can translate to higher instructive expenses and delay time to degree attainment (Melguizo, Kienzl, & Alfonso, 2011).

There are 13 community colleges in Tennessee that have multiple programs of study with articulation agreements to facilitate transfer into specific programs of study at specified 4-year institutions and are only valid at institutions specified. They are the result of articulation

agreements between Tennessee Community Colleges and the receiving institutions. One example of an articulation agreement is the 60-hour Manufacturing Technology (A.S. Degree) program at Northeast State Community College that says it is:

The university parallel program in Manufacturing Technology is designed for individuals who intend to complete the first two years of a baccalaureate degree program at Northeast State and then transfer to a 4-year college or university to complete the bachelor's degree with a major in Manufacturing Technology. The curriculum includes general education and other selected courses typically required in a baccalaureate degree program in Manufacturing Technology. (Manufacturing Technology A.S. Degree, 2018, para. 1)

These A.A. and A.S. guides are designed to facilitate transfer to ETSU unless otherwise noted. (Manufacturing Technology A.S. Degree, 2018, para. 8)

The 2018 Manufacturing Technology A.S. Degree requires 60 credit hours required for this degree. Fifteen credit hours of coursework are specified as “Course designed for transfer” (para. 3) but to view this information requires clicking on the title of the course to see this information (Manufacturing Technology A.S. Degree, 2018). An additional 29 required credit hours are listed, but the student must choose the classes from a list of approved coursework for them to transfer (General Education Core A.S. Degree, 2018, para. 8). The student must also choose a 2-credit hour elective that may transfer if they choose properly (Manufacturing Technology A.S. Degree, 2018, para. 7). The remaining 14 credit hours in the manufacturing concentration are specified as “Course Not designed for transfer,” (para. 4, MATT 1110) but to view this statement requires clicking on the title of the course to see this information (Manufacturing Technology A.S. Degree, 2018). These classes may be allowed to be used as electives at the receiving institution's discretion, but the B.S. in manufacturing concentration

usually contains 8 hours of electives (Engineering Technology, 2018). None of the coursework in the manufacturing concentration are taught in the last semester of coursework (Manufacturing Technology A.S. Degree, 2018).

Continuing with this example from the receiving institutions perspective; there are many different requirements for transfer, but because this papers focus is whether transfer students in engineering technology perform as well as their native counterparts the policies that apply primarily to engineering technology will be examined. Transfer complications also become more complex than this paper will examine in too great of detail when the transfer is from an out of state institution. If a student transfers from Virginia Highlands community college the number of courses that will transfer is almost as large as if they had transferred from a community college in Tennessee, but if the student transfers from Indiana University-Purdue University Indianapolis, the number of courses that are listed on the receiving institutions list of equivalent courses are six, four that are chemistry, one in math, and one in ENTC, so the maximum equivalent courses would only be four that would transfer (East Tennessee State University Transfer Course Equivalency, 2018). “All non-technology coursework such as English, mathematics, and science is evaluated for transfer by an analyst in the Office of Admissions. All technology coursework submitted for transfer will be analyzed by the department chair or the appropriate program coordinator” (Engineering Technology Major-Transferring Policy para 1, 2018). There are also several other requirements that must be satisfied in the transfer process: The number of credits earned at the transferring institution must meet a minimum GPA for admittance. These 4 additional requirements apply:

1. Coursework must have been taken at a regionally accredited 2- or 4-year

institution.

2. Coursework must be equivalent to an ETSU course; if not, it will count as elective credit.
3. Only coursework that a grade of C (2.0) or higher was earned will be accepted for transfer credit for courses in English, mathematics, science, and technology.
4. No associate degree coursework will be accepted for Engineering Technology coursework at the 4xxx level (Engineering Technology Major-Transferring Policy 2018, para. 2).

If all credits successfully transfer the average student will have 68 additional credits to earn to complete the degree (Engineering Technology Major, 2018). Fulfilling this requirement will typically mean completing 4 semesters and possibly more depending on the availability and timing of these courses being offered.

If students transfer after only completing most of the core classes, they can avoid taking courses that will not transfer and allow them to integrate into the 4-year institution sooner (D'Amico, Dika, Elling, Algozzine, & Ginn, 2014). Outside of factors associated with success post transfer, or lack thereof, it is essential to consider the fundamentals the transfer student is experiencing at the receiving institution and how they influence the students' adjustment. One study indicated the most reliable predictor of student satisfaction and their post transfer academic performance is transfer preparedness that may include counseling, advice from faculty and staff, and understanding academic requirements (Berger & Malaney, 2003).

Transfer Shock

Transfer shock is a term that describes the temporary dip in academic performance or grade point average in the first or second semester after transfer from a community college to a 4-year university. This phenomenon is often seen in community college students immediately after transferring to a 4-year university. The newly transferred student faces psychological, academic, and environmental challenges as they adjust to a new campus. Additionally, the 4-year institution may have different academic standards and performance expectations (Lanaan, 2003). Multiple studies have concluded transfer shock is only a temporary phenomenon and student affairs professionals and the transfer student joining a student organization can provide academic and social support (Castaneda, 2002; Cejda 1997; Melguizo, Kienzl, & Alfonso, 2011). To study the effect of transfer shock Cejda (1997) studied 100 community college students who had transferred and examined them by discipline. Students who transferred to the areas of education, fine arts, humanities, and social sciences did not experience transfer shock. Transfer students in business, mathematics, and sciences experienced significantly greater transfer shock rates than students in other majors. Engineering technology incorporates both math and science. Pascarella and Terenzini (2005) reported students seeking a bachelor's degree who first enroll in a community college reduces the probability of them earning the degree by 15%-20% prior to transferring, but once the student actually transfers to a 4-year institution the probability of them earning the degree is the same as if they first-enrolled at a 4-year institution.

Transfer students face adjustment experiences that are multidimensional and very complex. These experiences are often more critical when the student is pursuing a degree in a STEM discipline than other majors. Being active at helping to socialize students in STEM areas

can benefit in understanding the issues that can influence their adjustment experience. This knowledge can benefit 2- and 4-year college and university student affairs advisors, academic counselors, admission specialists, programs for student retention, students, faculty and policy creators. Community colleges often play an essential role in helping prepare students in their pursuit of a bachelor's degree, and adequately preparing students pursuing a degree in engineering and science is of the utmost importance to the future of the nation's economy. Preparing transfer students is essential for the transition and adjustment to a STEM-intensive program is not a task that educators can tolerate failure. Students must feel connected to the academic environment, but equally important they must connect with their area of study (Jackson & Laanan, 2015).

Community Colleges Purposes

Community colleges were initially meant to be a stepping stone to a college degree. When community colleges first opened, their primary function was to prepare students for transfer into an institution that offered a 4-year degree. "They brought students into higher education that would have otherwise never have attended" (Brint & Karabel, 1989, p. 91). The open-door admission policies used by most community colleges was an attempt to provide access to higher education to all members of society (Guarasci & Cornwell, 1997).

Community Colleges can serve many different student needs. They are often the first postsecondary education that thousands of students in the United States receive. Community college students represented 36% of all first-time undergraduates enrolled in 2016 nationally (Ginder, Kelly-Reid, & Mann, 2016). They provide many students with an option that may help

them begin their academic journey, often seeking a bachelorette degree or higher (Berkner & Choy, 2008).

Community colleges can prepare students wanting to earn a degree as well as prepare them to move directly into the workforce in professions that require training beyond a high school diploma. The world has seen a dramatic rise in high technology-based equipment and machinery. Many of the jobs in the 21st century require specialized training but may not require a bachelor's degree or higher degree. Some of these areas can be nursing, diesel mechanics, welders, plumbers, electricians, machinists, and many other professions and occupations. These types of institutions train people for entry-level positions in these fields as well as allow them to learn to operate newer equipment. Without this specialized training these institutions provide there would be more unfilled jobs and work being performed by underqualified people. A shortage of skilled workers could potentially create unsafe conditions and unacceptable wait times to get the necessary maintenance performed on equipment. Community colleges are the primary institutions of higher education that deliver higher-education to the underserved population (Shaw & London, 2001).

Community college students can choose between vocational training or prepare for transfer to a 4-year institution. As costs to attend a 4-year institution continue to rise, more students may decide to take the community college route in pursuit of a bachelor's degree. Nationally in the 2015-2016 school year community college students earned 833,093 associate degrees and 533,579 certificates (AACC 2018 Fact Sheet, 2108). In 2015 community college freshmen represented 54% of the freshmen enrolled in the Tennessee public higher education system (Tennessee Higher Education Fact Book, 2016).

According to Ehrenberg and Smith (2004) 2-year institutions are incredibly complex, possibly more so than some research universities. Their offerings can include subjects targeted at adult education; they can provide contract courses for industry, training for government employees, training students for careers, as well as preparing students for transfer into a 4-year institution.

Many community colleges offer a curriculum that meets the community and student needs but can be different from what might be offered at a 4-year institution, although some of the offerings may be the same. Some of these institutions consider themselves to be a comprehensive community college. This type of college can offer programs designed for students wishing to obtain an associate degree or who wants to transfer to another college or university, usually a 4-year institution. Community colleges typically offer other career programs designed to meet the needs of students who wish to immediately enter the workforce after graduation, often by earning a proficiency certificate. Many community colleges also offer remedial classes for students who need to improve in some subjects so they can earn a degree or be admitted into a program they were not able to qualify for before taking these courses. They may also offer coursework in continuing education as well as professional development (About Northeast State, n.d.).

Community colleges can offer savings outside of lower tuition rates. Students can often live at home and avoid the expense of room and board, meals, as well as other expenses related to having a near campus living facility. In general community colleges have complicated purposes, that can include offering degree programs, prepping students to transfer to a 4-year institution, and offering many other educational choices as well as vocational opportunities.

They usually have low tuition rates and flexible schedules and are located in places that tend to be more convenient for the student. They tend to serve many first-generation students and those who are full-time employed (Cohen & Brower, 2003).

Tennessee also has Colleges of Applied Technology or Technical colleges that have a curriculum that tends to be different from typical 2- or 4-year institution. Students who graduate from this type of institution rarely continues their education at 2- or 4-year institutions but typically earn a certificate of competency in their field of interest that can help them obtain employment in that profession. Often the students who have earned their certificate choose to enter the workforce rather than continuing their education. The average ACT score of incoming freshmen fall of 2015 was 18.8 (Tennessee Higher Education Fact Book, 2016).

Tennessee Promise

The necessity for the students to be able to transfer credits from the community college to a 4-year university is becoming more significant because many states are implementing free tuition programs at the community college level (Mercer, 2018). Having a better-educated workforce is an attempt to attract more industries and jobs to their states by increasing the number of students who attend college. The Tennessee Promise scholarship program provides students with a last-dollar scholarship that will cover tuition costs not covered by the Pell grant, The Hope scholarship, or the Tennessee Assistance Award, that provides the students with the funds to pay for college they might not otherwise have. The program can help fund an associate degree at any of the state's 13 community colleges or 27 TCATs (Tennessee Centers of Applied Technology), or any other institution in Tennessee that offers an associate degree program. Providing financial support is only one of the critical provisions of the Tennessee Promise

program. The program also provides students with a mentor who guides the student through their academic journey. Participants are also required to complete and document 8 hours of community service per term enrolled as well as maintain a 2.0 G.P.A. (Tennessee Promise, n.d.).

Twenty-one percent of 2015 Tennessee Promise students graduated after 5 semesters. While still a low graduation rate this represented almost a 7% increase over the 2014 cohort, the year before the implementation of the program. More than one-half of the students had graduated, transferred, or were still enrolled in a community college after the 5 semesters. The number of students enrolled in community college in Tennessee has increased by almost 25% since the program began (Gonzales, 2018).

Tennessee has recently implemented the Tennessee Reconnect program that allows adults to earn an associate degree or technical certificate tuition-free. Tennessee Reconnect program will provide adults with free 2-year tuition at state-run community colleges that may also increase the number of transfer students as they begin to graduate. With the implementation of the Tennessee Promise, and the Tennessee Reconnect program more students may first-enroll in community colleges (Tennessee Promise, n.d.).

Graduation Rates

Shapiro and Dundar (2017a) reported from 2010 to 2016 in the United States overall the 6-year outcomes for all students who started at 4-year public institutions were 62.43% total completion rate, with 49.46% completing at the university they initially enrolled in, 9.76% completing at a different institution somewhere in the U.S., 3.23% completing at a 2-year college somewhere in the U.S., 13.24% are still enrolled somewhere, and 24.33% not enrolled anywhere (Shapiro & Dundar, 2017a).

