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Native and Community College Transfer Students in Biological Sciences at a  
Four-Year Institution: A Comparative Study

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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

Doctorate in Education in Educational Leadership

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by

Nathanial Owen Weber

December 2017

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*Keywords:* persistence, community college, biological sciences, transfer

## ABSTRACT

Native and Community College Transfer Students in Biological Sciences at a

Four-Year Institution: A Comparative Study

by

Nathanial Owen Weber

Though current literature covers many aspects of vertical transfer from community colleges to four-year institutions, many did so for an entire institution, and with often conflicting results when attempting to quantify overall vertical transfer success. Instead, this study investigated similar variables seen in many other studies within a single discipline at a four-year institution and compared those students who are native to the four-year institution to community college transfer students. Univariate analysis of archival transcript data was used to identify differences in the study population and multiple regression analyses were employed to investigate which variables could significantly predict success. The purpose of this study was to investigate differences between native and community college transfer students and identify factors that predicted upper-level biology course grade-point average and final overall grade-point average at a four-year institution in biological sciences. The results of this study indicated four-year institution persistence was not significantly related to gender, high school grade-point average, or ACT composite score. Persistence was significantly related to transfer status; whether the student was a native or community college transfer student with native students persisting at a higher rate at the four-year institution than community college transfer students. Furthermore, ACT composite score, high school grade-point average, final overall grade-point average, and upper level biology course grade-point average were significantly related to transfer status.

Multiple regression analyses indicated high school grade-point average and ACT composite score were significantly predictive of upper-level biology course grade-point average while high school grade-point average, ACT composite score, and Pell eligibility were significantly predictive of final overall grade-point average.

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## DEDICATION

To Amy and Owen. I love you both.....so much!

## ACKNOWLEDGMENTS

I acknowledge that I am finished with this dissertation.....And many thanks to Don  
Good for your guidance.

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## CHAPTER 1

### INTRODUCTION

Students attending community colleges have historically had lower rates of persistence to bachelor degree attainment within 6 years than students attending only four-year institutions (Shapiro et al., 2012), and the educational aptitude of community college students is often questioned (Aulck & West, 2017). With the recent implementation of Tennessee Promise, signed into law by Tennessee Governor Haslam in 2014, graduating high school students in Tennessee have the option of free tuition at any of the state's 13 community colleges and 27 colleges of applied technology. This program was designed to increase the number of community college students and to make vertical transfer between the state's community colleges and its four-year institutions more efficient (Tennessee Promise, 2015). Tennessee Promise brings into greater focus the transfer pathways and the preparedness of the students transferring from community colleges to four-year institutions. Without a more thorough understanding of the differences in success rates between community college transfer and four-year students, a program such as Tennessee Promise could create a population of transfer students that are not prepared for educational life once they reach a four-year institution. By investigating factors transfer success for native four-year and community college transfer students, a clearer understanding of the dynamics surrounding successful vertical transfer may be developed.

Much literature exists concerning the preparedness of transfer students from community colleges to four-year institutions. In these studies various factors have been used to estimate the rates of success for transfer students as well as the challenges in accurately estimating transfer

success. For example, demographic variables (D'Amico, Dika, Elling, Algozzine, & Ginn 2013), credits earned (Melguizo, Kienzl, & Alfonso, 2011), retention factors (Mertes & Hoover, 2014), level of involvement of the community college (D'amico et al., 2013; Ellis, 2013), and grade-point averages (Middleton, 2013) have been investigated. Other studies have examined aspects of transfer success, both persistence and grade-point average, such as the rates of transfer between community colleges and four-year institutions (Aulck & West, 2017; Mourad & Hong, 2011), factors of persistence within a single institution type (Hamilton, 2011), and various retention factors (Middleton, 2013). These studies often endeavored to identify distinctions between students who began at a community college before transferring (transfer students) and those who attended only a four-year institution (native students). However, an overarching theme concerning successful vertical transfer is not apparent from previous studies. There is often contradiction between studies that have reported significant predictive power (e.g. Cedja, Rewey, & Kaylor, 1998; D'Amico et al., 2013) of variables such as grade-point average, demographics, such as high school GPA, and credits earned and those studies that have reported weak or no predictive power (Melguizo et al., 2011; Middleton, 2013). In a study of nearly 70,000 students, Aulck and West (2017) attempted to compare community college transfer students and native students at a four-year institution. Though they reported community college transfer students had lower entrance exam scores, the attrition rates and overall grades of those students did not significantly differ from native students. Kopko and Crosta (2017) endeavored to ask if earning an associate degree prior to transfer was important to post transfer success at a four-year institution.

Fewer researchers have compared student success at four-year institutions within a single discipline between native and community college transfer students with most attempting to

explain, define, identify, or characterize factors leading to successful upward transfer from a general, cross-institution viewpoint.

### *Statement of the Problem*

Many studies have investigated students' overall success either at a single institution or between certain institutions regardless of their discipline. Stewart and Martinello (2012) suggested narrowing the scope of research would allow for better control over variability. They proposed that education is multidimensional and, therefore, difficult to assess with a single measure or from a broad viewpoint. Education's multifaceted nature provided the substantiation for assessing student success in a single discipline between native and community college transfer students.

Therefore, the purpose of this non experimental study was to investigate differences between native and community college transfer students and identify factors that predicted upper-level biology course grade-point average and final overall grade-point average at a four-year institution in biological sciences. This study measured differences in persistence, overall grade-point average, upper-level biology course grade-point average, ACT composite score, high school grade-point average, and gender

### *Research Questions*

To identify differences between native and community college transfer students and estimate predictors of upper-level biology course grade-point average and final overall grade-point average, the following questions were developed to guide this research.

**Research Question 1:** Is there a significant difference in persistence between male and female students in biological sciences?

**Research Question 2:** Is there a significant difference in persistence between native and community college transfer students in biological sciences?

**Research Question 3:** Is there a significant difference in high school grade-point averages between persisting and non-persisting students in biological sciences?

**Research Question 4:** Is there a significant difference in ACT composite scores between persisting and non-persisting students in biological sciences?

**Research Question 5:** Is there a significant difference in ACT composite scores between native and community college transfer students in biological sciences?

**Research Question 6:** Is there a significant difference in high school grade-point averages between native and community college transfer students in biological sciences?

**Research Question 7:** Is there a significant difference in overall grade-point averages between native and community college transfer students in biological sciences?

**Research Question 8:** Is there a significant difference in upper-level biology course grade-point averages between native and community college transfer students in biological sciences?

**Research Question 9:** To what extent do gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, or transfer status predict upper-level biology course grade-point average?

**Research Question 10:** To what extent do gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, or transfer status predict final overall grade-point average?

### *Significance of the Study*

According to Smith (2015) 22,534 college freshmen participated in the first year of Tennessee Promise. Logically, this increase will relate to an increase in transfer students from Tennessee's community colleges to four-year institutions amplifying the importance of successful vertical transfer thus putting more impetus on transfer pathways between community colleges and four-year institutions. Tennessee's four-year institutions can also benefit from an increase of community college enrollment. Jenkins and Fink (2015) suggested that strong transfer partnerships can benefit four-year institutions in the follow ways:

- provide post-transfer institutions with a more college ready student;
- allow post-transfer institutions to focus less on remedial education and more on development of upper-level programs;
- simultaneously concentrate on the recruitment of more qualified freshman entrants while still increasing enrollment with community college transfer students; and
- help meet the growing demands for skilled workers as well as those in the workforce that require a more advanced degree.

Shapiro et al. (2012) reported that only about 15% of community college students complete a baccalaureate degree within six years. However, in a study of over 41,000 students, Kopko and Crosta (2017) found those community college students who completed an associate degree were 50% more likely to then complete a baccalaureate degree within that same time frame. This low percentage of transfers could partially be attributed to the technical and certificate programs at community colleges with those students not interested in transfer.

Though, even after controlling for those non-transfer students, there are still large proportions, 80%, of community college students who have intentions of transfer (Jenkins & Fisk, 2015)

This study investigated differences between native and community college transfer students and identified factors that significantly predicted upper-level biology course grade-point average and final overall grade-point average at a four-year institution in biological sciences. Therefore, the significance of this study is to provide a foundation for a more seamless transfer path between community colleges and four-year institutions in the biological sciences by allowing a better alignment of curricula between institutions. This study may prove useful to administrators and faculty in aspects of recruitment, retention, and student success thus increasing persistence.

#### *Limitations and Delimitations of the Study*

Limitations that are not accounted for could incorrectly and misleadingly alter the results of this research. This study was delimited to students who declared a major in biological sciences at the primary institution beginning in August 2008 through January 2017. This starting date was selected as this is the date the four-year institution adopted its current records keeping software. Students who were not currently enrolled at this institution as of this date were not included in this study.

1. The study did not differentiate between the entrance standards of community colleges and the primary four-year institution.
2. This study did not differentiate between grading scales of community colleges and the primary four-year institution.
3. This study did not account for student support services offered at the institutions.

4. This study did not address variations in faculty demographics included percentage of classes taught by full-time faculty and adjunct faculty.
5. Transcript data cannot account for the varying levels of academic rigor between the various institutions.
6. Only demographic and academic information received from the primary four-year institution's Banner system was included in this study.
7. The primary four-year institution's data records may be incomplete or inaccurate for some students.
8. Gender was self-reported by students.
9. As this study was confined to a single institution, generalizations for other institutions may not be appropriate or valid.

### *Definitions of Terms*

To ensure a better understanding of the terms and ideas discussed, the following definitions are provided:

1. Full-time student – a student who is enrolled for at least 12 credit hours per semester (IES, 2016).
2. Lower-level – typically, the first two years of a four-year college program (Duggan & Pickering, 2008); defined in this study as Biology 1000 and 2000 level courses.
3. Native student – a student who completed Biology 1000 and 2000 level courses at the primary four-year institution.
4. Part-time student – a student who is enrolled for less than 12 credit hours per semester (IES, 2016).

5. Persistence - persistence was considered one of the following: For native students completion of a Bachelor's of Science in Biological Sciences within six years from the first term enrolled was considered persistence. For transfer students persistence was completion of a Bachelor's of Science in Biological Science within four years from the first term enrolled at the four-year institution. For native and transfer students continuous enrollment with no more than two consecutive semesters not enrolled, not including summer, was considered persisting.
6. Transfer student – a student who completed Biology 1000 and 2000 level courses at a community college.
7. Upper-level – typically, the last two years of a four-year college program (Duggan & Pickering, 2008); defined in this study as Biology 3000 and 4000 level courses.

### *Chapter Summary*

This chapter includes a brief introduction to the study, provides a statement of the problem, lists research questions, discusses the significance of the study, lists limitations and delimitations, and defines terms used in the text. Chapter 2 contains a review of literature important for this study, and Chapter 3 defines the quantitative methodological approaches. Chapter 4 reports the results from data analysis and Chapter 5 provides interpretation and discussion of those results and provides recommendations for future research.

## CHAPTER 2

### REVIEW OF LITERATURE

Much literature exists concerning the preparedness of transfer students from community colleges to four-year institutions. In these studies various factors such as demographics (D'Amico et al., 2013), credits earned (Melguizo et al., 2011), retention factors (Mertes & Hoover, 2014), level of involvement of the community college (Ellis, 2013), and grade-point averages (Middleton, 2013) have been investigated to estimate the rates of and the success of transfer students as well as the challenges those student face (Syliva, Long, & Walters, 2010). Other studies have considered aspects of transfer success such as transfer between two- and four-year institutions (Mourad & Hong, 2011) and factors of persistence within a single institution type (Hamilton, 2011). A study by Kopko and Crosta (2016) questioned the valued of the associate degree itself for transfer students.

These studies attempted to make a distinction between students who began at community colleges before transferring (transfer students) and those who only attended a four-year institution (native students). As the literature reveals there is often contradiction between studies and the significant predictive power of variables such as grade-point average, demographic and background information, and credits earned varies greatly. These studies have attempted to explain, define, identify, or characterize factors leading to successful transfer from a broad, generalized viewpoint thus leading to a paradox of results.

### *Characteristics of Community Colleges*

Community colleges were established with the goal of democratizing American higher education by providing the opportunity of education beyond high school to both the advantaged and disadvantaged (Brint & Karabel, 1989) and they have been praised for offering this democratic access into higher education (Carlan & Byxbe, 2000). The current American community college model is rooted in a collaboration between the President of the University of Chicago, William Harper, and a local high school principal, J. Stanley Brown, at the turn of the 20<sup>th</sup> century when entry into a university was competitive and often financially exclusive (Patton, 2000). With the belief that freshman and sophomore level courses could be completed outside the university environment, Brown and Harper partnered to establish Joliet Junior College in Illinois. Less than a decade later the state of California provided funding to the state's high schools to offer freshman and sophomore college courses. Though the first community colleges were based in the liberal arts, their expansion continued during the post-World War II era with an increasing number of veterans attending institutions of higher education (US DVA, 2013). This led to California establishing more than 20 public junior colleges by 1921, with a nationwide system of 457 community colleges being established by the 1960s (Patton, 2000). Most of the nation's community college students enrolled in some type of vocational program (Cohen & Brawer, 2003). As of 2016, 12.3 million students were enrolled in 1,108 community colleges across the nation (AACC, 2016).

Community colleges are typically defined as those institutions that award two-year, associate's degrees (Cohen & Brawer, 2008) with some conferring bachelor's degrees (Floyd, Skolnik, & Walker, 2005) as well. The primary mission of community colleges is to provide a vertical transfer pathway to four-year colleges and universities (Cohen & Brawer, 2008; Higgins

& Katsinas, 1999). Horn and Skomsvold (2011) estimated that more than 80% of community college students plan to transfer to a four-year institution. Though the community college mission is now more expansive, the institutions should not stray too far from their transfer foundation as vertical transfer remains one of the most essential aspects of the community college (Higgins & Katsinas, 1999).

Wood, Nevarez, and Hilton (2012) suggested that transfer is presently one of the primary components of community colleges as they can provide a valid and affordable gateway to higher education (Mourad & Hong, 2011). Since the early days of the American community college, they have steadily grown and expanded from its original purpose (Cohen & Brawer, 2008). Though the mission of vertical transfer still prevails, changes in society and pressures from the workforce have led to an emergence of a variety of programs offered at community colleges. Senie (2015) posited that the multiple missions of the community colleges serve as one of its great strengths but will inherently drive not transfer rates. Handel (2007) asserted that community colleges provide access to higher education to those who are from educationally disadvantaged backgrounds. Handel also suggested that transfer rates among community college students are higher at institutions that have active transfer programs and faculty involvement. Modern community colleges not only offer transfer pathways to four-year institutions, but also remediation courses, vocational training and certificates, and terminal degrees that allow immediate entrance into the workforce (Brint & Karable, 1989; Cohen & Brawer, 2008). In reference to these various missions, Mourad and Hong (2011) suggested community colleges have historically been preparing students for an equally important but less advanced technical career.

According to Mobelini (2013) community colleges are garnering more prevalent niches in the educational landscape with some offering 90/30 plans, and others offering a community college baccalaureate (Floyd et al., 2005). The 90/30 plan allows students seeking a 120-credit hour bachelor's degree to complete 90 hours at the community college level and the remaining 30 hours at the conferring four-year institution. A community college baccalaureate begins to blur the transfer line between the two institution types with baccalaureate degrees being conferred on community college campuses. The community colleges baccalaureate degree continues to gain traction in America growing in number from four to 18 from 2000 to 2011 (McKinney, Scicchitano, & Johns, 2014). It is viewed by some as the natural progression of the community college model while others see this as a shift that undermines the primary purpose of the community college (Floyd et al., 2005). In a study of 32 community colleges that confer baccalaureate degrees, they suggested changes in the areas of human resources and student services when institutions make the decision to offer bachelor's degrees. One such change is in the hiring of faculty to administer the new four-year programs. The authors suggested that some current community college faculty would not be experienced enough to lead a four-year program. Regardless of the perception of the community college baccalaureate, there is evidence of the changing nature of the educational landscape in America as well as the flexible and reactive nature of community colleges. No other sector of higher education has transformed more in response to change within society (Kasper, 2003).

### *A Profile of Community College Students*

One modern perception of community colleges is that they diminish the potential of high school graduates to obtain a bachelor's degree with only 22% community college students

transferring to a four-year institution (Romano, 2004). This notion traces its roots to the 1960s with the idea of “cooling-out” (Brint & Karabel, 1989; Clark, 1960) whereby students become disengaged with the educational experience and thus fail to persist to a bachelor’s degree. Alba and Lavin (1981) posited community colleges deter first-time students from attaining their educational goals and that students appear to become discouraged during their second year. Furthermore, Tinto (1994) found various reasons that students do not persist in higher education such as academic and extracurricular experiences, social integration, educational aspirations and goals, and commitments outside higher education. Students choose to enroll at community colleges for a variety of reasons including financial pressures, interest of certificate programs and more personal attention from faculty and staff (Mitchell, 2015).

Cejda and Kaylor (2001) conducted a qualitative study of 103 community college students who transferred to a four-year institution and found 71% of students transfer after two years’ enrollment at the community college but after they had not earned enough credits for an associate’s degree. They also reported the most commonly identified intentions of community colleges students were completion of general education requirements, getting harder courses completed before attending a four-year institution, and saving money by enrolling at a less expensive community college. Similarly, Bradburn and Hurst (2001) reported 71% of community college students had intentions of earning a bachelor’s degree but community college students often need more assistance and direct interaction after transfer than they actually received at the four-year institution (Townsend & Wilson, 2006).

The terms traditional and nontraditional are used to define the student populations. Often, community colleges are made up of a larger proportion of non-traditional students while four-year institutions have a higher proportion of students directly enrolled after high school.

The U.S. Department of Education (2016) defines nontraditional students as those over the age of 25 with many outside priorities (work, family) and traditional students as under the age of 25 and often recently graduated high-school seniors. Mertes and Hoover (2014) argued that community colleges often have a heterogeneous nature to the student population. The majority of students attending community colleges are women, minority, and nontraditional students (Middleton, 2013). Referencing three surveys: The National Educational Longitudinal Study, the Beginning Postsecondary Longitudinal Study, and the Baccalaureate and Beyond Study, Choy (2002) noted that nearly one quarter of college students work full-time and a student's likelihood of attending a four-year institution is correlated with their parents' educational level. As of 2014 the average age of community college students was 28 with 37% under the age of 21 and 49% between the ages of 22 and 29. Fourteen percent of students were over the age of 39 (AACC, 2016).

### *Vertical Transfer from Community Colleges*

According to the 2013 National Student Clearinghouse Research Center Signature Report transferring between postsecondary institutions is becoming more common with nearly 33% of college students transferring and roughly 17% doing so twice. This poses a problem and an opportunity for community colleges. Of the 12.3 million (AACC, 2016) students at community colleges, over 4 million of them will transfer. While this has the potential to drive down community college graduation rates, transfer options will increase. According to 2016 data from the American Association of Community Colleges (AACC) of students who transfer from community colleges to four-year institutions, 60% attained a degree (or were still attending). This attainment rate is in line with 2011 data from the Institute of Education Sciences' National

Center for Education Statistics that reported graduation rates of 59% for native, full-time students at four-year institutions. Likewise, Adelman (2006) reported one third of native students at four-year institutions complete a bachelor's degree within four years with 55% taking six years for completion. However, Hagedorn, Moon, Cypers, Maxwell, and Lester (2006) concluded community college transfer rates are lower than optimal.

Three quarters of students who begin at four-year institutions persist to the second year while only 50% of first-year community college students do so (McIntosh & Rouse, 2009). Furthermore, within five years, students who begin their higher education career at four-year institutions are twice as likely to earn a bachelor's degree as compared to students who begin at community colleges. In summarizing volumes of research, Lin and Vogt (1996), reported that students at four-year institutions are nearly 20% more likely to persist to a bachelor's degree. Lee, Mackie-Lewis, and Marks (1993) used logistic regression to estimate the probability of attaining a bachelor's degree for students who first enrolled in community college. In comparing that group of students to a group that entered directly into a four-year institution, no differences in the probability of attaining a bachelor's degree were reported. Using Horn and Premo's (1995) risk factors such as no high-school diploma, attending part-time, having a dependent spouse, and being a single parent as a construct, Freeman, Conley, and Brooks (2006) studied community college transfer students who did and did not persist to a bachelor's degree. They found nearly 55% of community college students who transferred and subsequently persisted to a bachelor's degree were female. However, the authors also reported the odds ratio for persistence to bachelor's degree was lower for females than males. Lin and Vogt (1996) suggested these differences speak to the vocational aspect of community colleges in that many students at such institutions could not or were not interested in attending a four-year institution. They also

proposed that these students had access to higher levels of income after completing their program at the community college level and thus had no interest in vertical transfer.

### *Educational Perspective*

The level of educational attainment between transfer and native students can vary (Freeman et al., 2006). Native students are those who begin and remain at a four-year institution and transfer students are those who begin at a community college and then transfer to a four-year institution (Glass & Harrington, 2010). A general misconception may be that community college students do not have the same level of attainment in mind when compared to those attending a four-year institution (Adelman, 2006; Townsend & Wilson, 2006). The quality and rigor of community college education has been questioned with Rachal (1984) finding community college faculty were one grade more lenient. Similarly, Friedl, Pittenger, and Sherman (2012) found evidence for grade inflation when comparing a community college and a state university. Grade differences between native and transfer students have been attributed to the aptitude and nurturing environment offered at community colleges (Carlan & Byxbe, 2000). However, Melguizo et al. (2011) used quantitative methods to compare educational outcome of transfer and native students and reported no significant difference in degree attainment between the two groups. Once community college students transfer, they are just as likely to earn a bachelor's degree as native students (Melguizo et al., 2011). This suggests community colleges serve to prepare students for the rigors of a four-year institution instead of putting them at a disadvantage after transfer. Mertes and Hoover (2014) argued that community colleges often have a heterogeneous nature to the student population leading to reduced course load and thereby potentially lower transfer rates due to the less rigorous community college programs.