From 2010 to 2016 in the United States overall the 6-year outcomes for all students who started at 2-year public institutions were 39.29% total completion rate, with 26.67% completing at the college they initially enrolled in, 3.32% completing at a different institution somewhere in the U.S., 9.3% first completing at a 4-year university somewhere in the U.S., 6.65% subsequently completing at a 4-year university, 15.8% are still enrolled somewhere, and 44.9% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for all students who started at 4-year public institutions were 57.34% total completion rate, with 44.61% completing at the university they initially enrolled in, 9.1% completing at a different institution somewhere in the U.S., 3.63% completing at a 2-year college somewhere in the U.S., 13.86% are still enrolled somewhere, and 28.8% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for all students who started at 2-year public institutions were 39.9% total completion rate, with 28.08% completing at the college they initially enrolled in, 2.29% completing at a different institution somewhere in the U.S., 9.54% first completing at a 4-year university somewhere in the U.S., 6.85% subsequently completing at a 4-year university, 10.6% are still enrolled somewhere, and 49.5% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for students exclusively enrolled full-time who started at 4-year public institutions were 80.81% total completion rate, with 66.29% completing at the university they initially enrolled in, 8.21% completing at a different institution somewhere in the U.S., 1.86% completing at a 2-year college somewhere in the U.S.,

3.72% are still enrolled somewhere, and 15.47% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for students exclusively enrolled part-time who started at 4-year public institutions were 17.42% total completion rate, with 15.64% completing at the university they initially enrolled in, 1.1% completing at a different institution somewhere in the U.S., 0.68% completing at a 2-year college somewhere in the U.S., 5.31% are still enrolled somewhere, and 77.27% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for students enrolled in a mix of part-time and full time who started at 4-year public institutions were 39.32% total completion rate, with 23.34% completing at the university they initially enrolled in, 10.53% completing at a different institution somewhere in the U.S., 5.45% completing at a 2-year college somewhere in the U.S., 23.65% are still enrolled somewhere, and 37.03% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for students 20 years old or younger who started at 4-year public institutions were 59.06% total completion rate, with 45.44% completing at the university they initially enrolled in, 9.74% completing at a different institution somewhere in the U.S., 3.89% completing at a 2-year college somewhere in the U.S., 14.21% are still enrolled somewhere, and 26.72% not enrolled anywhere (Shapiro & Dunder, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for students over age 20 but less than 24 year old who started at 4-year public institutions were 43.29% total completion rate, with

34.32% completing at the university they initially enrolled in, 6.23% completing at a different institution somewhere in the U.S., 2.74% completing at a 2-year college somewhere in the U.S., 14.13% are still enrolled somewhere, and 42.57% not enrolled anywhere (Shapiro & Dundar, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for all students 24 years of age or older who started at 4-year public institutions were 47.35% total completion rate, with 41.25% completing at the university they initially enrolled in, 4.49% completing at a different institution somewhere in the U.S., 1.62% completing at a 2-year college somewhere in the U.S., 10.53% are still enrolled somewhere, and 42.11% not enrolled anywhere (Shapiro & Dundar, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for women who started at 4-year public institutions were 66.01% total completion rate, with 46.28% completing at the university they initially enrolled in, 10.69% completing at a different institution somewhere in the U.S., 4.05% completing at a 2-year college somewhere in the U.S., 14.04% are still enrolled somewhere, and 24.93% not enrolled anywhere (Shapiro & Dundar, 2017a).

From 2010 to 2016 in Tennessee the 6-year outcomes for men who started at 4-year public institutions were 54.2% total completion rate, with 43.53% completing at the university they initially enrolled in, 7.46% completing at a different institution somewhere in the U.S., 3.21% completing at a 2-year college somewhere in the U.S., 14.39% are still enrolled somewhere, and 31.4% not enrolled anywhere (Shapiro & Dundar, 2017a).

In 2015 out of 22,184 incoming freshmen in TBR community colleges 11,553 or 52% were enrolled in developmental education. The TBR community college system had a 58% retention rate. In 2015 in Tennessee 9,896 students earned an associate degree (Tennessee

Higher Education Fact Book, 2016). Also in 2015 Nationally 731,758 students earned an associate degree (National Center for Educational Statistics, 2018a).

Transfer Between 2- and 4-Year Institutions

Transfer Rates

In the fall-2014-2015 academic year in the Tennessee TBR community college system there were 13,977 first-time full-time freshmen. Eight-thousand one-hundred thirty-six of them were retained or 58%. Six-hundred sixty-nine of these students had transferred to another public institution (Tennessee Higher Education Fact Book, 2016). Nationally students who had first enrolled in a community college in 2010, 13% of them had earned a bachelor's degree somewhere within 6-years of initial enrollment. Nationally 34% of community college graduates transferred to a 4-year university after earning a degree at the community college, and 42% of these transfer students had earned a degree within 6-years of initial enrollment (Shapiro et al., 2017).

Transfer Challenges

Transfer students who have shown success expressed running into common barriers to their achievement, they overcame them by searching all sources of information available to them on their own. When discussing obstacles to their success students cited out of date materials on the receiving institution's websites as well as a plethora of broken website links, none of these contributed to their success. Their persistence in finding the information they needed was vital to their success, and poor advising did not deter them. Students were shuffled from office to office and persisted in their search for answers until they acquired the information they needed to be successful. The students found ways to circumvent staff, faculty, and administrators who

gave them incorrect information or behaved in unprofessional manners. They expressed having negative interactions with advisors who were rude, unenthusiastic, and gave them the run around (Ellis, 2013).

Transfer Strategies

A theory based on research is it is difficult at best to identify at-risk students (They do not wear brightly colored hats). Short of knowing those transfer students who are at the highest risk of attrition at the time of transfer, it would be an intelligent strategy to treat all transfer students as at risk. There are multiple ways of intervention from advising to faculty initiatives—The primary focus needs to be sustained contact and interaction with the students that will allow appropriate direction if concerns arise (Tinto, 2007).

Providing students with the opportunity to meet personally with their academic strategies course instructor assisted the students' recognition of the instructors as a source of help with problem-solving in both personal and academic challenges. Deliberate and personalized interaction between students and faculty should become an academic strategy for helping transfer students adjust to the receiving institution (Reaser, 2008).

Predictors of Successful Completion in a Community College

Students from low socioeconomic status report financial issues are critical to their persistence (Jones & Watson, 1990). There is a significant relationship between poverty and under-education (Roueche & Roueche, 1993). Brint and Karabel (1989) concluded students who enroll in a community college decrease the probability of them attaining a bachelor's degree.

Pascarella, Smart, and Ethington (1986) tested Tinto's model for 2-year community colleges and found academic and social integration were both significant positive predictors for

both men and women when attempting to predict persistence and completion. Student integration into campus culture has been shown to have a positive correlation with student success. Research on student-faculty interaction particularly outside of the classroom has served as a positive predictor of student achievement (Cotton & Wilson, 2006). Pascarella and Terenzini's (2005) findings suggested the student's level of involvement and integration into the institutions academic and social system can be a critical factor in persistence.

4-Year Programs in Engineering Technology

National Completion Rates in Engineering

There is a significant variation in graduation rates among engineering colleges. According to Veenstra (2016) 50% of students graduating in 5-years is the average. Most colleges (80%) reported achieved at least a 30% graduation rate. The median graduation rate is 47% for the 150 4-year engineering colleges reported by Veenstra. The variability from one engineering college to another is quite large. The bottom 10th percentile college has a 26% graduation rate compared to 77% for the 90th percentile college, resulting in a 51% difference. The probability of graduating within 5 years from initial enrollment in the college with the 77% graduation rate is 3 to 1 when compared to the college with the 26% graduation rate. At the university with the worst graduation rate the 5-year graduation rate is only 4% while the university with the highest graduation rate is 97%. When considering the 6-year graduation rate the variability between universities decreases. Some students in engineering majors take longer to graduate, often completing in 6 or 7 years (Veenstra, 2016).

Tennessee

Twenty-five percent of university students in Tennessee attend part-time (Community College Graduation Rates, n.d.). In 2015 the average incoming freshmen in TBR Tennessee universities ACT score was 23.2. In Tennessee the statewide university retention rate was 82%. In the fall-2014-2015 academic year in the Tennessee TBR University system there were 34,113 first-time full-time freshmen. Twenty-four thousand six-hundred forty-nine of them were retained or 72%. Two-thousand thirty-three of these students had transferred to another public institution (Shapiro & Dundar, 2017).

Requirements

To obtain a Bachelor of Science degree in engineering technology from the public universities that offer it in Tennessee typically requires earning 120-128 credit hours, depending on the major the student chooses to pursue. Industrial technology typically requires the least number of credit hours at 120 and is one of the easier to transfer credits into because it accepts the broadest range of technology electives and permits 13 hours of electives. Most engineering technology majors only permit 8 hours of electives (Engineering, Engineering Technology and Surveying, 2017). Depending on the school and the major the program can be accredited by the Accreditation Board for Engineering Technology, commonly referred to as ABET, engineering technology programs that are accredited by ABET have a stringent set of coursework that is acceptable and can be applied to earning a degree, potentially making transfer of electives either more complicated or not permitted (ABET, n.d.). Often transfer students will have 12 hours of coursework that will only transfer as an elective, so the major they choose to transfer into can affect how many of their earned hours will apply to the degree (Northeast State, 2018). Most

programs require a 2.0 GPA average on all coursework completed and a 2.0 minimum in all engineering technology and mathematics courses (Engineering Technology, (B.S.E.T.) 2018).

Completion Rates

While graduation rates for universities are generally available, graduation rates for engineering technology programs seem to be unpublished. There are eight public universities in Tennessee that have engineering technology programs. The rates being reported for each university are the average 6-year graduation rate for the entire university not the engineering technology programs. None of the Tennessee universities listed graduation rates for engineering technology students on their websites.

Predictors of Successful Completion in a 4-Year University

Carlen and Byxby (2000) concluded transfer students who earned good grades in their community college coursework should also earn good grades in higher level college coursework. Their study found 2 disciplines that did not follow the conclusions; they were students who were studying a business or science major, even though these 2 groups of students tend to have high ACT scores that are considered positive predictors in higher level coursework. They felt this group of students is affected more by transfer shock than academic unpreparedness.

Cejda, Rewey, and Kaylor (1998) examined 200 community college students, some who received an Associate of Arts degree who then transferred into a private liberal arts college and others who had transferred without earning a degree. They found two factors predicted student persistence: earning an A.A. degree before transfer and GPA. They concluded the students who had both earned the degree and had a GPA of 3.0 or higher had the highest rates of persistence.

Student Retention

Retention rates at 4-Year Universities

Radford, Berkner, Wheelless, and Shepherd (2010) used numbers reported by the National Center for Educational Statistics to perform a longitudinal study examining outcomes from students who first enrolled in postsecondary education in 2003. These are the results from students who enrolled at any institution 6 years after initial enrollment. Of the 2003–04 beginning students, approximately 9% earned received a certificate, 9% earned an associate degree, and 31% earned a bachelor's degree within 6 years from any institution. An additional 15% were currently enrolled at some institution but had not yet earned a degree, the remaining 35% had not earned a degree and were not enrolled at any institution. These authors suggested students who begin in a 2-year public institution appear to have the most trouble with persistence and attainment. Of the 2003–04 beginning students who first enrolled in a public 2-year institution, after 6 years approximately 8% had earned a certificate, 14% had earned an associate degree, and 12% had earned a bachelor's degree within 6 years from any institution. An additional 20% were currently enrolled at some institution but had not yet earned a degree, the remaining 46% had not earned a degree and were not enrolled at any institution (Radford et al., 2010). Students who first enrolled in a 4-year public institution appear to perform the best.

Of the 2003–04 beginning students who first enrolled in a 4-year institution, after 6 years approximately 58% had earned a bachelor's degree, 5% had earned an associate degree, and 2% had earned a certificate within 6 years from any institution. An additional 12% were currently enrolled at some institution but had not yet earned a degree, the remaining 24% had not earned a degree and were not enrolled at any institution (Radford et al., 2010).

The 6-year graduation rate among first-time, full-time undergraduate students who first-enrolled in a bachelor's degree program at a 4-year degree-granting institution beginning fall 2009 was 59%. Fifty-nine percent had completed a bachelor's degree by 2015 in the same institution they first-enrolled in 2009. The 6-year graduation rate at public institutions was 59%, at private nonprofit institutions the 6-year graduation rate was 66%, and at private for-profit institutions it was 23%. The 6-year graduation rate for females was 62%, and for males it was 56 %; the rate was higher for females than for males at both public (61% vs. 55%) and private nonprofit institutions (68% vs. 62%). At private for-profit institutions, males had a higher 6-year graduation rate than females (24% vs. 22%). The 6-year graduation rates for full-time students who first-enrolled in a bachelor's degree in fall 2009 varied by the institutional selectivity. Six-year graduation rates were the highest at institutions that were the most selective (the lowest admissions acceptance rates) and were the lowest at institutions that were the least selective (had open admissions policies). At 4-year institutions with open admissions policies, 32% of students earned a bachelor's degree within 6 years. At 4-year institutions where the acceptance rate was below 25% the 6-year graduation rate was 88% (National Center for Educational Statistics, 2018b).

Stopping Out

Stop out is a term commonly used when students leave the institution they are enrolled in for a semester or more and later return to either the institution they left or another. A problem that confounds identifying students who have stopped out is the fact they can only be identified from students who have dropped out permanently after they have returned to higher education (Berkner & Choy, 2008).

To earn a degree a student must enroll in an institution and then pass all the required coursework in their area of study. Therefore, stopping out delays the time to complete the degree and can threaten coursework completion because the student leaves the academic environment and there is a discontinuity in their learning. Differences in enrollment durations suggest exclusively part-time students are more likely to stop out than full-time students (Chen, 2007).

Ehrenberg and Smith (2004) posited there is no way we can distinguish from data whether a student has permanently dropped out of college or if they have just temporarily stopped out, or whether they have stopped out for academic or nonacademic reason. Wang (2016) suggested stopping out occurs more often in native students that result in absences and gaps in their student enrollment records. Receiving need-based financial aid reduces student stop-out behavior (Bettinger, 2004).