## *Remediation*

Remedial education is a means by which to ensure first-time college students are sufficiently prepared for the academic rigors of higher education (Crisp & Delgado, 2014). The nature of open enrollment at community colleges translates into a larger number of students in need of remediation. It is estimated that two thirds of community college students are not academically prepared for higher education (Bailey, 2009; Lavin & Calcagno, 2008) and thus, must enroll in one or more remedial courses. According to data from a 2012 Complete College America report 20% of students at four-year institutions and 50% of students at community colleges require remedial courses. That same study noted that 40% of community college students who require remediation never finish those courses and that only 10% of students who began remediation actually graduate within three years. In a qualitative study of older and younger first-time community college students in Florida, Calcagno et al. (2007) compared the impact of educational pathways between the two groups and reported remedial courses generally decrease the odds of graduating for all students but is less likely to affect older students.

As remediation in higher education has both opportunity and financial costs (Crisp & Delgado, 2014), some states are beginning to limit remedial education. The cost of opportunity is evident in that remedial courses are most often noncredit courses and can add up to one year to the normal associate's degree timeframe. From a cost standpoint the concern is that state and local tax dollars are being spent at the higher education level to teach high school concepts. Thus, taxpayers are essentially double-paying when remediation is required. The state of Florida has moved all remedial courses out of four-year institutions and is now housing those programs in community colleges (Merisotis & Phillips, 2000). In a study of 2,780 students who began at a two-year institution and indicated they wanted to transfer, Crisp and Delgado (2014) found 44%

of students not requiring remedial courses transferred and 35% of students requiring remediation did not transfer. Mertes and Hoover (2014) also reported those students who were assigned to remedial level courses have lower retention rates. These data provide an obstacle for community colleges to ensure retention and persistence rates remain at an optimal level.

### *Lower Division Grade Point Average*

The predictive power of grade point average is mixed in literature with some authors suggesting a correlation between lower division (first two years) grade-point average and persistence while others reported no significant correlation. In a study of nearly 1,000 students D'Amico et al. (2013) found lower division success to be a predictor of posttransfer success. Similarly, Cedja et al. (1998) reported grade-point average to be a positive predictor of persistence and bachelor's degree attainment. They also suggested transfer students who completed an associate's degree with a grade-point average of 3.0 or higher had graduation rates level with native students. Koker and Hendel (2011) explored various demographic variables along with high school and pretransfer grade-point average to predict graduation rates of students at both two- and four-year institutions. They found first-term credits completed and last term grade-point average to be significant predictors of graduation. Furthermore, research by Mertes and Hoover (2014) indicated that high school grade-point average was highly correlated to student retention.

Glass and Harrington (2010) compared mean grade-point average of native and transfer students after the first two years (lower division) of course work in a College of Arts and Sciences. They found the mean grade-point average of transfer students was significantly lower for transfer students as compared to native students after the first semester at a four-year

institution. This evidence suggests some level of transfer shock experienced by transfer students. However, the authors also reported that after an initial drop in grade-point average, a majority of transfer students experienced a rise in subsequent semesters. Melguizo et al. (2011) reported no significant differences in the levels of baccalaureate attainment between transfer and non-transfer students. In research conducted by Middleton (2013), transfer students were assessed pre- and posttransfer. She reported a very weak correlation between pre- and posttransfer grade-point average suggesting making a prediction is more complex than a simple single variable analysis.

### *Transfer Shock*

The differences between community colleges and life on a four-year campus can be extensive. Many studies have assessed transfer shock, an umbrella term for an initial drop in grade point average during the first or second semester after transfer. Factors associated with transfer shock are many and include social, socioeconomic, academic, and psychological factors (Stewart & Martinello, 2012). They implied that the concern of transfer shock for four-year institutions is widespread and can lead to course withdrawals, lower grade-point average; and therefore, lower retention rates. Transfer students may also struggle due to the differences in academic levels between community colleges and four-year institutions. Cedja (1997) found the severity of transfer shock was related to program of study with students transferring in business, science, and math facing the most significant challenges. All of these factors will negatively affect bachelor's degree attainment of transfer students, which is the ultimate measure of successful vertical transfer. Mourad and Hong (2011) have suggested a balancing point between extended course load at a community college and upward transfer. They reported while each credit hour completed at community college resulted in a 5% increase in bachelor's degree

attainment, each semester enrolled at a community college resulted in decreased odds of obtaining a degree. Conversely, Pascarella and Terenzini (2005) suggested that students who began their educational path at a community college are at a disadvantage compared to those who began at a four-year institution.

Transfer shock can come from a variety of aspects post-transfer. D'Amico et al. (2013) viewed transfer success through the filter of community college integration. In a study of 968 students, they found perceived academic fit and campus interactions to be only two positive predictors of second semester persistence. Campus integration, be it in the classroom or from a student services point of view, can increase a student's feelings of belonging and foster a more supportive social environment. Furthermore, the same study found that transfer grade-point average was not a significant predictor of persistence. Furthermore, Aulck and West (2017) reported no evidence of significant transfer shock in a study of nearly 70,000 students at a large public four-year institution. Similarly, Astin (1999) theory of student involvement provided reason on why a student would chose to leave or stay at an institution. Astin suggested that students who became more involved with their institution had a higher likelihood of persistence. Conversely, those students who did not participate on campus other than attending class would have a higher likelihood of not persisting.

### *Social Aspects*

Transfer success can also be a function of social and community aspects. Many studies contain a variable component to assess the correlation between upward transfer success and social and psychological experiences. Much of the literature (e.g. Bean & Metzner, 1985; Webb, Dantzler, & Hardy, 2014) suggested that an academic experience is more encompassing than

grades, and thus qualitative variables are needed to fully understand transfer success. D'Amico et al. (2013) attempted to assess social interactions (institutional experiences, faculty and advisor engagement, study groups, and club participation) by assigning a discrete value to a series of responses referring to these interactions. D'Amico et al. reported academic but not social factors as strong predictors of future academic success. Further qualitative methods were employed by Mery and Schiorring (2011) in examining institutions with high transfer rates for attributes that lead to increased upward transfer. One point of distinction is that increased upward transfer does not imply successful upward transfer. Though the student and the institution influence both of these, increased upward transfer is more a reflection of the institution. Mery and Schiorring identified six factors that influence upward transfer related to the institution: student support services, strong relationships with high schools and four-year institutions, transfer culture, student-focused environment, and an overall commitment to the institution.

Other authors approached the variation in transfer success not from an active direction but more from an imbedded, inherent viewpoint. By investigating the differences in grade expectations between community college and four-year institution students, McCann, Immel, Kadah-Ammeter, and Priniski (2013) provided insight into perceived expectations. The authors noted a higher initial grade expectation of those students at community college when compared to those at four-year institutions. Though it cannot be determined if this is an indictment of the student or the community college as an institution, it is necessary to consider the assumptions students have when assessing transfer success. Furthermore, Friedl et al. (2012) found students who transferred a math credit from the community college had significantly higher grades in that course than did those native students who took the class at the four-year institutions. Subsequently however, the transfer students earned poorer grades in successive math courses

Duggan and Pickering (2008) explored the noncognitive factors of success and retention of 369 transfer students entering a four-year institution. The authors looked to describe the barriers to academic success that face students in the 21<sup>st</sup> century. One noncognitive factor discussed as risks of persistence is the balance of education with the demands of work, family, and community obligations. As for modelling transfer rates, Duggan and Pickering explained the difficulty in doing so with a single model as the transfer student population is heterogeneous.

Successful vertical transfer has been shown to be significantly predicted by a variety of factors. Mooring and Mooring (2015) found factors such as transfer program and grade-point average to be most predictive while others (Aulck & West, 2017) found grade-point average not to significantly differentiate between native and community college transfer students. Wang (2012) found factors such as campus environment conditions, personal interactions, and sociological and psychological aspects to be predictive of baccalaureate attainment. Middleton (2013) suggested a larger proportion of those students attending part time are nontraditional with many supporting families or working full-time jobs. Wang (2012) further addressed the psychological aspect to successful upward transfer asserting a difference between those students who have an internal locus of control from those with an external one. Locus of control, he suggested, is where the burden of responsibility falls; either within oneself or outside the person's perceived area of control. He suggested those with an internal locus of control are more apt to take personal responsibility for their education. In light of Tinto's 1987 concept of separation, Elkins, Braxton, and James (2000) investigated first-semester to second-semester persistence of full-time, first-time students at a public four-year institution. They found that separation, which is the change from a previous environment including friends, family, and

community, could explain why some students leave during their first semester but reported that 92% of students continued enrollment.

### *Challenges Calculating Transfer Rates*

As evidenced by the various and often contradictory results found in the literature, the convoluted enrollment patterns make calculating transfer rates difficult. These difficulties can lead to inaccurate perceptions about the role of community colleges in America (Townsend, 2002). One theme presenting concerns with calculating transfer rates is the wide variety of definitions used to explain transfer. Some authors (e.g. Bumpus, 2014) define transfer as whether or not a community college student completes an associate's degree prior to attending a four-year institution, while others do not include the completion of an associate's degree. For example, Sylvia, Song, and Waters (2010) suggested the problem is such that an attempt to apply a common methodological approach would be unsuccessful as a valid universal methodology to predict upward transfer success would be improbable. They offered six factors that further convolute the measure of transfer rates: structural, technological, economic, instructional, and social. Though these factors are important to address, the problem is not in the development of the metric but in the implementation. Without a standardized metric(s) by which to define and estimate transfer, the dichotomy of results will continue to cloud the results.

To calculate transfer rates Castaneda (2002) suggested geographic location should be a consideration. Though a review of literature revealed no consistent patterns, students from rural areas generally have overall lower transfer rates than their counterparts from urban areas (Castaneda, 2002). This difference could be attributed to factors such as distance to transferring institution, seeking a terminal process, and a desire to remain in their native community.

Evidence for this is offered in a study of community college students in rural Appalachia. Wright (2012) discovered that, while some students look to community college as a stepping-stone, many desired to use their community college education to provide them with means to remain in their community. It is imperative to at least be cognizant of reasons students do not persist other than the reason of academic unpreparedness, transfer shock, and remediation. In some cases students are forced to leave higher education temporarily for personal or financial reasons. Factors such as family changes, employee relocation, military service, and illness could all negatively skew the calculations of transfer rates. Tinto (1994) suggested that students leave higher education for a variety of reasons including financial, individual, and external considerations.

Other studies have looked less at the student and more at the institution in an attempt to identify predictors of student success. In summarizing a variety of studies Bailey and Alfonso (2005) reported two major predictors of success for community college students are counseling and advising strategies and learning communities. Learning communities, small groups of often nontraditional students who collaborate, were important as the students often spend less time on campus as compared to their four-year institution counterparts. Similarly, Strauss and Volkwein (2004) found institutional commitment to be a positive predictor of student success. Institutional commitment can be defined as the quality of the institution, a feeling of fitting in, and overall satisfaction with the educational experience. Cejda and Kaylor (2001) found that nearly half of the community college students interviewed mentioned faculty interactions as an important factor. Crisp and Taggart (2013) recommended expanding the research base in areas of learning communities, student success, and supplemental instruction programs. McIntosh and Rouse (2009) showed that learning communities have positive effects on both grades and retention.

Though results reported in the literature present confounded results, transcript analysis has been shown useful in calculating transfer rates (Hagedorn, 2005; Hagedorn, Cabrera, & Prather, 2010). Furthermore, Hagedorn et al. (2010) explained the usefulness of transcript analysis especially in that it allows institutions to make data-driven decisions. Transcript data is specifically useful in that archival data can be extensive and easy to obtain.

### *Tennessee Promise*

In Tennessee the relationship between the state's community colleges and its four-year institutions is now more important than ever with the launch of Tennessee Promise. Signed into law in May 2014, Tennessee Promise is a last-dollar financial aid program available to Tennessee high school graduates and covers all costs associated with tuition and mandatory fees not covered by other gift aid programs such as Pell (TSAC, 2015). To be eligible students must graduate from a Tennessee high school prior to the age of 19, maintain a grade-point average of 2.0, and complete eight hours of community service. With the implementation of Tennessee Promise, it is logical to project an increase of community college students and therefore, the potential for transfer (Smith, 2015). As of February 2017 the Tennessee Higher Education Commission reported more than 33,000 students enrolled in college under Tennessee Promise (16,291 in 2016 and 16,790 in 2016). Furthermore, 17% fewer students in Tennessee have taken out student loans (THEC, 2017).

### *Chapter Summary*

The importance of successful upward transfer for both community colleges and four-year institutions is paramount. Community colleges may stand to increase perceived academic validity and four-year institutions stand to admit students as juniors who have both academic and social experience, providing a higher rate of retention. The literature has evidenced the interest and importance of upward transfer for both community colleges and four-year institutions and provided how community colleges can increase their educational validity by promoting transfer, showing potential students that community college is not a setback or second-class education but a stepping-stone to a more advanced degree.

## CHAPTER 3

### RESEARCH METHODOLOGY

The purpose of this nonexperimental, quantitative study was to investigate differences between native and community college transfer students and identify factors that predicted upper-level biology course grade-point average and final overall grade-point average at a four-year institution in biological sciences. The population for this study consisted of students who had a declared major of Biological Sciences entering the Fall 2008 term through the January 2017 term. As archival quantitative transcript data were used, an *ex-post facto* method was appropriate. This approach uses data that were previously amassed but originally not for research, such as transcript and demographic data, and attempts to establish relationships or associations within the data (McMillian & Schumacher, 2014). Though this approach allows for broad analyses of the relationships between subpopulation and the ability to make predictions based on the data, it cannot account for causation of those relationship. This allowed for the investigation of differences between native and community college transfer students and their persistence at a four-year institution.

#### *Research Questions and Null Hypotheses*

Specific research questions and corresponding null hypotheses are as follows:

***Research Question 1:*** Is there a significant difference in persistence between male and female students in biological sciences?

H<sub>0</sub>1: There is no significant difference in persistence between male and female students in biological sciences.

**Research Question 2:** Is there a significant difference in persistence between native and community college transfer students in biological sciences?

H<sub>0</sub>2: There is no significant difference in persistence between native and community college transfer students in biological sciences.

**Research Question 3:** Is there a significant difference in high school grade-point averages between persisting and nonpersisting students in biological sciences?

H<sub>0</sub>3: There is no significant difference in high school grade-point averages between persisting and nonpersisting students in biological sciences.

**Research Question 4:** Is there a significant difference in ACT composite scores between persisting and non-persisting students in biological sciences?

H<sub>0</sub>4: There is no significant difference in ACT composite scores between persisting and nonpersisting students in biological sciences.

**Research Question 5:** Is there a significant difference in ACT composite scores between native and community college transfer students in biological sciences?

H<sub>0</sub>5: There is no significant difference in ACT composite scores between native and community college transfer students in biological sciences.

**Research Question 6:** Is there a significant difference in high school grade-point averages between native and community college transfer students in biological sciences?

H<sub>0</sub>6: There is no significant difference in high school grade-point averages between native and community college transfer students in biological sciences.

**Research Question 7:** Is there a significant difference in overall grade-point averages between native and community college transfer students in biological sciences?

H<sub>0</sub>7: There is no significant difference in overall grade-point averages between native and community college transfer students in biological sciences.

**Research Question 8:** Is there a significant difference in upper-level biology course grade-point averages between native and community college transfer students in biological sciences?

H<sub>0</sub>8: There is no significant difference in upper-level biology course grade-point averages between native and community college transfer students in biological sciences.

**Research Question 9:** To what extent do gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, or transfer status predict upper-level biology course grade-point average?

H<sub>0</sub>9: Gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, and transfer status do not predict upper-level biology course grade-point average to a significant extent.

**Research Question 10:** To what extent do gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, or transfer status influence final overall grade-point average?

H<sub>0</sub>10: Gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, and transfer status do not predict final overall grade-point average to a significant extent.

### *Instrumentation*

This study used student data from the primary four-year institution's Banner system. Banner is a web-based student information system developed by SunGard that assists institutions in maintaining data related to the institution and is used by most of the institutions in the primary four-year institution's governing body. It is used to preserve data from not only students but also employees, alumni, and donors. Banner can be used as a recruiting and admissions tool as well as a tool to monitor student enrollment and guide retention efforts. The student data housed within the Banner system can be used to establish the academic structure required to best support the needs of the student body and identify areas for improvement (ETSU, 2016). Using archival data is one means by which to reduce the bias that is inherent to collecting data directly from students (Good & Hardin, 2003). Student transcript data including gender, high school grade-point average, ACT composite score, first generation status, Pell eligibility, persistence, transfer status, overall grade-point average, and upper-level biology course grade-point average were analyzed.

### *Population*

This study was conducted at a public university serving southern Appalachia with a student population of roughly 14,000 that is classified as a doctoral/research university (DRU) by The Carnegie Classification of Institutions of Higher Education. Students in this study included those who had a declared major of biology from August 2008 through January 2017. To be included in this study students had to meet specific criteria. Native students were those who completed lower level biology courses (Biology 1000 or 2000) at the primary four-year institution, while transfer students were those who complete lower level biology courses at a

community college. Regardless of transfer status students included in this study must have completed at least three credit hours in upper level biology courses (Biology 3000 or 4000) at the primary four-year institution.

Of the 427 students in this study, 217 (50.8%) were female and 210 (49.2%) were male. Three-hundred seventy-one (86.9%) students were persisting while 56 (13.1%) were nonpersisting and 349 (81.7%) were native students while 82 (18.3%) were community college transfer students. The following students were excluded from this study.

1. Students who completed lower level biology courses at a community college but had not completed upper level courses at the four-year institution.
2. Students who completed lower level biology courses at the primary four-year institution but had not completed upper level courses.
3. Students who completed lower level biology courses at another four-year institution.
4. If a student had completed lower level biology courses at both a community college and at the primary four-year institution, the lower level biology courses at the primary four-year institution were not included in biology course grade-point average calculations.
5. If a student completed upper level biology courses at a different institution, those courses were not considered in grade-point average calculations.

### *Data Collection*

Prior to collection of data approval was first gained from my dissertation committee. After my dissertation committee had approved my research, the study was submitted to the Institutional Review Board (IRB) at the primary four-year institution. Once the IRB determined

the study did not concern human subjects, the study was given an exempt status. The study was then submitted to the primary four-year institution's office of the Associate Vice President of Planning and Decision Support and Chief Planning Officer for data retrieval and was assigned an institutional researcher. To maintain student confidentiality all personal identifiers were removed by the institutional researcher and replaced with a randomly assigned numerical value for identification prior to decimation of data. The institutional researcher provided the data, which including transcript and demographic records, in an Excel spreadsheet.

### *Data Analysis*

For this research persistence was considered one of the following: For native students completion of a Bachelor's of Science in Biological Sciences within six years from the first term enrolled was considered persistence. For transfer students persistence was completion of a Bachelor's of Science in Biological Science within four years from the first term enrolled at the four-year institution. For native and transfer students continuous enrollment with no more than two consecutive semesters not enrolled, not including summer, was considered persisting.

This study used data that were both categorical, such as gender and persistence, and continuous, such as GPA. Chi-square analyses were conducted for Research Questions 1 and 2 and independent samples t-tests were conducted for Research Questions 3, 4, 5, 6, 7, and 8 to determine if differences were significant between specified groups. Multiple regression analysis was used for Research Questions 9 and 10 to identify factors that significantly predict upper-level biology course grade-point average and final overall grade-point average. Analyses were conducted with the statistical software package IBM-SPSS at a significance level of .05. Table 1 provides a list of variables and how they were coded.

Table 1

*Variable Names and Codes*

Variable	Variable Description
Gender	0 = Male; 1 = Female
HS Grade-Point Average	0.00 – 4.00
ACT Composite	1 – 36
Persistence	0 = Nonpersisting student; 1 = Persisting student
Overall Grade-Point Average	0.00 – 4.00
Upper Level Biology Grade-Point Average	0.00 – 4.00
Transfer Student	0 = Native student; 1 = Transfer student

*Chapter Summary*

This chapter includes a brief introduction of the methodological parameters, a review of research questions and null hypotheses, a summary of instrumentation, an explanation of the population, and an overview of data collection and analyses. Chapter 4 reports the results from the various data analyses and Chapter 5 provides interpretation and discussion of those results. Chapter 5 also includes implications of the results in terms of application across other disciplines or at other institutions.

## CHAPTER 4

### RESULTS

Chi-square (two-way contingency) tables are used for analysis of categorical data with more than one variable and test the relationship between the variables. In this study Chi-square analyses were used to test for a relationship between persistence and gender as well as between persistence and transfer status. Independent samples *t*-tests allow for the comparison of the means of a continuous dependent variable between two unrelated groups determining the likelihood of a difference occurring due to random chance. In this study independent samples *t*-test were used to compare mean high school grade-point average between persisting and nonpersisting students, mean ACT composite scores between persisting and nonpersisting students, mean ACT composite scores between native and community college transfer students, mean high school grade-point averages between native and transfer students, final overall grade-point averages between native and community college students, and upper-level biology course grade-point average between native and community college transfer students. Multiple regression analysis, an extension of a simple linear regression, is used to predict the value of a dependent variable from a set of independent variables. Multiple regression analyses were used to find significant predictors of upper-level biology course grade-point average and final overall grade-point average using gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, and transfer status as independent variables.

The purpose of this study was to investigate differences in native and community college transfer students and identify factors that influenced upper-level biology course grade-point average and final overall grade-point average at a four-year institution in biological sciences.

This chapter presents the results of analyses for the 10 research questions developed for this study. Data for this study were obtained from the primary four-year institution's records database, Banner. Research questions, null hypotheses, and analyses are presented below.