Dropping Out

Kurlaender and Long's (2008) longitudinal study tracked students enrolled in public institutions in Ohio over a 9-year period. They used a dataset that is a complete census of students enrolled in the public higher education system. Their study found the attrition rate over the more extended time frame is small. The point of the extended period of study was to be able to attempt to capture some of the students transfer behavior as well as stopping out and returning to college. Even with this large data set the researchers still found it was impossible to determine if the students listed as dropouts had transferred to a private institution or an institution in another state. Their research showed students who started at 2-year colleges, almost 44% had dropped out or stopped out 6 years after enrolling. Findings also showed 34% who first enrolled in a nonselective 4-year institution had dropped out or stopped out, and 18% who first

enrolled in a selective 4-year institution had dropped out or stopped out 6 years after initial enrollment. They also determined students who first enrolled in a community college have a significantly reduced likelihood of earning a degree and an increased likelihood of stopping out before earning a degree. Students who had started at a 2-year community college on average earned significantly fewer credit hours over a 6-year period from initial enrollment when compared to students who had initially enrolled in a 4-year institution (Kurlaender & Long, 2008).

Tennessee's drop-out rates for full-time students who first enrolled in a 2-year public college who had not earned a degree but were not enrolled anywhere after 6 years is 44%. Tennessee's drop-out rates for full-time students who first enrolled in a 4-year public university who had not earned a degree but were not enrolled anywhere after 6 years is 29% (Shapiro & Dunder, 2017).

Other Possibilities

Research on student retention has suggested many factors external to the institutional environment may affect student persistence. Some of these factors could be lack of financial aid, health problems, family needs, or the student's job requirements. When students have opportunities they feel are too good to pass up, they may choose to stop out or leave permanently (Yue & Fu, 2017).

Student retention is a severe problem for most institutions in the United States and efforts to stem attrition will only become more difficult as more at-risk students enroll. Long-term projections suggest higher numbers of low-income, disabled, and academically unprepared students will enter institutions of higher education. At-risk students tend to drop out

permanently or stop out at higher rates than the rest of the student population, this can have negative implications for higher education and society as a whole. When retention rates drop, funding for institutions is affected, along with curriculum planning, and funding for capital expansion decreases. Labor-markets are undesirably affected when at-risk students do not possess the required skills and abilities necessary to perform their responsibilities in business and industry (Merriam & Caffarella, 1999).

Colleges and universities have concluded it is financially more efficient to retain the currently enrolled students than to try to recruit new students. Retaining students is not a new issue as it has been a concern for higher education for decades. The higher the goals of the student at admission the more likely they are to persist until they meet these goals. Some students will only meet their goals after transferring, and students will only leave higher education after they accomplish what it is they came for, this may or may not involve earning a degree (Roueche & Roueche, 1993).

Academic and Social Integration of Transfer Students

Student integration into campus culture has been shown to have a positive correlation with student success. Research on student-faculty interaction particularly outside of the classroom has served as a positive predictor of student achievement. Focus groups have shown students who have minimal contact with faculty members are not aware of the importance of interacting with faculty (Cotton & Wilson, 2006).

Chapman and Pascarella (1983) examined institution type to consider how differences in institutions can affect the relevance of students' academic and social integration among different populations. They discovered community college students had less social interaction within the

institution. They determined it was not because the students were not social but because they found their social interactions off campus. They asserted universities should consider these differences when admitting transfer students.

Despite the frequent use of multiple institutions models, some question whether there is enough empirical evidence to support the multiple institution models (Braxton, Hirschy, & McClendon, 2004). Tinto (1975) recognizes there are differences that are not accounted for when considering nontraditional students, community college students, and older commuting students, especially the inability to consider the external elements that affect these types of students.

The accuracy of any quantitative study done on students can only take into account factors that can be measured. Even with useful data and well-defined variables, it is still impossible to account for non-academic factors that enable students' academic success in a postsecondary setting (Middleton, 2012).

A single institution study by Borglum and Kaluba (2000) reported finding no link between academic and social integration and persistence of community college students. It concluded students attended campus just long enough to attend classes and showed no interest in the activities on campus that are traditionally part of the social integration process. This study suggested new ways of thinking about students at community colleges may be required.

Cejda and Rhodes (2004) examined how connections established between faculty members and Hispanic community college students affected the students' retention and program completion. The study concluded frequent and intentional interactions with faculty members, both inside and outside the classroom significantly influenced the students' success in

completing a baccalaureate credential, earning an associate degree, and transfer to a 4-year institution. The faculty members involved in this study emphasized their part as a role model and mentor for the students have a significant impact on the students in encouraging and fostering their success in the community colleges.

Academic Factors

Scholars have been focusing on factors that affect a student's likelihood of transferring to a 4-year institution when in fact some of the students who enroll in a community college have no interest in obtaining a bachelor's degree and instead only want an associate degree or professional certificate (Grubb, 1996). Some of the factors identified as affecting community college students obtaining an associate degree are students with a high GPA and students who are financially dependent on their parents. Students with a lower probability of obtaining an associate degree tend to be older students, single parents, individuals who had not declared a major, and those enrolled in a vocational program (Jeager & Eagan, 2009).

One point of concern for 4-year institutions is community college transfer students might be potentially more expensive to the institution partly because of their additional needs while working thru the adjustment period. Transfer students typically enter at the junior level and enroll in upper-division coursework that often costs more to administer because there is usually a lower student-to-teacher ratio (Cheslock, 2005).

Cheslock (2005) and Melguizo (2008) argued admitting community college transfer students may be cost effective because they require a minimum of 2 years of institutional support rather than the typical four years. Many upper-level division courses operate at less than full capacity, and enrolling transfer students to fill them adds very little to instructional expenses.

Considering the 4-year institutions already have programs ongoing for their continuing students enrolled in and have empty seats, they can fill them with transfer students at no additional financial burden to the institution.

Research has shown the importance of having engaged and available faculty on campus to help the students outside of the classroom (Cotton & Wilson, 2006). These findings are similar to findings of other research papers that suggest exposure to part-time faculty has adverse effects on student retention and degree completion at 4-year institutions (Ehrenberg & Zhang, 2004). Scholars have suggested students' initial aspirations when they enter community college provide an imperfect measure of actual intentions and future behaviors (Adelman, 2005; Cohen, 2003).

Time to Degree

Time to degree is calculated in at least two different ways when reported in the literature. One method is elapsed time in calendar years from the initial enrollment in any college to the time a student earns their degree. This definition has no provision to distinguish time enrolled in courses from stop out time (Yue & Fu, 2017).

Nationally, 44% of the first-time bachelor's degree recipients in 2007-08, graduated within 4 years of initial enrollment. Twenty-three percent of the degree recipients took more than 6 years to complete. Over 11% of them had taken longer than 10 years (Woo, Green, & Matthews, 2012). It appears stop out had accounted for a large percentage of the time from entry until completion of the students that had taken more than 6 years to complete (Yue & Fu, 2017).

When the elapsed time is defined as time to earn a degree, progress is considered a more open system, where the institution functions as one of the components that interact to shape a

student's life (Berger & Milem, 2000). To comprehend time to degree by this definition external influences outside of the institution must be considered, along with internal institution factors, as well as student characteristics (Titus, 2006).

Elapsed time to degree is affected by two factors, those external to the institution and those that pertain to the student experiences at the institution. The second definition of time to a degree only counts terms the student is enrolled (semester, trimester, or quarter). It also focusses on the student's use of the time enrolled to progress until degree completion. This definition excludes external factors; these two theories are constrained because of these exclusions. The second classification of time to degree is affected by two distinct influences one external to the institution and the other relating to the interaction between the institution and the student. These two groups of influences tend to be related but completely different. They both must be understood and accounted for when considering the time to degree and are affected by features the student brings with them to colleges, such as family and social class (Yue & Fu, 2017).

There is still not a clear understanding of the factors that affect time to degree. The literature focuses on student demographics, academic preparation, and first-term performance for predicting the length of time a student will take to reach graduation. Knight and Arnold (2000) posited lengthened time to graduation is the fault of the institution, but others say it is influenced by the decisions the students make (Adelman, 2006). Knight (2002) suggested the most reliable predictors of a student completing a degree are average credit hour load per term and credit hours earned.

According to the National Center for Educational Statistics (2016), the 17.4% of first-enrolled community college students who were still enrolled after 6 years without obtaining a

degree or certificate during the period from 1996-2001, 6.6% enrolled at the same institution, 2.3% enrolled at other less than 4-year institution, 8.5% enrolled at 4-year institution. The 19.6% of first-enrolled community college students who were still enrolled after 6 years without obtaining a degree or certificate during the period from 2004-2009, 8.7% enrolled at the same institution, 4.4% enrolled at other less than 4-year institution, 6.4% enrolled at 4-year institution. This data indicates for these time frames more students took longer to earn a degree or certificate and less of them were still enrolled after 6 years have moved into a 4-year institution (Horn & Skomsvold, 2012).

Community colleges often help more people have access to earning a 4-year degree by preparing students for transfer. Today nearly one half of all students begin their academic journeys at a community college, and nearly two thirds of those students are enrolled in a vocational program. Community colleges still offer opportunities for students wishing to seek a 4-year degree who may not have been able to gain entrance to a 4-year institution without improving some skills (Brint & Karabel, 1989). Community colleges can also offer easier access for nontraditional students who may have reasons for not being able to live in a college dormitory (Berkner & Choy, 2008).

Transfer students sometimes assume after they completed 60 hours of coursework at a community college they will complete an additional 60 hours at the participating 4-year university and graduate. About 29% of first-time, degree-seeking community college students who transferred successfully to 4-year colleges did so after first earning an associate degree or certificate (Jenkins & Fink, 2016). Transfer students expect to finish 2 years of coursework then graduate. However, for some majors completing in 2 years is not the norm. A Bachelor of

Science degree in engineering technology typically requires 128 credit hours of coursework depending on the discipline (Engineering Technology, 2018); some require as little as 120 credit hours (Engineering Technology and Surveying, 2017) while others can require over 130 (Bachelor of Science Engineering Technology, 2019). Usually 44 to 48 of their credit hours earned will transfer unless the student transferred under the terms of an articulation agreement, then the entire 60 hours of coursework may transfer. Students who transfer into a Bachelor of Science in engineering technology program will typically have at least 68 credit hours to complete and often more depending on the discipline they choose and the number of credit hours that successfully transfer. The upper-level coursework can have pre-requisite coursework, and not all classes are offered every semester. These factors can all affect time to degree (Lederman, 2017).

CHAPTER 3

RESEARCH METHOD

The purpose of this nonexperimental comparative quantitative study was to determine if students who transfer into an Engineering Technology (ENTC) Department at the participating regional 4-year university performed as well as native students (students who first enrolled at a 4-year university). Identifying whether transfer students are performing as well as native students in upper-level ENTC courses could lead to better advising strategies. Identifying whether transfer students are performing as well or better than native students in upper-level coursework could help with identifying enrollment patterns that contributed to transfer student success. The optimum strategy for coursework enrollment for students who first enroll at a community college is not currently known (Crook et al., 2012). More Tennessee students may be starting their quest for a bachelor's degree at community colleges because tuition can be free at 2-year institutions. Because of the availability of the Tennessee Promise scholarships knowing what the optimum strategy to obtain a degree in each major has become significantly more critical (In Tennessee 2018). This study could help college administrators better understand differences between native and transfer students and their success rates.

Research Questions and Null Hypotheses

Most of the previous studies that have been conducted on community college transfer students' performance post transfer to a 4-year university have been general in focus. Fewer studies have examined post transfer performance by major. The focus of this study was to compare native students' performance in engineering technology majors to transfer students to determine if the transfer students were performing as well as their native counterparts.

Research Question 1

Is there a significant difference in the graduation rates between native and transfer students in the ENTC program at the participating university?

Ho1: There is no significant difference in the graduation rates between native and transfer students in the ENTC program at the participating university.

Research Question 2

Is there a significant difference in the GPAs of students for 3000 level ENTC courses between native and transfer students at the participating university?

Ho2: There is no significant difference in the GPAs of students for 3000 level ENTC courses between native and transfer students at the participating university.

Research Question 3

Is there a significant difference in the GPAs of students for 4000 level ENTC courses between native and transfer students at the participating university?

Ho3: There is no significant difference in the GPAs of students for 4000 level ENTC courses between native and transfer students at the participating university.

Research Question 4

Is there a significant difference in the proportion of students who are first-generation between native and transfer students at the participating university?

Ho4: There is no significant difference in the proportion of students who are first-generation between native and transfer students at the participating university.

Research Question 5

Is there a significant difference in high school GPAs between native and transfer students enrolled in the ENTC program at the participating university?

Ho5: There is no significant difference in high school GPAs between native and transfer students enrolled in the ENTC program at the participating university.

Research Question 6

Is there a significant difference in ACT composite scores between native and transfer students enrolled in the ENTC program at the participating university?

Ho6: There is no significant difference in ACT composite scores between native and transfer students enrolled in the ENTC program at the participating university.

Research Question 7

Is there a significant difference in the number of students who are nontraditional aged between native and transfer students enrolled in the ENTC program at the participating university?

Ho7: There is no significant difference in the number of students who are nontraditional aged between native and transfer students enrolled in the ENTC program at the participating university?

Research Question 8

Is there a significant difference in the proportion of students receiving Pell grants between native and transfer students enrolled in the ENTC program at the participating university?

Ho8: There is no significant difference in the proportion of students receiving Pell grants between native and transfer students enrolled in the ENTC program at the participating university.

Research Question 9

Is there a significant difference in the proportion of female students between native and transfer students enrolled in the ENTC program at the participating university?

Ho9: There is no significant difference in the proportion of female students between native and transfer students enrolled in the ENTC program at the participating university.

Research Question 10

Is there a significant difference in the graduation rates between female transfer and female native students in the ENTC program at the participating university?

Ho10: There is no significant difference in the graduation rates between female transfer and female native students in the ENTC program at the participating university.

Research Question 11

Is there a significant difference in the graduation rates between male transfer and male native students in the ENTC program at the participating university?

Ho11: There is no significant difference in the graduation rates between male transfer and male native students in the ENTC program at the participating university.

Instrumentation

Archival data from Institutional Research at the participating university were used. This data already existed in an electronic data base at the 4-year university in their Banner system that was developed by SunGard for helping institutions manage student data. It contained the

required information to perform the necessary analysis and was archived for purposes other than this research. The five academic indicators were graduation rate, high school GPA, ACT composite score, GPA in 3000 level engineering technology courses (ENTC), and GPA in 4000 level ENTC courses. Transfer and native students were also compared on age, first-generation status, Pell Grant status, and whether the student graduated or not. The 3000 and 4000 level coursework GPA were examined for transfer shock.

Population

The population for this study came from the students who had enrolled in 3000 and 4000 level ENTC courses at the participating 4-year university from fall 2008 to fall 2017. The population was divided into two groups: native and transfer. Because the population is appropriate to perform the specified statistical analyses required to examine the data set the entire population was considered. The population was from students who attended the participating 4-year university. This participating university is classified as a doctoral-granting research institution or DRU by The Carnegie Classification of Institutions of Higher Education (The Carnegie Classification of Institutions, 2017). Student data existed from 2008 until fall 2017. The population consisted of 1,316 students, 900 were native and 416 were transfer students who have taken 3000 and 4000 level ENTC classes at the participating 4-year university and who met the study requirements were included in this study.

Students who transferred after completing the core classes at a community college entered with approximately 44 credit hours. Because these students with a completed degree and their equivalents are the students qualified to compare to their native counterparts, they will be considered the transfer student population. This study was limited to engineering technology

students who had enrolled in 3000 and 4000 level ENTC courses at the participating university.

Data Collection

Prior to the collection of any data, the proposal for the study was submitted to the Institutional Review Board (IRB) at the participating 4-year university. The IRB determined that this proposed study neither meets the FDA nor the DHHS definition of research involving human subjects. Therefore, it does not fall under the purview of the IRB. A request for data along with the required IRB forms were then submitted to Institutional Research. All university procedures including IRB approval were followed. The data were retrieved by an Institutional Research employee from the Banner data management system used by the participating university for storage of student records. The data retrieved were from the fall 2008 through the fall 2017 semesters. To ensure student anonymity all personal identifiers were removed by the institutional researcher and replaced with random numerical identifiers prior to delivery of the data. The data were provided by the institutional researcher in a password protected Excel spreadsheet.

Data Analysis

The researcher conducted a nonexperimental quantitative analysis using inferential and descriptive statistics. Research Questions 1, 4, 7, 8, 9, 10, and 11 were evaluated using a series of two-way contingency table analyses using crosstabs. Research Questions 2, 3, 5, and 6 were evaluated using a series of independent sample t-tests. The same type analysis was used on all of these questions because combined they represent the same student's GPA individually at different levels. To analyze the collected data IBM-SPSS 25.0 was used to generate the data comparisons. Numerical codes were assigned to survey items to facilitate statistical analysis.

This method allowed comparisons between the subpopulations. The null hypotheses were tested at the .05 level of significance. Data are presented as text and tables.

CHAPTER 4

RESULTS

The purpose of this study was to determine if transfer students are performing as well as native students in upper-level ENTC courses at the participating university. Investigating differences in transfer and native students and identifying factors that could help with advising ENTC students was also an interest. The results from quantitatively analyzing 11 research questions that were developed specifically for this research study are presented in this chapter. The data for this study were obtained from institutional research records of existing data from fall 2008 through fall 2017 at the 4-year participating university.

For the purpose of this study transfer students were defined as students who initially enrolled at an institution other than the participating 4-year university and transferred to the university with a minimum of 40 credit hours, native students are defined as students who initially enrolled at the participating 4-year university or entered with fewer than 40 hours of transfer credits. In the present study crosstabs analysis were used to compare transfer students to native student graduation rates; to compare the number of first-generation transfer students to the number of first-generation native students; to compare the number of nontraditional aged transfer students to the number of nontraditional aged native students; to compare the number of Pell grant recipient transfer students to number of Pell grant recipient native students; to compare the number of female transfer students to the number of female native students; to compare the female transfer student graduation rates to the female native student graduation rates; to compare the male transfer student graduation rates to the male native student graduation rates; and to determine the graduation rate of all students who enrolled in upper level ENTC

(engineering technology concentration coursework) at the 4-year participating university. Chi-square analysis utilizing crosstabs that cross-tabulates two variables and displays their relationships in tabular form while generating information regarding bivariate relationships. Independent samples t-test is a parametric test that allows the comparison of the means of two independent groups to determine if there is statistical evidence showing the population means are significantly different. In the present study *t*-tests were performed to compare transfer student to native student 3000 level ENTC coursework; to compare transfer student to native student 4000 level ENTC coursework; to compare transfer student to native student high school GPA, and to compare transfer student to native student ACT scores. The research questions, the null hypothesis, and the results of the analyses are presented below. The demographic variables used in this study are present in Table 1.

Table 1

Demographics

ENTC Students	N	%
Native	900	68.4
Transfer	416	31.6
Total	1,316	
Male	1,179	89.6
Female	137	10.4
Male Transfer	383	92.1
Female Transfer	33	7.9
Male Native	796	88.4
Female Native	104	11.6
Pell Grant		
Yes	578	43.9
No	738	56.1
Pell Grant Native	412	45.8
Pell Grant Transfer	166	39.9
First Generation		
Yes	661	50.2
No	655	49.8
First Generation Native	486	36.9
First Generation Transfer	175	42.1
Graduated		
Yes	382	29
No	934	71
Transfer Graduated	181	43.5
Native Graduated	201	22.4
Male Graduated	348	29.5
Female Graduated	34	24.8

Research Questions

Research Question 1

Is there a significant difference in the graduation rates between native and transfer students in the ENTC program at the participating university?

Ho1: There is no significant difference in the graduation rates between native and transfer students in the ENTC program at the participating university.

A two-way contingency table analysis was conducted to evaluate whether there is a significant difference in the graduation rates between transfer and native students in the ENTC program at the participating university. The two variables were whether the students graduated or not, and whether the students were transfer or native. The difference in graduation rates between the two groups was significant. Pearson $\chi^2(1, N = 1318) = 61.93, p < .001$, Cramér's $V = .22$. Therefore, Ho1 was rejected. The proportion of students who graduated between fall 2008 and fall 2017 from the ENTC program was .435 for the transfer student population compared to .224 for the native student population. The overall graduation rate was 29% from the ENTC programs at the 4-year participating university during this time frame. Figure 1 displays the counts for transfer and native students at the participating university.

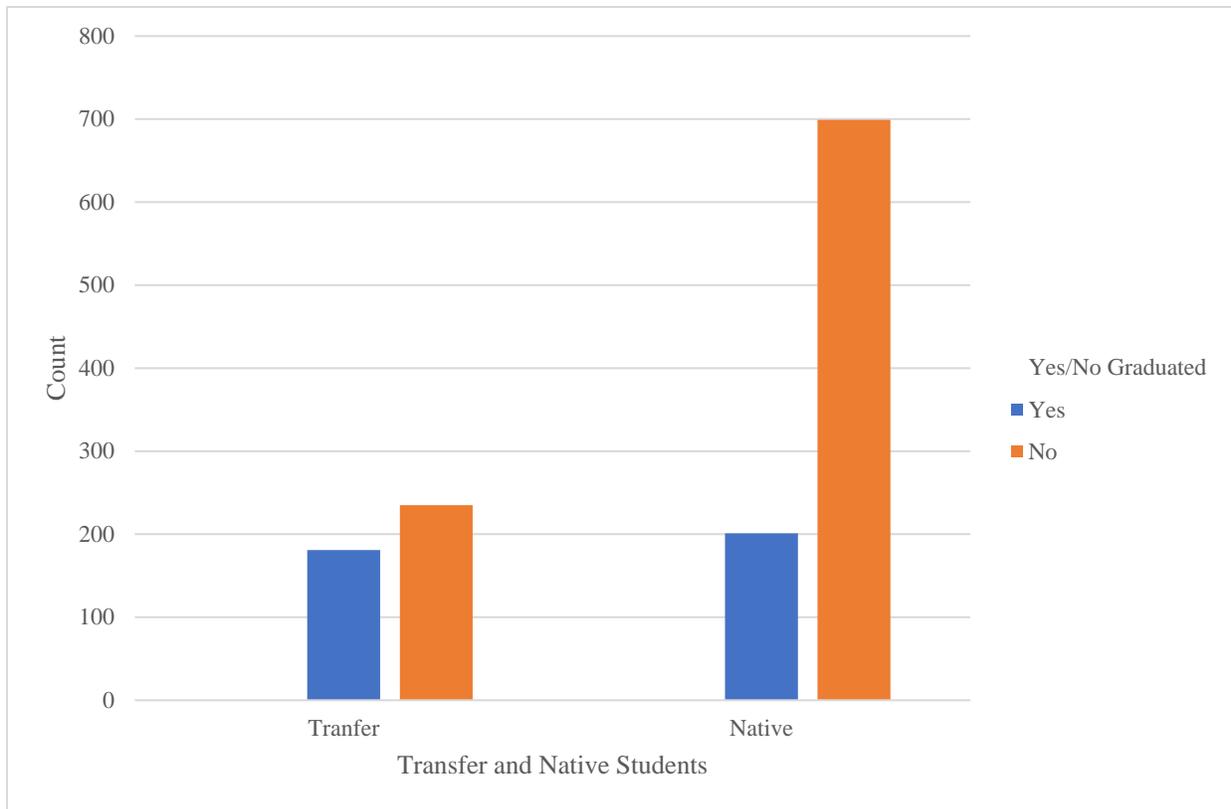


Figure 1. Transfer and native students fall 2008 to fall 2017

Research Question 2

Is there a significant difference in the GPAs of students for 3000 level ENTC courses between native and transfer students at the participating university?

Ho2: There is no significant difference in the GPAs of students for 3000 level ENTC courses between native and transfer students at the participating university.

An independent-samples *t*-test was conducted to evaluate whether the mean GPAs of students for 3000 level ENTC courses from fall 2008 to fall 2017 between native and transfer students were significantly different at the participating university. The students 3000 ENTC course GPA was the test variable, and the grouping variable was transfer or native student. The

test was not significant, $t(236) = 1.25, p = .212$. Therefore, H_0 was retained. The η^2 index was $<.01$ which indicated a small effect size. The transfer students ($M = 3.16, SD = 1.04$) tended to have 3000 ENTC level GPAs similar to the native students ($M = 2.98, SD = 1.16$). The 95% confidence interval for the difference in means was $-.10$ to $.47$. Figure 2 displays the distribution of GPAs between transfer and native students.

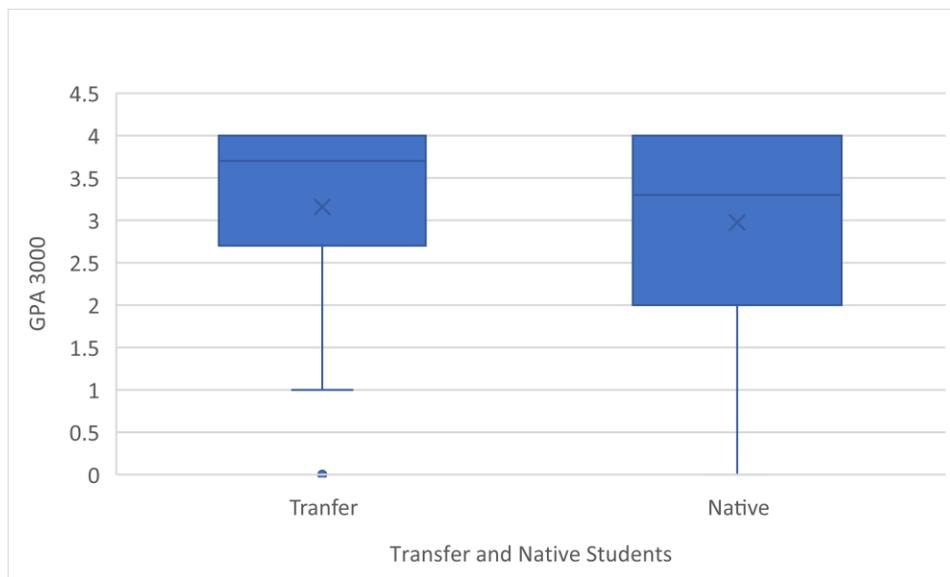


Figure 2. Transfer and native student GPAs in 3000 level ENTC courses fall 2008 to fall 2017

Research Question 3

Is there a significant difference in the GPAs of students for 4000 level ENTC courses between native and transfer students at the participating university?