***Research Question 1:*** Is there a significant difference in persistence between male and female students in biological sciences?

H<sub>0</sub>1: There is no significant difference in persistence between male and female students in biological sciences.

A two-way contingency table analysis was conducted to evaluate whether gender and persistence were significantly related. The study population consisted of 209 female and 210 male students. Analysis indicated persistence and gender were not significantly related, Pearson  $\chi^2(1, N = 419) = 2.01, p = .157$ , Cramer's V = 0.07. Therefore, the null hypothesis was retained. In general, persistence does not differ when compared by of gender. Figure 1 displays proportion of male and female persistence.

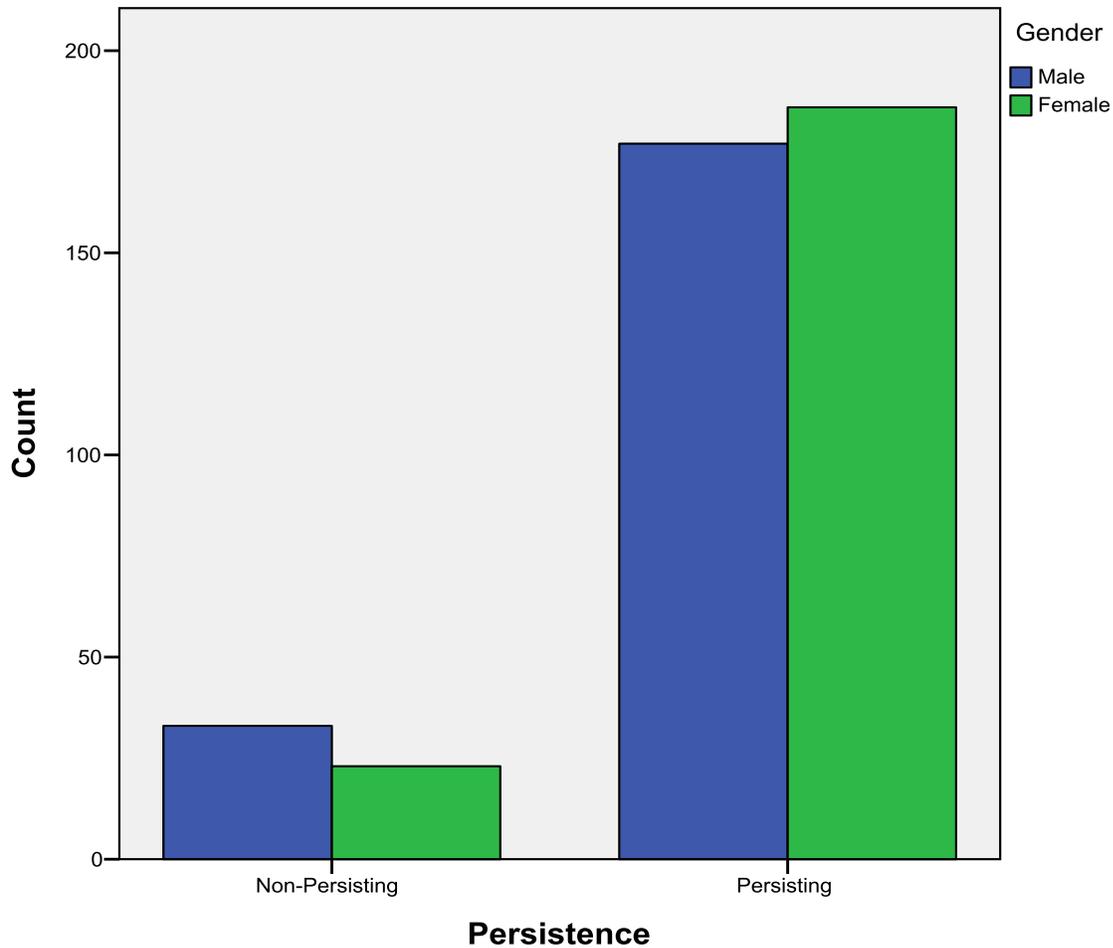


Figure 1. Persistence as a Function of Gender

**Research Question 2:** Is there a significant difference in persistence between native and community college transfer students in biological sciences?

- H<sub>0</sub>2: There is no significant difference in persistence between native and community college transfer students in biological sciences.

A two-way contingency table analysis was conducted to evaluate whether student type and persistence significantly related. The study population consisted of 81% native and 19% community college transfer students. Analysis indicated persistence and student type (native or transfer) were significantly related, Pearson  $\chi^2(1, N = 420) = 4.72, p = .030$ , Cramer's V = 0.03.

Therefore, the null hypothesis was rejected. In general, native students persist at a higher percentage than do community college transfer students. Figure 2 displays proportions of persistence for native and community college transfer students.

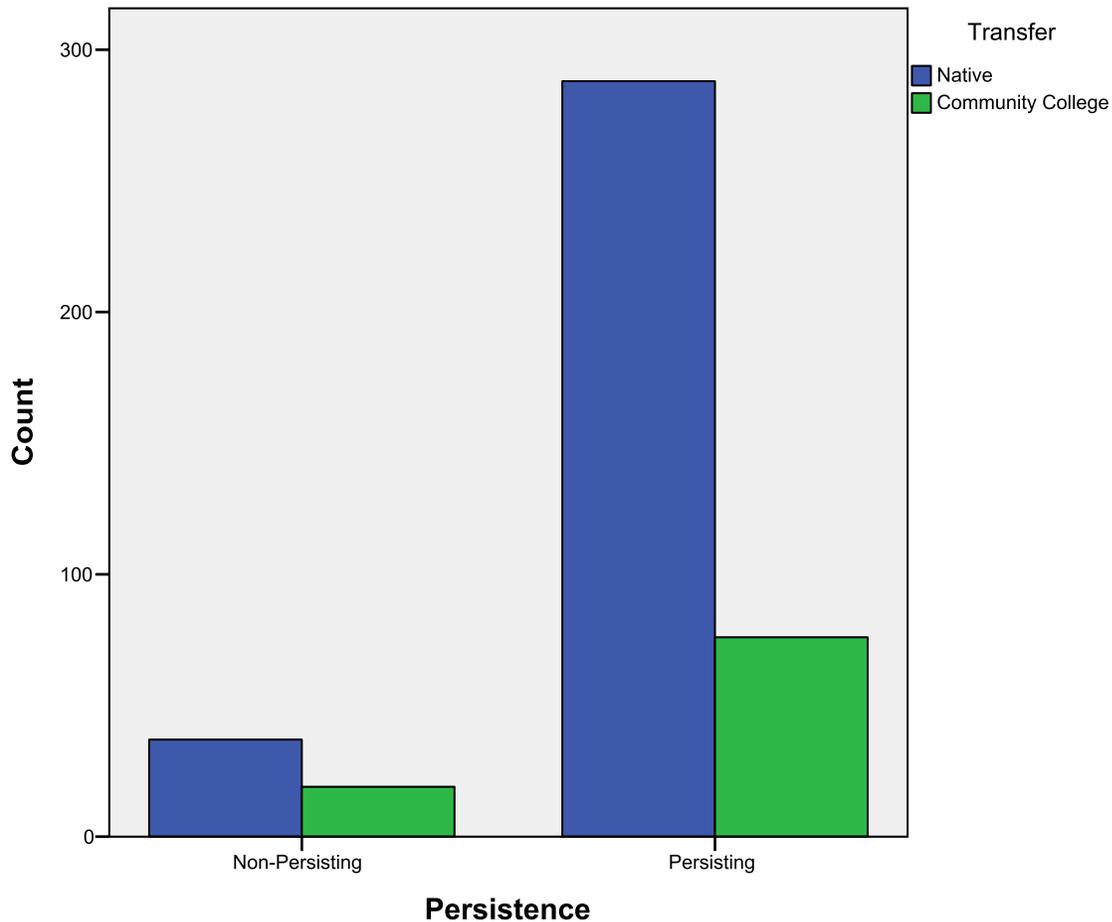
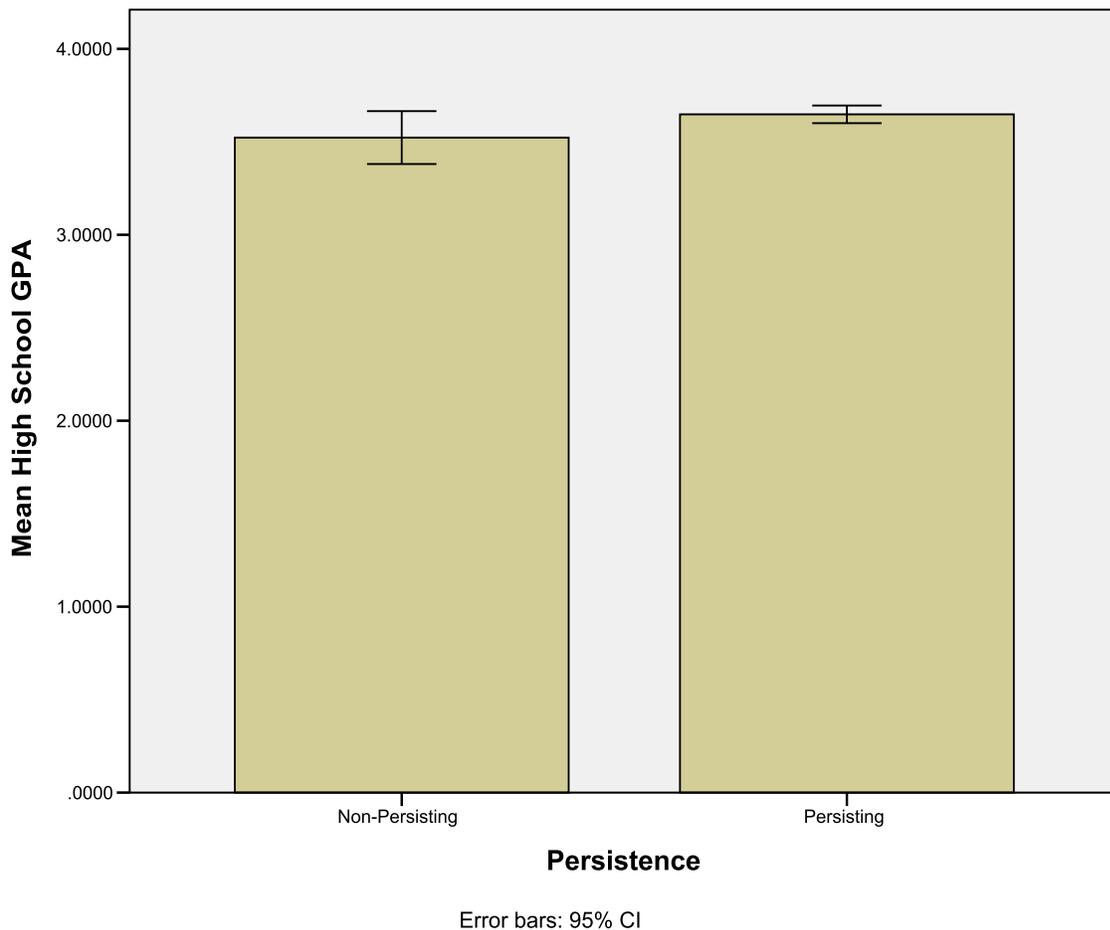


Figure 2. Persistence as a Function of Native or Community College Transfer Students

**Research Question 3:** Is there a significant difference in high school grade-point averages between persisting and nonpersisting students in biological sciences?

- H<sub>03</sub>: There is no significant difference in high school grade-point averages between persisting and nonpersisting students in biological sciences.

An independent-samples t-test was conducted to evaluate whether high school grade-point averages differed between persisting and nonpersisting students in biological sciences. High school grade-point average was the test variable and the grouping variable was persisting or nonpersisting student. The test was not significant,  $t(387) = 1.83, p = .068$ . Therefore, the null hypothesis was retained. The  $\eta^2$  index was 0.01, which indicated a small effect size. Persisting students ( $M = 3.65, SD = 0.44$ ) have higher, but not significantly higher high school grade-point averages than nonpersisting students ( $M = 3.52, SD = 0.50$ ). The 95% confidence interval for the difference in means was 3.59 to 3.68. Figure 3 shows the distributions for the two groups.



*Figure 3.* Distribution of High School Grade-Point Average for Persisting and Nonpersisting Students

**Research Question 4:** Is there a significant difference in ACT composite scores between persisting and nonpersisting students in biological sciences?

- H<sub>04</sub>: There is no significant difference in ACT composite scores between persisting and nonpersisting students in biological sciences.

An independent-samples t-test was conducted to evaluate whether ACT composite scores differed between persisting and non-persisting students in biological sciences. ACT composite score was the test variable and the grouping variable was persisting or nonpersisting students. The test was not significant,  $t(298) = 0.73, p = .465$ . Therefore, the null hypothesis was retained. The  $\eta^2$  index was 0.001, which indicated a small effect size. In general, ACT composite scores were similar between those students who were persisting ( $M = 25.37, SD = 3.84$ ) and those who were nonpersisting ( $M = 24.84, SD = 3.91$ ). The 95% confidence interval for the difference in means was 24.88 to 25.73. Figure 4 shows the distributions for the two groups.

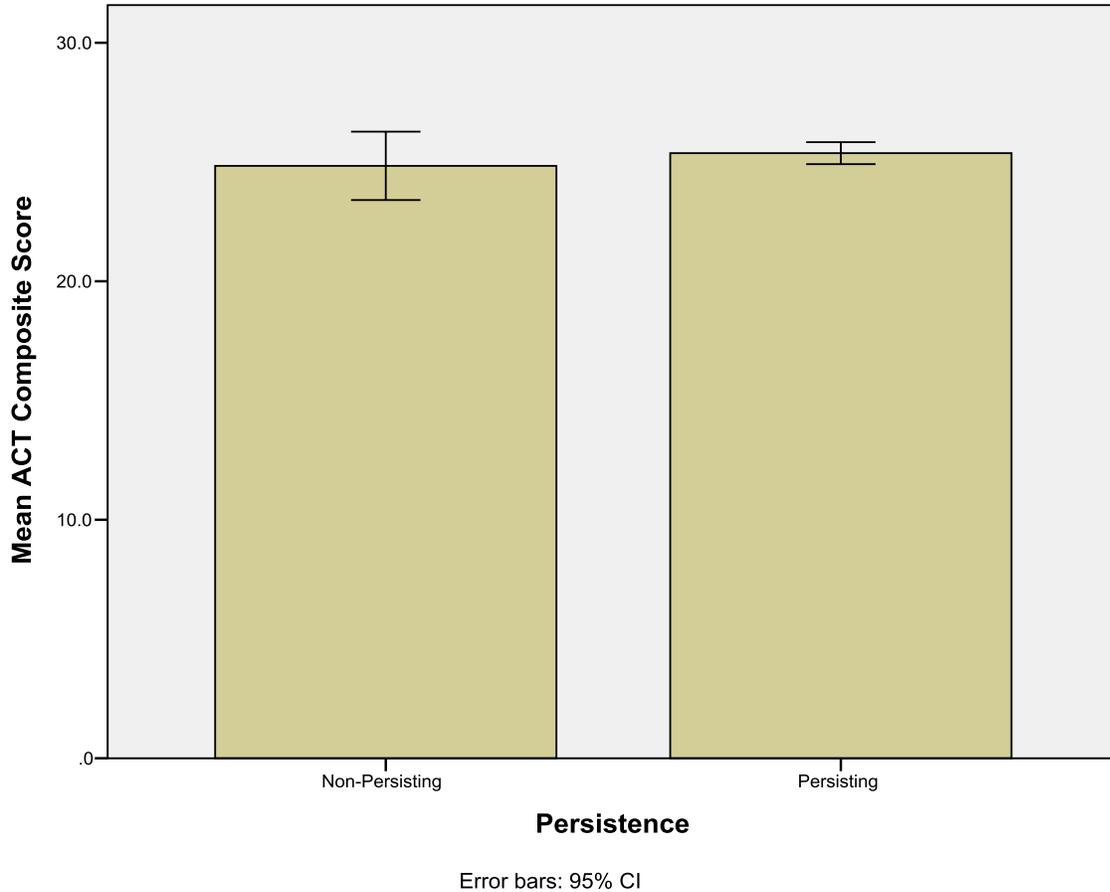


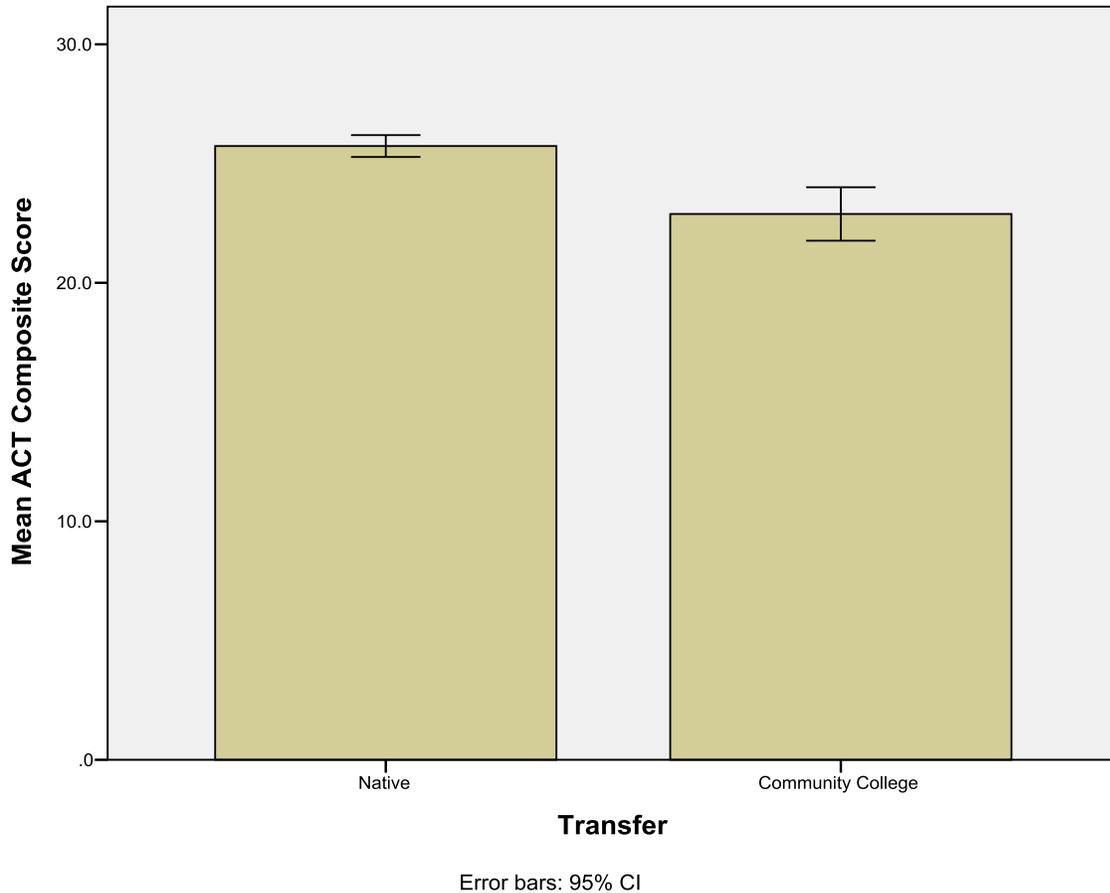
Figure 4. Distribution of ACT Composite Scores for Persisting and Nonpersisting Students

**Research Question 5:** Is there a significant difference in ACT composite scores between native and community college transfer students in biological sciences?

- H<sub>05</sub>: There is no significant difference in ACT composite scores between native and community college transfer students in biological sciences.

An independent-samples t-test was conducted to evaluate whether ACT composite scores differed between native and community college transfer students in biological sciences. ACT composite score was the test variable and the grouping variable was native or community college transfer student. The test was significant,  $t(298) = 4.70, p < .001$ . Therefore, the null hypothesis was rejected. The  $\eta^2$  index was 0.069, which indicated a small effect size. ACT composite

scores were significantly higher for native students ( $M = 25.37$ ,  $SD = 3.72$ ) than for community college transfer students ( $M = 22.87$ ,  $SD = 3.69$ ). The 95% confidence interval for the difference in means was 24.88 to 25.73. Figure 5 shows the distributions for the two groups.



*Figure 5.* Distribution of ACT Composite Scores for Native and Community College Transfer Students

**Research Question 6:** Is there a significant difference in high school grade-point averages between native and community college transfer students in biological sciences?

- $H_0$ : There is no significant difference in high school grade-point averages between native and community college transfer students in biological sciences.

An independent-samples t-test was conducted to evaluate high school grade-point averages differed between native and community college transfer students in biological sciences. High school grade-point average was the test variable and the grouping variable was native or community college transfer students. The test was significant,  $t(387) = 2.99, p = .001$ . Therefore, the null hypothesis was rejected. The  $\eta^2$  index was 0.022, which indicated a small effect size. High school grade-point averages were significantly higher for native students ( $M = 3.69, SD = 0.41$ ) than for community college transfer students ( $M = 3.51, SD = 0.558$ ). The 95% confidence interval for the difference in means was 3.59 to 3.68. Figure 6 shows the distributions for the two groups.