H_0 : There is no significant difference in the GPAs of students for 4000 level ENTC courses between native and transfer students at the participating university.

An independent-samples t -test was conducted to evaluate whether the mean GPAs of students for 4000 level ENTC courses from fall 2008 to fall 2017 between native and transfer

students were significantly different at the participating university. The students 4000 ENTC course GPA was the test variable, and the grouping variable was transfer or native student. The test was not significant, $t(150) = 1.74, p = .193$. Therefore, H_03 was retained. The η^2 index was .02 which indicated a small effect size. The transfer students ($M = 3.32, SD = .96$) tended to have 4000 ENTC level GPA similar to the native students ($M = 3.00, SD = 1.10$). The 95% confidence interval for the difference in means was $-.06$ to $.70$. Figure 3 displays the distribution of GPAs between transfer and native students.

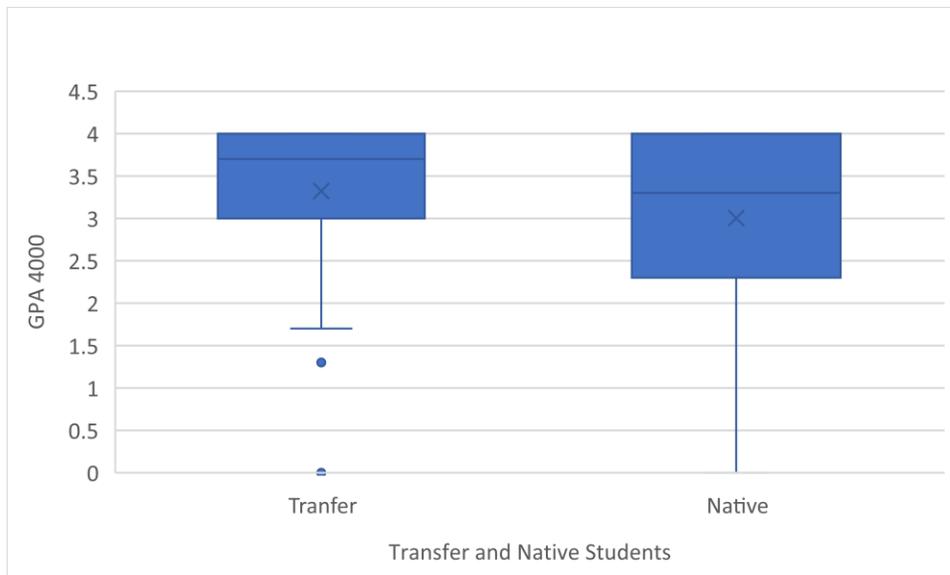


Figure 3. Transfer and native students' GPAs in 4000 level ENTC courses fall 2008 to fall 2017

Research Question 4

Is there a significant difference in the proportion of students who are first-generation between native and transfer students at the participating university?

H_04 : There is no significant difference in the proportion of students who are first-generation between native and transfer students at the participating university.

A two-way contingency table analysis was conducted to evaluate whether there is a significant difference in the first generation status between transfer and native students in the ENTC program at the participating university. The two variables were whether the students were first generation or not, and whether the student were a transfer or native. The difference in proportions between the two groups was significant. Pearson $\chi^2(1, N = 1316) = 16.20, p < .001$, Cramér's $V = .11$. Therefore, H_04 was rejected. The proportion of students who were first generation between fall 2008 and fall 2017 was 50.2% of the overall 4-year university population. First generation transfer students represented 42.06% of the transfer student population compared to the native first-generation students who represented 54% of the native student population. Figure 4 displays the distribution of first generation status between native and transfer student.

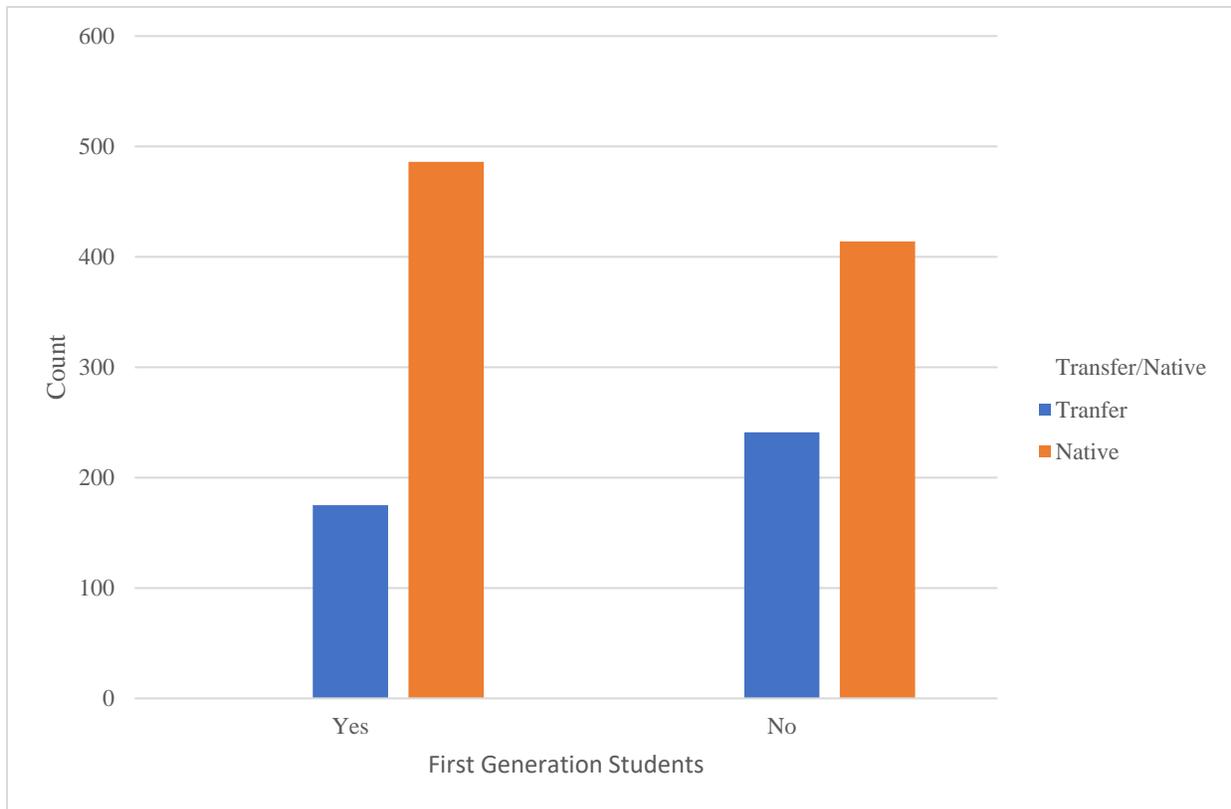


Figure 4. First generation students fall 2008 to fall 2017

Research Question 5

Is there a significant difference in high school GPAs between native and transfer students enrolled in the ENTC program at the participating university?

Ho5: There is no significant difference in high school GPAs between native, and transfer students enrolled in the ENTC program at the participating university.

An independent-samples *t*-test was conducted to evaluate whether there was a significant difference in high school GPAs between transfer and native students who enrolled in ENTC courses at the participating 4-year university. The student's high school GPA was the test variable, and the grouping variable was transfer or native student. The test was not significant, $t(1114) = 2.10, p = .847$. Therefore, Ho5 was retained. The η^2 index was $< .02$, which indicated a

small effect size. Transfer students ($M = 3.14$, $SD = .58$) and native students ($M = 3.22$, $SD = .57$) had similar high school GPAs. The 95% confidence interval for the difference in means was .01 to .15. Figure 5 displays the distribution of High School GPAs.

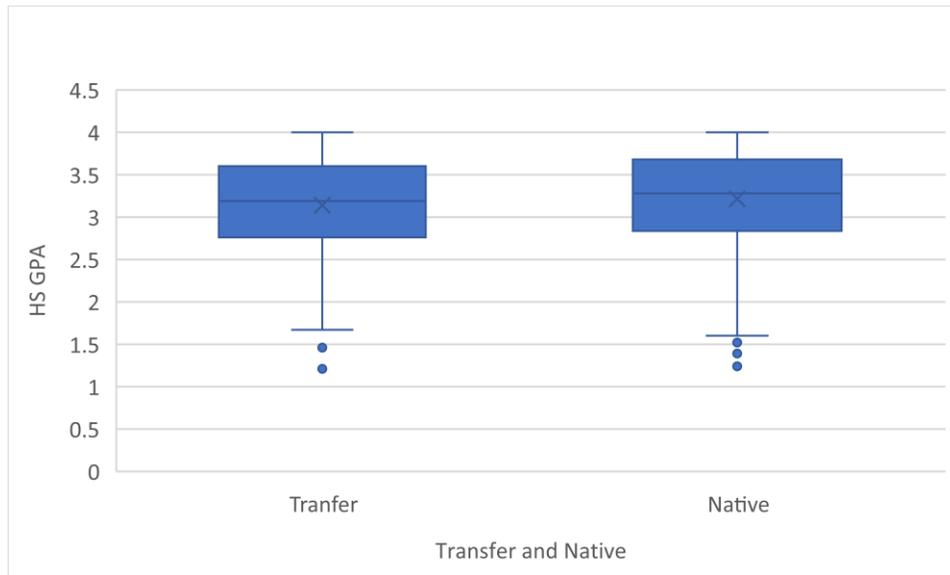


Figure 5. High school GPA students fall 2008 to fall 2017

Research Question 6

Is there a significant difference in ACT composite scores between native and transfer students enrolled in the ENTC program at the participating university?

Ho6: There is no significant difference in ACT composite scores between native, and transfer students enrolled in the ENTC program at the participating university.

An independent-samples t -test was conducted to evaluate whether there was a significant difference in ACT composite scores between transfer and native students who enrolled in ENTC courses at the 4-year participating university. The students ACT composite score was the test variable, and the grouping variable was transfer or native student. The test was not significant, $t(670) = -.22$, $p = .223$. Therefore, Ho6 was retained. The η^2 index was $<.01$, which indicated a

small effect size. Transfer students ($M = 21.68, SD = 4.36$) and native students ($M = 21.79, SD = 3.99$) has similar ACT composite scores. The 95% confidence interval for the difference in means was -1.09 to .889. Figure 6 displays the distributions of ACT Scores between transfer and native students.

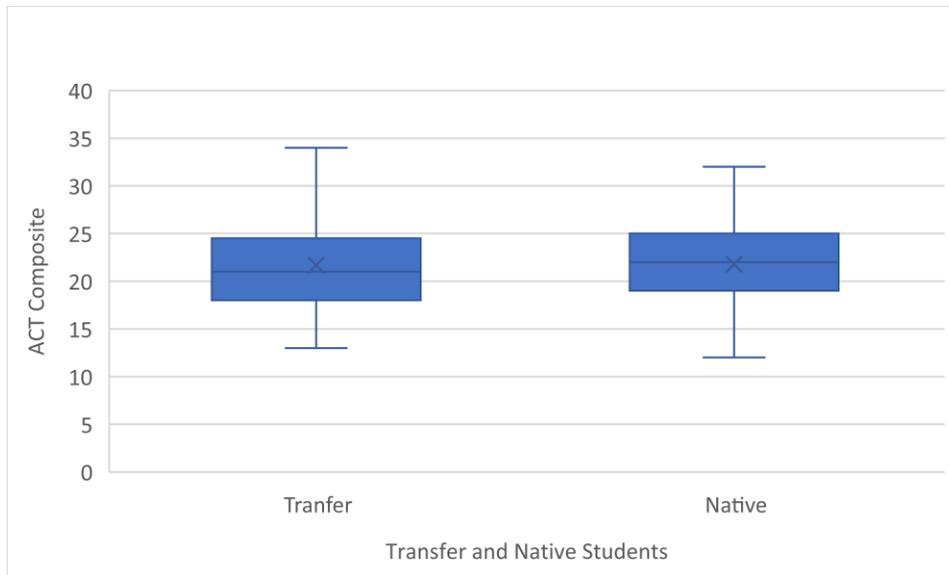


Figure 6. Act composite score students fall 2008 to fall 2017

Research Question 7

Is there a significant difference in the number students who are nontraditional aged between native and transfer students enrolled in the ENTC program at the participating university?

Ho7: There is no significant difference in the number of students who are nontraditional aged between native and transfer students enrolled in the ENTC program at the participating university?

A two-way contingency table analysis was conducted to evaluate whether there is a significant difference in the proportion of students who are nontraditional aged between transfer

and native students in the ENTC program at the participating university. The two variables were whether the students were nontraditional or traditional aged, and whether student were transfer or native. The difference in nontraditional aged students between the two groups was significant. Pearson $\chi^2(1, N = 169) = 90.15, p < .001$, Cramér's $V = .262$. Therefore, H_0 was rejected. Transfer nontraditional aged students represented .257 of the transfer student population compared to the native nontraditional aged students who represented .068 of the native student population. The proportion of students who were nontraditional aged between fall 2008 and fall 2017 was .128 of the overall 4-year university population. Figure 7 displays the count of traditional aged and nontraditional aged student for the transfer and native student population.