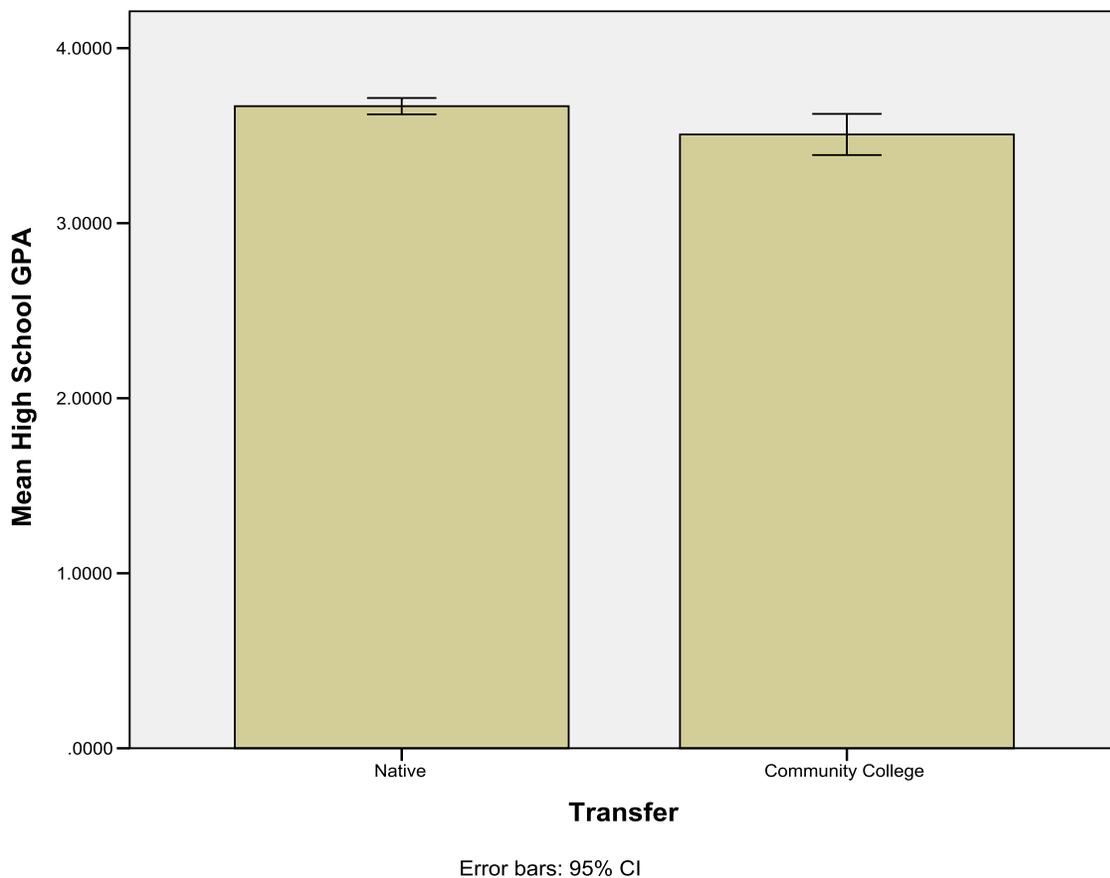
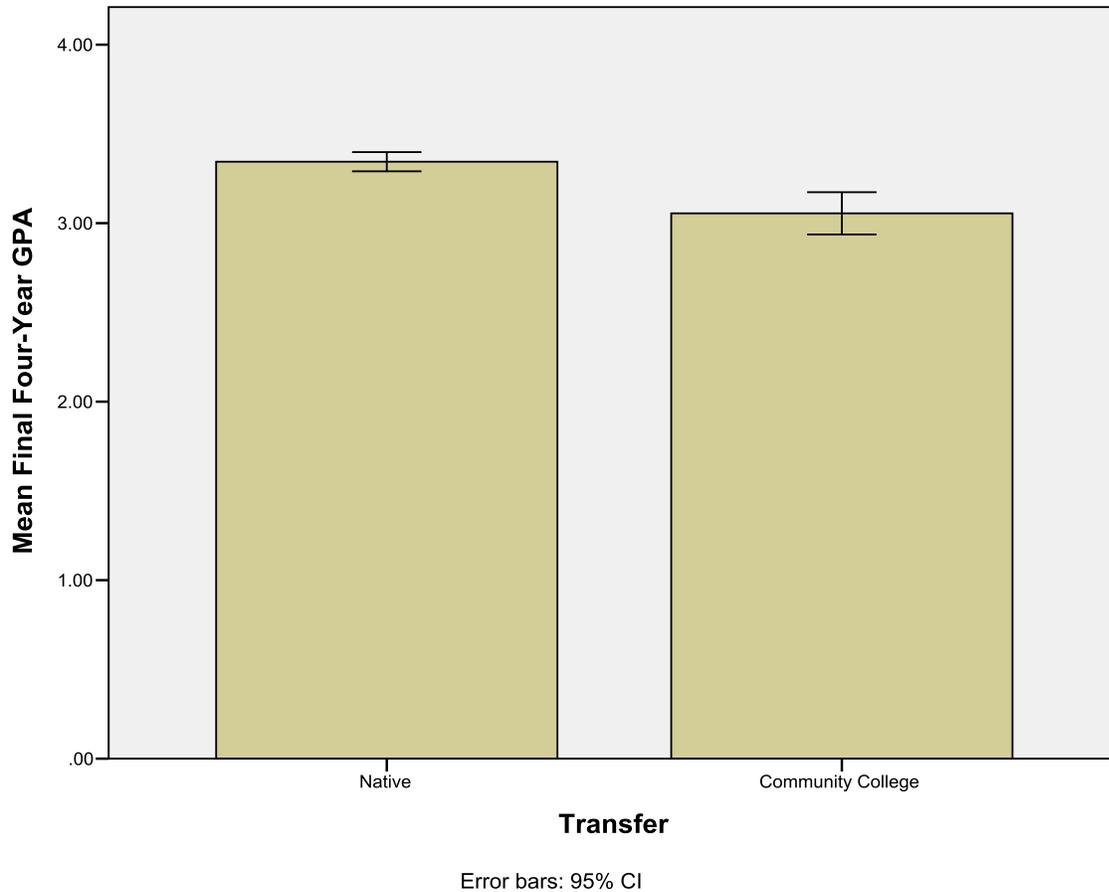


Figure 6. Distribution of High School Grade-Point Average for Native and Community College Transfer Students

**Research Question 7:** Is there a significant difference in overall grade-point averages between native and community college transfer students in biological sciences?

- $H_07$ : There is no significant difference in overall grade-point averages between native and community college transfer students in biological sciences.

An independent-samples t-test was conducted to evaluate whether overall grade-point averages differ between native and community college transfer students in biological sciences. Overall grade-point average was the test variable and the grouping variable was native or community college transfer student. The test was significant,  $t(418) = 4.82, p = .018$ . Therefore, the null hypothesis was rejected. The  $\eta^2$  index was 0.052, which indicated a small effect size. Overall grade-point averages were significantly higher for native students ( $M = 3.34, SD = 0.49$ ) than for community college transfer students ( $M = 3.05, SD = 0.581$ ). The 95% confidence interval for the difference in means was 3.23 to 3.33. Figure 7 shows the distribution for the two groups.



*Figure 7.* Distribution of Overall Grade-Point Average for Native and Community College Transfer Students

**Research Question 8:** Is there a significant difference in upper-level biology course grade-point averages between native and community college transfer students in biological sciences?

- H<sub>0</sub>8: There is no significant difference in upper-level biology course grade-point averages between native and community college transfer students in biological sciences.

An independent-samples t-test was conducted to evaluate whether upper-level course grade-point averages differ between native and community college transfer students in biological

sciences. Upper-level grade-point average was the test variable and the grouping variable was native or community college transfer student. The test was significant,  $t(418) = 2.81, p = .005$ . Therefore, the null hypothesis was rejected. The  $\eta^2$  index was 0.019, which indicated a small effect size. Upper level biology course grade-point averages were significantly higher for native students ( $M = 3.02, SD = 0.909$ ) than for community college transfer students ( $M = 2.72, SD = 0.954$ ). The 95% confidence interval for the difference in means was 2.86 to 3.04. Figure 8 shows the distribution for the two groups.

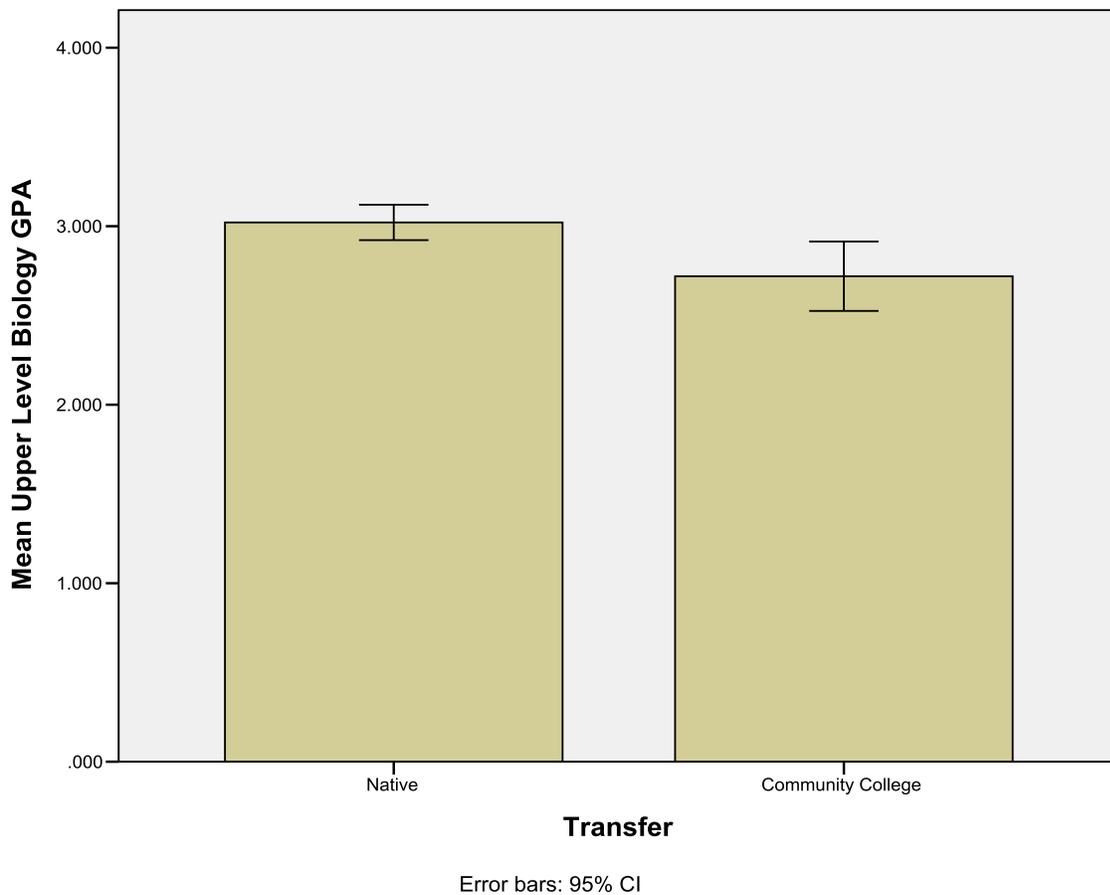


Figure 8. Distribution of Upper Level Biology Grade-Point Average for Native and Community College Transfer Students

**Research Question 9:** To what extent do gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, and transfer status predict upper-level biology course GPA grade-point average?