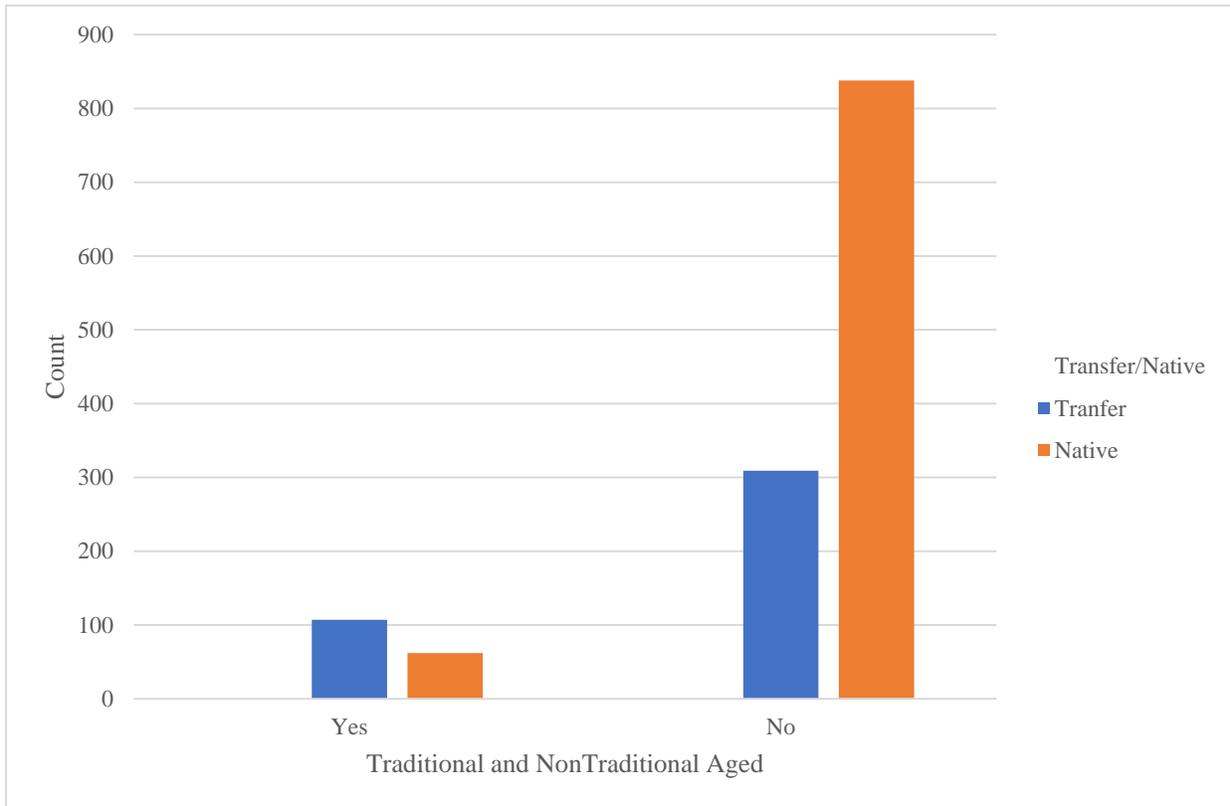


Figure 7. Traditional or nontraditional aged students fall 2008 to fall 2017

Research Question 8

Is there a significant difference in the proportion of students receiving Pell grants between native and transfer students enrolled in the ENTC program at the participating university?

Ho 8: There is no significant difference in the proportion of students receiving Pell grants between native and transfer students enrolled in the ENTC program at the participating university.

A two-way contingency table analysis was conducted to evaluate whether there is a significant difference in the proportion of students who received Pell grants between transfer and native students in the ENTC program at the participating university. The two variables were whether the student received a Pell grant and whether the student were a transfer or native student. The difference in the proportion of students receiving Pell grants between the two groups was significant. Pearson $\chi^2(1, N = 578) = 3.99, p = .046$, Cramér's $V = .055$. Therefore, Ho8 was rejected. Approximately .399 of transfer students received Pell grants between fall 2008 and fall 2017 and .458 of native students received Pell grants. Combined students receiving Pell grants represented .439 of the overall student population at the 4-year university. Figure 8 displays the count of students receiving Pell grants for the transfer and native students.

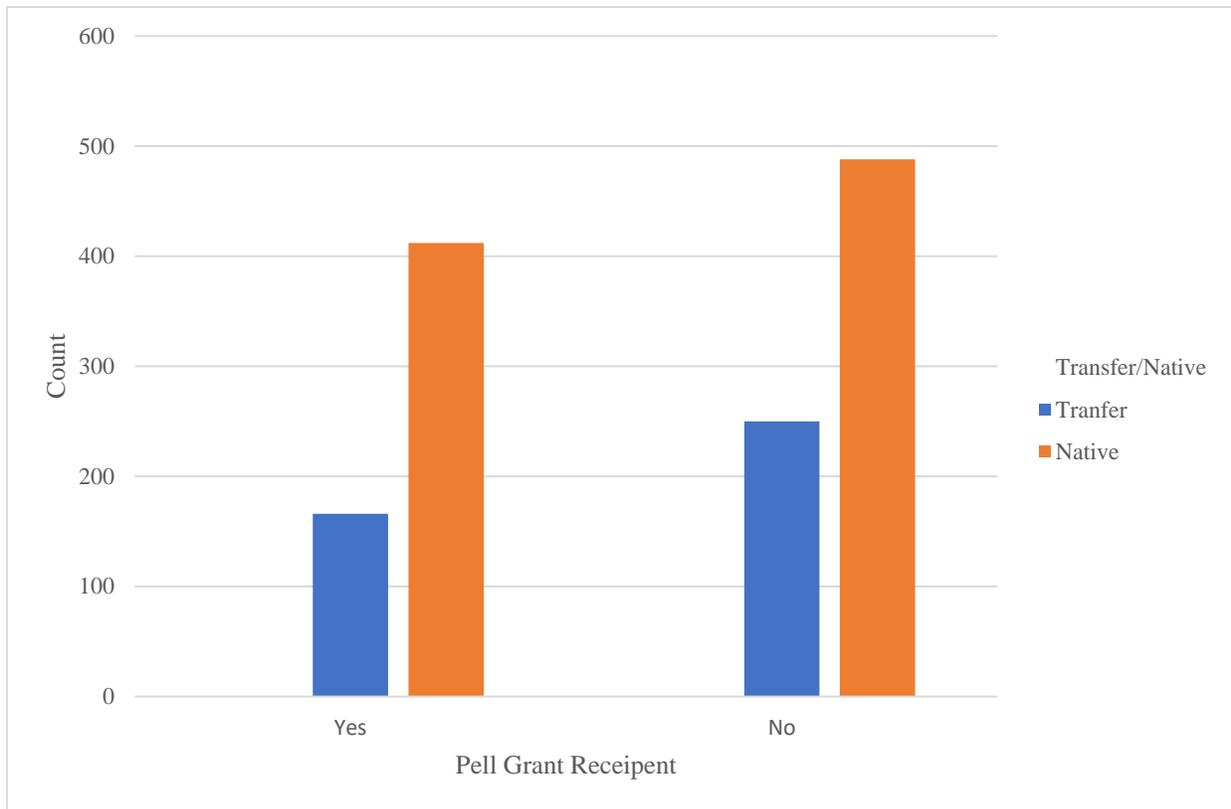


Figure 8. Pell grant recipient students fall 2008 to fall 2017

Research Question 9

Is there a significant difference in the proportion of female students between native and transfer students enrolled in the ENTC program at the participating university?

Ho9: There is no significant difference in the proportion of female students between native and transfer students enrolled in the ENTC program at the participating university.

A two-way contingency analysis was conducted to evaluate whether there is a significant difference in the proportion of female student between transfer and native students in the ENTC program at the participating university. The two variables were whether the student were a transfer or native student, and whether the student was a male or a female. The difference in the proportion of female students between the two groups was significant. Pearson $\chi^2(1, N = 137) =$

4.00, $p = .045$, Cramér's $V = .055$. Therefore, H_0 was rejected. Approximately 7.9% of transfer students were female, and 11.6% of the native students were female. The transfer students who were female between fall 2008 and fall 2017 at the participating 4-year university were 24.1% of the female student population compared to the female native students who were 75.9% of the female student population at the participating 4-year university. Females represented 10.4% of the overall fall 2008-fall 2017 student population in the ENTC 3000 and 4000 level courses. The female transfer students represented 2.5% of these students, and the native females represented 7.9% of the students who enrolled in ENTC 3000-4000 level courses. Figure 9 displays the counts of females and males for transfer and native students.

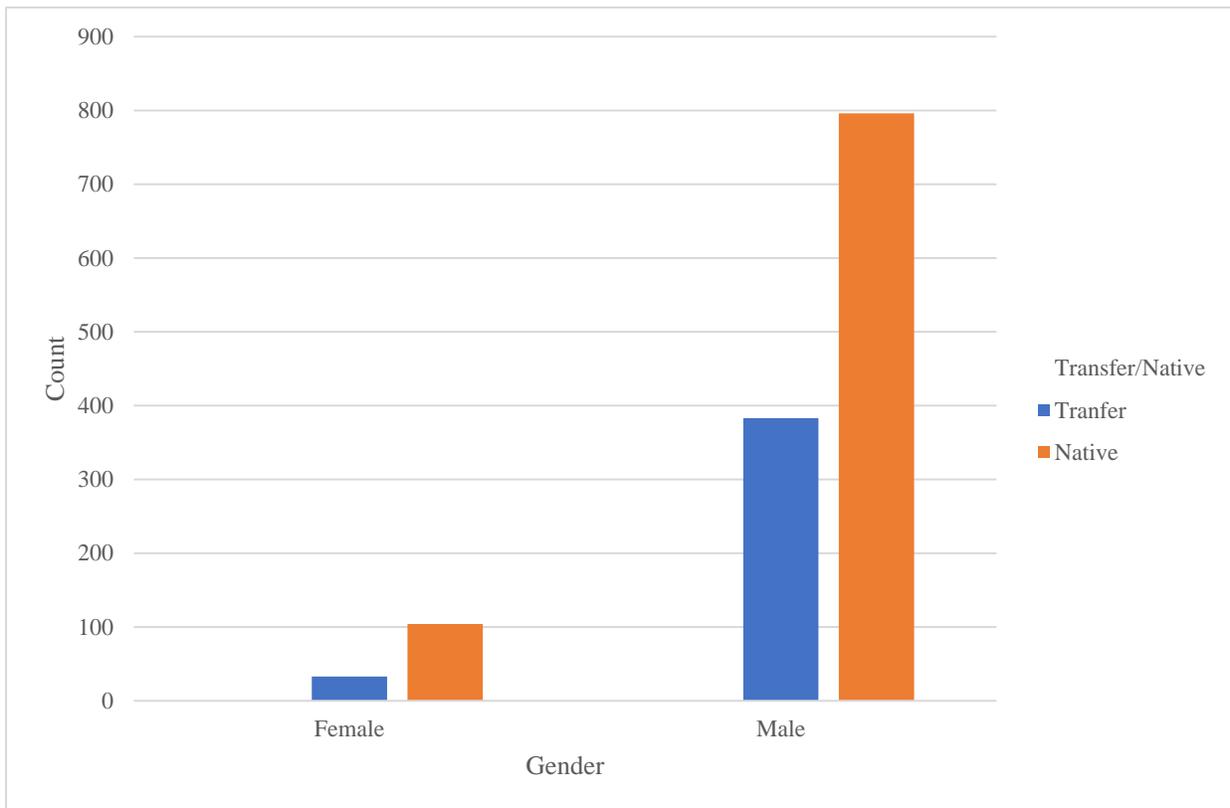


Figure 9. Gender of transfer and native students fall 2008 to fall 2017

Research Question 10

Is there a significant difference in the graduation rates between female transfer and female native students in the ENTC program at the participating university?

Ho10: There is no significant difference in the graduation rates between female transfer and female native students in the ENTC program at the participating university.

A two-way contingency analysis was conducted to evaluate whether there is a significant difference in the graduation rates between female transfer and female native students in the ENTC program at the participating university. The two variables were whether the female student graduated or not, and whether the student was a transfer or native. The difference in graduation rates between the two groups was significant. Pearson $\chi^2(1, N = 138) = 13.05$, $p < .001$, Cramér's $V = .31$. Therefore, Ho10 was rejected. Between fall 2008 and fall 2017 48.4% of female transfer students graduated and 17.3% of female native students graduated. All female students graduated at a 24.8% rate. Figure 10 displays the counts of female graduates for transfer and native students.

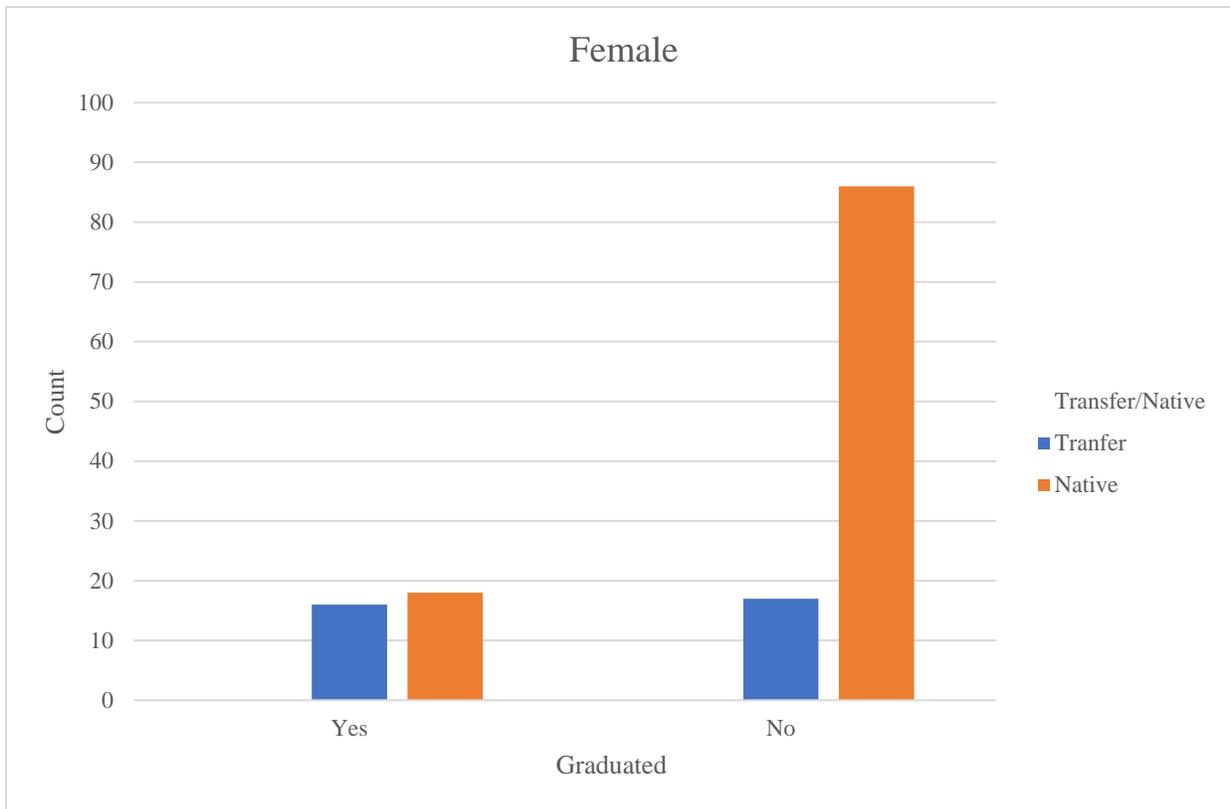


Figure 10. Graduation rates of female transfer and native students fall 2008 to fall 2017

Research Question 11

Is there a significant difference in the graduation rates between male transfer and male native students in the ENTC program at the participating university?

Ho11: There is no significant difference in the graduation rates between male transfer and male native students in the ENTC program at the participating university.

A two-way contingency analysis was conducted to evaluate whether there is a significant difference in the graduation rates between male transfer and native students in the ENTC program at the participating university. The two variables were whether the student was a transfer or native and whether the male student graduated or not. The difference in graduation

rates between the two groups was significant. Pearson $\chi^2(1, N = 1179) = 50.17, p < .001$, Cramér's $V = .20$. Therefore, H_0 was rejected. Between fall 2008 and fall 2017 43.1% of male transfer students graduated compared to the native student population who graduated at a 22.9% rate. Male students represented 89.59% of the overall 4-year university population. All male students in the ENTC program graduated at a 29.51% rate. Figure 11 display the counts of male graduates for transfer and native students.

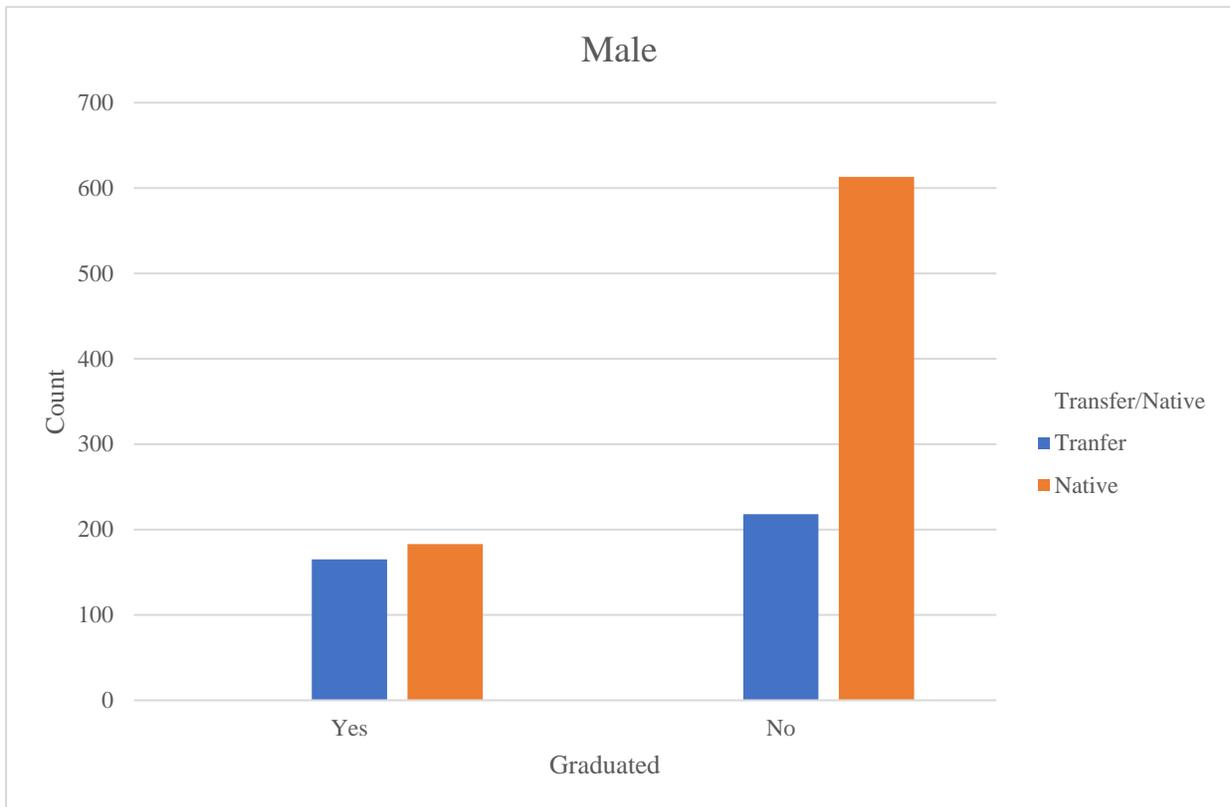


Figure 11. Graduation rates of male transfer and native students fall 2008 to fall 2017

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Several studies have investigated vertical student transfer from community colleges to 4-year universities. The majority of those studies focused on the university-wide population, not individual majors (Jenkins & Fink, 2015; Kurlaender & Long, 2008; Middleton, 2012; Roksa & Keith, 2008). Most majors are different from one another, the intent of this study was to examine students in the discipline of engineering technology (ENTC) at a 4-year institution and attempt to determine by quantitative analysis if the transfer students (minimum of 40 transfer credit hours) were doing as well as the native students (students who first enrolled or transferred with less than 40 credit hours to the 4-year university). Identifying whether transfer students were performing as well or better than native students in upper-level coursework could help with identifying enrollment patterns that contributed to transfer student success and possibly lead to better advising strategies. The optimum strategy for coursework enrollment for students who first enroll at a community college is not currently known (Crook et al., 2012). More Tennessee students may be starting their quest for a bachelor's degree at community colleges because tuition can be free at 2-year institutions because of the Tennessee Promise and Reconnect programs. Because of the potential increase of students from these programs, knowing what the optimum strategy to obtain a degree in each major has become significantly more critical (In Tn. 2018). The present study may help college administrators better understand the differences between native and transfer students and their success rates. The study population was students who had enrolled in 3000 or 4000 ENTC coursework from the fall of 2008 through fall 2017. The students were divided into two categories: transfer and native. For the purposes of this study

transfer students are defined as having completed a minimum of 40 credit hours at another institution, native students are defined as having completed fewer than 40 credit hours at another institution or initially enrolling at the participating 4-year university. This level of credit hour achievement was chosen because not all credit-hours earned transfer and a student who earned a 60-credit hour associates degree and if only two thirds of these credits transfer they enter the program with 40 credit hours. If community college students choose to transfer before they took all courses they needed for the associate degree they also met the minimum 40-credit hour benchmark to be counted as a transfer student.

Summary

For Research Question 1 the two-way contingency analysis indicated the difference in the graduation rates between transfer and native students in the ENTC program at the participating university during the time frame studied were significant. The proportion of students who graduated between fall 2008 and fall 2017 from the ENTC program was .435 for the transfer student population compared to .224 for the native student population. Overall transfer students had a significantly higher graduation rate than native students from fall 2008 thru fall 2017.

The independent-samples *t*-test for Research Question 2 indicated the mean GPA of students for 3000 level ENTC courses from fall 2008 to fall 2017 between native and transfer students was not significantly different at the participating university. The transfer students' 3000 level mean GPA mean of 3.16 was similar to the native students' GPA of 2.98.

The independent-samples *t*-test for Research Question 3 indicated the mean GPA of students for 4000 level ENTC courses from fall 2008 to fall 2017 between native and transfer students was not significantly different at the participating university. The transfer students'

4000 level mean GPA mean of 3.32 was similar to the native students' GPA of 3.00.

For Research Question 4 the two-way contingency analysis indicated that the difference in the percentage of students that were first-generation between transfer and native students in the ENTC program at the participating university was significant. The percentage of students who were first-generation between fall 2008 and fall 2017 was 50.2% of the 4-year university population. First-generation transfer students represented 42.01 of the transfer student population compared to the native first-generation students who represented 54.0 of the native student population.

For Research Question 5 the independent-samples *t*-test indicated the mean of students' high school GPAs who enrolled in ENTC 3000-4000 level courses from fall 2008 to fall 2017 between native and transfer students were not significantly different. The transfer students mean high school GPAs were 3.13 which were similar to the native students' GPA of 3.22.

The independent-samples *t*-test for research question 6 indicated the mean of students' ACT scores who enrolled in ENTC 3000-4000 level courses from fall 2008 to fall 2017 between native and transfer students were not significantly different. The transfer students ACT score mean of 21.68 was similar to the native students' ACT score mean of 21.79.

The two-way contingency analysis for Research Question 7 indicated that there were significant difference in the percentage of nontraditional aged students between transfer and native students in the ENTC program at the participating university. The percentage of students who were nontraditional aged between fall 2008 and fall 2017 was 12.8% of the overall 4-year university population. Nontraditional aged transfer students represented 25.7% of the transfer

student population compared to the native nontraditional aged students who represented 6.8% of the native student population.

The two-way contingency analysis for Research Question 8 indicated that there were significant difference in the percentage of students who received Pell grants between transfer and native students in the ENTC program at the participating university. The percentage of students who were Pell grant recipients between fall 2008 and fall 2017 was 43.9% of the overall 4-year university population. Transfer students that were Pell grant recipients represented 39.9% of the transfer student population compared to the native students that were Pell grant recipients who represented 45.8% of the native student population.

For Research Question 9 the two-way contingency analysis indicated that there were significant difference in the percentage of female students between transfer and native students in the ENTC program at the participating university. The transfer students who were female between fall 2008 and fall 2017 at the participating 4-year university were 24.1% of the female student population compared to the female native students who were 75.9% of the female student population at the participating 4-year university. Females represented 10.4% of the overall fall 2008 to fall 2017 student population in the ENTC 3000 and 4000 level courses. The female transfer students represented 2.5% of these students, and the native female students represented 7.9% of the students who enrolled in ENTC 3000-4000 level courses. A significantly higher percentage of native ENTC students are female compared to female transfer students.

For Research Question 10 the two-way contingency analysis indicated there is a significant difference in the graduation rates between female transfer and female native students in the ENTC program at the participating university. Between fall 2008 and fall 2017 48.4% of

female transfer students graduated and 17.3% of female native students graduated. These female students combined graduated at a 24.8% rate. The female transfer student graduation rate of 48.4% was higher than the overall transfer student graduation rate of 43.5%, but the female native student graduation rate of 17.3% is below the native student graduation rate of 22.4%.

The two-way contingency analysis for research question 11 indicated there is a significant difference in the graduation rates between male transfer and native students in the ENTC program at the participating university. Between fall 2008 and fall 2017 43.1% of male transfer students graduated and 22.8% of male native students graduated. Overall male students in the ENTC program graduated at a 29.51% rate.

Conclusions

Pascarella and Terenzini (2005) reported community college students seeking a bachelor's degree who transferred to a 4-year university have the same probability of earning the degree as native students do. The findings for the present study run contradictive to that statement; the transfer students (43.5%) in the present study graduated at a significantly higher rate than the native students (22.4%). The transfer students are graduating at a higher rate than Horn and Skomsvold (2012) concluded nationally community college students who transfer to a 4-year university tend to graduate at the 42% rate within 6 years. Results from the present study also indicates the ENTC department at the participating university is assimilating the transfer students adequately. The native student's graduation rate is significantly lower than the national rate of 42% for students in 6 years. Native students who enrolled in spring of 2013 or later have probably not been at the university long enough to graduate. Some of the native students may have entered the participating 4-year university to increase their GPA in engineering

technology to provide them with the opportunity to attend another selective university they may not have been able to gain entrance. Over 30% of all college students transfer from the college they first enrolled into another institution at least once in their academic careers regardless of whether they first enrolled in a 2-year or 4-year institution (Lederman, 2017). Some of the native engineering students may have transferred, stopped out, changed major, or be still enrolled somewhere, or any number of other reasons that cannot be determined from the data. One probability is transfer students arrive with the intention of earning an engineering technology degree. The time frame studied was during a very significant economic downturn. The participating university student attrition rate was possibly artificially high during the first half of this time frame due to financial hardships, and the majority of the students who could have graduated in 6 years were from this time frame. Some of the students in the present study may have chosen to enroll at a community college level because of cost savings. Because there were no significant differences in students' 3000-4000 level GPA it seems logical that the transfer students are probably entering the university with a higher GPA than the native students have earned. The engineering technology discipline may have more persistent community college students transferring into the university, or it may indicate a shift away from the historical pattern. Nationally 49% of all the students who earned a bachelor's degree in the 2015-2016 academic year at a 4-year institution had previously been enrolled in a 2-year public institution in the previous 10 years (Snapshot Report, 2017). This indicates nearly one half of the national 2015-2016 graduating class started their quest to earn a bachelor's degree at a community college. Cejda, Rewey, and Kaylor (1998) concluded community college students who had both earned an associate degree and had a GPA of 3.0 or higher prior to transfer had the highest rates of persistence.

Coursework at the 3000 and 4000 level was evaluated separately specifically to look for instances of transfer shock. The results of the transfer students 3000 level coursework do not show any evidence of transfer shock being a widespread problem considering the transfer students were performing equally as well or slightly better than native students in the same coursework. Cejda (1997) concluded transfer students in business, mathematics, and sciences experienced significantly greater transfer shock rates than students in other majors. Engineering technology incorporates both math and science. Carlen and Byxby's (2000) study indicated two disciplines were more often affected by transfer shock: business and science majors. If the students experienced transfer shock there was no indication of it in the results of the present study as evidenced by the higher mean GPA of the transfer students.

Cohen and Brower's (2003) conclusion that first-generation students are more likely to begin at community colleges cannot be verified by the present study. In the present study the number of first-generation students who transferred into the 4-year university was only 42% of the transfer students; this is not a true representation of the first-generation students enrolled in the community colleges, just the percentage who transferred. Also the present study included only first-generation students who transferred into the 4-year participating university. The percentage of first-generation students who transferred is not an accurate representation of the number of first-generation students who enrolled in the community colleges. The first-generation native students represented 54% of the native student population. There may be more first-generation students enrolling in college and many of them are enrolling in the 4-year university. It is also possible a large percentage of first-generation students are choosing to enroll in engineering technology. Because there is a 15-year difference between the studies we

may be seeing a shift in trends or simply more first-generation students who wish to major in engineering technology first enroll in a 4-year university.

The only predictive power that high school GPA appeared to have in this study was if a student had a high school GPA of 1.85 or lower, they did not graduate from the ENTC programs. Interestingly only 30% of students with a 4.0 high school GPA graduated from the ENTC programs. Middleton's (2012) study showed a weak positive relationship to high school GPA (23%-26%) for community college students after transfer. Middleton concluded pretransfer GPA is not the best predictor, but it can be useful when considering the other factors along with it. The present study did not find similar results.

Students' ACT scores showed no significant difference between transfer and native students. Interestingly students who had ACT scores between 17 and 25 graduated from the ENTC programs in more significant numbers than students with an ACT score above or below 17-25. Carlen and Byxby (2000) concluded transfer students who earned good grades in their community college coursework should also earn good grades in higher level college coursework. Students in science and technology majors tend to have high ACT scores. High ACT scores are often considered to be positive predictors in higher level coursework but no significant correlation between high ACT scores and graduation was indicated in the present study.

The present study's results concur with Middleton's (2012) conclusions that community colleges have higher percentages of nontraditional students. This difference, 25.7% of the transfer student population compared to the 6.8% native nontraditional aged students. The number of nontraditional transfer students is not a true representation of the number of nontraditional students enrolled in community colleges. It is just how many of them transferred

to the 4-year university. Their actual percentage of the community college population is probably higher. There was almost a 4:1 ratio difference in the number of nontraditional students in the transfer population compared to the native. Nontraditional students can often have resources that they do not have to rely on others for and can be more determined to complete the degree. Nontraditional students are more likely to be paying their way through college, so if they do not do well in some classes they can retake them and losing a scholarship or other financial support will not always keep them from persisting. Community colleges can offer easier access to campus for nontraditional students who may have reasons they cannot live in a college dormitory (Berkner & Choy, 2008). Approximately 30% of nontraditional students in the present study graduated compared to 29% of traditional students who graduated.

Although the percentage of Pell grant recipients in the two populations were significantly different, the difference in the populations was only about 6%. The Pell grant receiving transfer students represented 39.9% of the transfer student population while the Pell grant receiving native students represented 45.8% of the native population. The difference in graduation rates of the Pell grant receiving students between the two populations was significant. The Pell grant receiving transfer students graduated at the 39.8% rate while the Pell grant receiving native students graduated at the 18.2% rate. Approximately 25% of all Pell grant recipients graduated compared to 33% of students who did not receive Pell grants who graduated.

The results of the present study indicated a significant difference between native and transfer female students. Jackson and Laanan (2015) reported community colleges being more effective at fostering women in STEM disciplines. The present study found far fewer female students enrolled in the 4-year university were transfer students. However, results indicated

female transfer students are graduating at the highest rate of all subpopulations examined at a 48.5% rate. The present study results also indicated the native female students are graduating at the lowest rate of all subpopulations examined at a 17.3% rate. The high transfer female student persistence is to be expected because women typically graduate at higher rates than men. The female native student graduation rate indicates the students are not persisting either through transfer, switching majors or some other reasons that warrant a more in-depth examination of potential causes.

The present study indicated male transfer students are graduating at a significantly higher rate (43.1%) than the native male students (22.9%). The transfer students who enter the 4-year university should be able to complete sooner because they are entering with at least 40 credit hours. Shapiro et al. (2017) reported engineering students typically take longer to graduate with the norm being 6 years. Gonzalez (2012) reported 60% of 4-year bachelor's degree-seeking students transfer institutions at least once. Both of these findings can impact native male student graduation rates. The graduation rates between male transfer and male native students and female transfer and female native students were all significantly different.

Because there is a significant difference in graduation rates and there was no significant difference in the transfer student vs native student performance at the 3000 and 4000 levels, the difference in graduation rates are most likely due to transfer students having higher GPA from the 1000 and 2000 level coursework. According to Wang (2009) pretransfer GPA is associated with post transfer persistence and is consistently one of the most reliable predictors of baccalaureate attainment. A one-point increase in GPA increases students' probability of

earning a degree by a factor of 3.029 (Wang, 2009). The researcher did not have access to pretransfer GPA so a comparison was not possible.

Because many students transfer to the 4-year participating university it is essential for students to be able to transfer their earned credits. Vertical co-enrollment is the best way to accomplish this. When all of the student's credits fail to transfer time to degree can increase, and students has spent time and money that will not count towards their degree (Lederman, 2017). Students being able to transfer all of their credits decreases time to graduation and can improve agreements with some community colleges the Tennessee Promise and Reconnect programs do not allow vertical co-enrollment with the participating 4-year university. The students in these Tennessee Promise and Reconnect programs are often using the same grant money and other financial resources under these programs as they would if they were not participating in them, but these programs often unfairly restrict students from being eligible for a vertical co-enrollment track. The researcher's data did not distinguish vertical co-enrollment students from normal enrollment, so a direct comparison was not possible although there were transfer students that were not able to transfer all of their earned credit hours.

Addressing transfer issues will also help the Drive to 55 goal (Drive to 55 Tennessee, 2018). Koker and Hendel (2003) found evidence the higher the number of credits the student earned pretransfer that are accepted at the post transfer institution are positively associated with higher student success rates. According to Koker and Hendel 82% of students who had all of their credits accepted graduated within 6 years, compared to only 42% of students graduating who were not able to transfer all of the credits they had earned. A national study conducted by

researchers at the American Council on Education found students who transferred before earning an associate degree were more likely to have all of their credits earned transfer into the 4-year institution (Palmer, Ludwig, & Stapleton, 1994).

There are 65 native students and 4 transfer students who finished with a GPA between 1.8 and 1.99 which prevented them from graduating in the time frame of the present study. There are also hundreds of students who had satisfactory grades and adequate credit hours but never graduated for unknown reasons, possibly not enough of their credit hours earned were in major. If some of these students earn a degree the university's graduation rates would be higher. There is a reasonable probability the ex-students are unaware they can return and complete.

Shapiro and Dundar's (2017a) study indicated that U.S. (62.43%) overall graduation rates are slightly higher than 4-year public universities in the state of Tennessee (57.34%). Students who first enroll in a 4-year university in Tennessee with the highest probability of completing a degree are: women followed next by students under 20 years of age. The group with the third highest probability of completing are students who first enrolled at 24 years of age or older, they are also more likely to complete at the institution they first enrolled in and are the least likely to drop down to a 2-year college to complete. The exclusively part-time enrolled students have the lowest completion rates. In the community colleges the U.S. (39.29%) overall graduation rate is very close to the Tennessee (39.9%) graduation rate. The biggest difference in the 6-year outcomes between the U.S. (44.9%) and Tennessee (49.5%) is at the end of 6 years about 4.6% less community college students from Tennessee are enrolled.

The students enrolled in ENTC coursework at the 4-year participating were not graduating at or even near the rates reported by Shapiro and Dundar (2017a) for Tennessee

public 4-year universities which was performed over much of the same time period as the present study. Because this study looked specifically at engineering technology that is not one of the easiest majors and all available graduation rates measure the entire university populations graduation rates this could account for some of the differences in completion rates.

Recommendations for Practice

The following recommendation for practice are made:

1. Use the Engineering Technolgy orientation class for an in-depth exploration of GPA and requirements for graduation and how they will affect the student's probability of graduating for incoming freshman;
2. Change university policy to allow the replacement of the lower grade and substituting the higher grade when a course is repeated. Because the ENTC programs require a minimum 2.0 GPA in major a student who fails a course must now earn an A for their grade in that class to average a 2.0. Allowing this substitution would give students who fail a class in major a better probability of still being able to graduate;
3. Determine and implement best practices for recruiting and retaining female students in engineering technology programs;
4. Petition the state of Tennessee to permit students enrolled in either the Tennessee Promise or Tennessee Reconnect programs to be allowed to participate in vertical co-enrollment programs between the university and community colleges. This would better prepare them for coursework at the university while allowing the student to earn their A.S. degree without taking classes that may not transfer or transferring without earning an A.S. degree;

5. Find ways to educate beginning community college students that vertical co-enrollment programs exist and how they can benefit students seeking a bachelor's degree;
6. Create a 2-year A.S. pre-engineering degree to allow students to enter the university under the Tennessee Promise or Reconnect programs. Some students are taking classes that may or may not transfer at community colleges. It would potentially benefit both the student and the university to allow them to take their coursework at the university while still earning an A.S. degree;
7. Create a 2-year A.S. of general studies degree to allow students to enter the university under the Tennessee Promise or Reconnect programs. Allowing the students to earn an A.S. degree of general studies at the university would benefit both the student and university and ensure the students have completed the same coursework as the native students, better preparing them for upper-level coursework;
8. Educate freshman on understanding and calculating GPA as well the course catalog their program of study will be based on;
9. Become more proactive in monitoring and intervening when a student's GPA could lead to problems graduating;
10. Have student advisors or mentors review at-risk students' GPAs with the student bi-annually to help these students create a plan for corrective action;
11. Because the majority of ENTC graduates are transfer students look for ways to simplify transfer success such as: Add hyperlinks to transfer-oriented subjects to the Department of Engineering Technology's main webpage.

12. If a student has a high-school GPA below 1.8 and he or she wants to declare ENTC as a major, encourage them to look for another major; and
13. Create a program that would permit students with a GPA over 2.0 and more than 130 hours to be awarded a B.S. in general studies.

Recommendations for Further Research

The following recommendations are made for further research:

1. Repeat this study as a longitudinal study over multiple 6-year enrollment time frames;
2. Conduct a study to determine why so many students have so many credit hours, a high GPA, but no degree;
3. Conduct a study to learn why so few of the female students are graduating;
4. Conduct a study to determine why there are so few native students graduating;
5. Replicate and expanding the present study to include all student records. Doing so should give a more informed view of why the native students are persisting at a lower percentage. Being able to determine if the native student has transferred elsewhere would give better insight into what is happening to them;
6. Conduct a study to analyze individual community colleges and the majors they offer to determine what students could benefit from vertical co-enrollment and how to inform them that vertical co-enrollment programs exist;
7. Conduct a study to determine the best advisement strategies for students wishing to transfer into a 4-year university ENTC program; and

8. Repeat this study at all state universities in Tennessee. Doing so may benefit students wishing to transfer from a community college to a 4-year university. A study of this nature may benefit the universities assimilation efforts.

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