- H<sub>09</sub>: Gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, and transfer status do not predict upper-level biology course grade-point average to a significant extent.

A multiple regression analysis was conducted to estimate how well gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, and transfer status predict upper-level biology course grade-point average. As part of the analysis, intercorrelations among the predictor variables were assessed for multicollinearity. Collinearity tests are used to identify redundancies among predictor variables, which could cause an over fit within the model. The analysis indicated no critically correlated variables.

The linear correlation of the predictor variables was significantly related to the criterion variable, upper-level biology course GPA,  $F(6, 287) = 7.34, p < .001$ . Therefore, the null hypothesis was rejected. The correlation of determination was .13, indicating that 13% of variance in upper-level biology grade-point average was accounted for by the included predictor variables. The regression equation is as follows: Upper-level biology course Grade-Point Average =  $-.06$  Gender +  $.51$  high school GPA -  $.21$  Pell eligibility +  $.14$  first generation status +  $.03$  ACT composite score -  $.10$  transfer status +  $.289$ .

Table 2 shows the indices of specific relative strength of the individual predictors. The beta weights indicate the relative contribution of each variable to the overall predication of upper-level biology course grade-point average. The data indicate the greatest predictors of

upper-level biology course grade-point average are high school grade-point average ( $p = .002$ ) and ACT composite score ( $p = .038$ ).

Table 2

*Regression Coefficients, Standard Errors, and Significance Levels for Upper-Level Biology Course Grade-Point Average*

Variable	<i>B</i>	Standard Error of <i>B</i>	$\beta$	<i>p</i>
Intercept	.29	.56		
Gender	-.06	.10	-.03	.566
High school GPA	.51	.17	.21	.002*
Pell eligibility	-.21	.11	-.11	.052
First generation	.14	.12	.07	.236
ACT composite	.03	.02	.14	.038*
Transfer status	-.10	.15	-.04	.518

\* Significant at the .05 level; *B* = unstandardized regression coefficient; Standard Error of *B* = standard error of the coefficient;  $\beta$  = standard coefficient

**Research Question 10:** To what extent do gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, and transfer status predict final overall grade-point average?

- $H_{010}$ : Gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, and transfer status do not predict final overall grade-point averages to a significant extent.

A multiple regression analysis was conducted to estimate how well gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, and transfer

status predict final overall grade-point average. As part of the analysis, intercorrelations among the predictor variables were assessed for multicollinearity. Collinearity tests are used to identify redundancies among predictor variables, which could cause an over fit within the model. The analysis indicated no critically correlated variables.

The linear correlation of the predictor variables was significantly related to the criterion variable, final overall GPA,  $F(6, 287) = 18.53, p < .001$ . Therefore, the null hypothesis was rejected. The correlation of determination was .28, indicating that 28% of variance in final overall grade-point averages was accounted for by the included predictor variables. The regression equation is as follows: Final overall grade-point average =  $-.06$  Gender +  $.42$  high school grade-point average -  $.16$  Pell eligibility +  $.04$  first generation status +  $.02$  ACT composite score -  $.10$  transfer status +  $1.21$ .

Table 3 shows the indices of specific relative strength of the individual predictors. The beta weights indicate the relative contribution of each variable to the overall predication of final overall grade-point average. The data indicate the greatest predictors of upper-level biology course grade-point average are high school GPA ( $p < .001$ ), Pell eligibility ( $p = .002$ ), and ACT composite score ( $p = .002$ ).

Table 3

*Regression Coefficients, Standard Errors, and Significance Levels for Final*

*Overall Grade-Point Average*

Variable	<i>B</i>	Standard Error of <i>B</i>	$\beta$	<i>p</i>
Intercept	1.21	.27		
Gender	-.06	.05	-.06	.244
High school GPA	.42	.08	.32	<.001*
Pell eligibility	-.16	.05	-.17	.002*
First generation	.04	.06	.04	.458
ACT composite	.02	.01	.19	.002*
Transfer status	-.10	.07	-.07	.174

\* Significant at the .05 level; *B* = unstandardized regression coefficient; Standard Error of *B* = standard error of the coefficient;  $\beta$  = standard coefficient

## CHAPTER 5

### SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Though much research has investigated successful vertical transfer from community colleges to four-year institutions, most studies have done so from a broad viewpoint. With the multidimensional nature of education, this study focused on a single academic discipline at a single institution. By doing so both community colleges and four-year institutions can assess differences in more specific student populations and thus better address issues of persistence and success. The implication of the results defined in Chapter 4 are present in this chapter.

#### *Summary*

The purpose of this study was to investigate differences between native and community college transfer students and identify factors that influenced upper-level biology course GPA and final overall grade-point average at a four-year institution in biological sciences. The study population was students with a declared major of biology from fall 2008 through spring 2017. Native students were those who had completed Biology 1000 and 2000 level biology courses at the primary four-year institution and also had attempted at least three credit hours in Biology 3000 or 4000 level courses. Transfer students were those who completed Biology 1000 and 2000 level courses at a community college and attempted at least three credit hours in Biology 3000 or 4000 level courses at the primary four-year institution. All other students, including those who completed Biology 1000 and 2000 level courses at a different four-year institution before transferring, were excluded from this study. Using SPSS, univariate analyses were used

to either establish differences between subpopulations or further explain significantly predicted variables in multiple regression analyses.

### *Discussion*

#### ***Research Question 1***

Two-way contingency analysis indicated that persistence at the primary four-year institution, being defined as continuous enrollment or graduation within six years for native students and within three years after transfer for community college transfer students, was not affected by gender. Both male (84.4%) and female (89.0%) students persisted at approximately the same rate. These findings are similar to results from Aulck and West (2017) in which attrition rates for both males and females were similar. However, this runs counter to results from Freeman et al. (2006) in which they reported the odds of completing a baccalaureate degree were lower for females than males. Perhaps, considering the time span between the two studies, this could suggest a general shift regarding male and female students and their likelihoods of persisting at a four-year institution.

#### ***Research Question 2***

No clear consensus is evident in the literature linking persistence with transfer status, being either a native or community college transfer student. For instance, Melguizo et al. (2011) reported no significant differences in the levels of baccalaureate attainment between transfer and nontransfer students while Shapiro et al. (2012) reported community college transfer students were less likely to persist at a four-year institution. The results of this study supported the results

of Shapiro et al. (2012) with native students (88.6%) persisting at a significantly higher rate than community college transfer students (80.0%).

The differences in persistence between native and community college native students could be attributable to a variety of factors. For instance, within biological sciences, the class size is often much smaller at community colleges than at the primary four-year institution. Smaller class size can often relate to more individualized attention for the student from the instructor. As in Mitchell's 2015 study, this was one factor why students often choose to enroll at a community college. Faculty interactions were also discussed as positive influences for community college students and as negative influences for posttransfer community college students (Townsend & Wilson, 2006). This could provide an opportunity for both community college and four-year institution student services to identify and address challenges related to vertical transfer, most specifically within biological sciences.

### ***Research Questions 3 and 4***

Many studies have investigated high school grade-point average as a correlate for success persistence in higher education. Research by Mertes and Hoover (2014) indicated that students with higher high school grade-point average were more likely to persist. Furthermore, Mery and Schiorring (2011) reported strong relationships with high schools as a positive factor for vertical transfer. In this study no significant difference in mean high school grade-point average was found between those students who persisted and those who did not. Persisting students had a mean high school grade-point average of 3.65 while nonpersisting had a grade-point average of 3.52. Similar to high school grade-point average, there was no significant difference in mean ACT composite scores for persisting (25.37) and nonpersisting (24.84) students. These results

indicate that both persisting and nonpersisting students have similar high school grade-point averages and ACT composite scores and individually would not be strong predictor of success.

#### ***Research Question 5***

The results indicated a significant difference in mean ACT composite scores between native and community college transfer students. The mean ACT scores for native students was 25.37 and 22.87 for community college transfer students. The results are inline when considering the admission requirements of the primary four-year institution and the local community colleges. Community colleges often enroll less academically prepared students (Mourad & Hong, 2011) and work to prepare them for vertical transfer. Lower ACT scores, specifically in math, may require those students to enroll in remedial courses. Students in remedial courses have been shown to have lower retention rates (Mertes & Hoover, 2014).

#### ***Research Question 6***

Though not significantly different for persisting and nonpersisting students, high school grade-point average was significantly different for native and community college transfer students. Mean high school grade-point averages for native students was 3.69 while community college transfer students had a mean of 3.51. As with ACT scores, community colleges often enroll students with lower high school grade-point averages, thus potentially enrolling a larger percentage of students in remedial courses.

### ***Research Question 7***

Final overall grade-point average at the primary four-year institution was analyzed for differences between native and community college transfer students. The results indicated a significant difference in mean final overall grade-point average between native (3.34) and community college transfer (3.05) students. Final overall grade-point average can be used as one measure of overall success of vertical transfer. The results of final overall grade-point average coincides with persistence rates for native and community college transfer students. Native students have both higher final overall grade-point averages as well as higher persistence rates. It is reasonable to assume persistence rates to decline with a decrease in overall grade-point averages.

### ***Research Question 8***

To better focus on the single discipline nature of this study upper-level biology course grade-point average was analyzed for differences between native and community college transfer students. This variable could provide valuable insight into how well community college are preparing students for their posttransfer course work. Native students would have complete lower-level biology courses at the primary four-year institution while community college transfer students would have completed those course at the community college level.

The data indicated a significant difference in upper-level biology grade-point average between native (3.02) and community college transfer (2.72) students. This indicated some difference in the overall level of preparedness for the upper-level biology courses between native and community college students. One potential source of difference is the extent to which math is used in upper-level biology courses. If community college transfer students are, generally,

less prepared in math at the time a transfer, a difference in grade-point average would be expected.

### ***Research Question 9 and 10***

In this study, both upper-level biology course and total overall grade-point average at the four-year institution were assessed for differences between native and community college transfer students using univariate methodologies. Understanding the differences in the two subpopulations would provide not only practical information as to better prepare transfer students but also a basis for more involved predictive analyses. For upper-level biology course grade-point average, native students had a significantly higher mean grade-point average (3.02) than did community college transfer students (2.72). A similar trend was found for final overall grade-point average with native students mean GPA (3.34) being significantly higher than community college transfer students (3.05).

After establishing differences between the two subpopulations, multiple regression analyses were used to identify significant predictors of upper-level biology course and final overall grade-point average at the four-year institution. From the univariate analyses, upper-level biology course and final overall grade-point average were both significantly different, with native students having a higher mean grade-point averages than community college transfer students. However, due to interactions between the predictor variables, transfer status was not a significant predictor of either upper-level biology course or final overall grade-point average. Upper-level biology course grade-point average was significantly predicted by high school grade-point average and ACT composite score while final overall grade-point average was significantly predicted by high school grade-point average, ACT composite score, and Pell

eligibility. Though univariate analyses indicated significant differences between native and community college students, the results of the multiple regression analyses suggest a variety of factors are involved with vertical transfer. This suggestion is substantiated by many previous studies that reported several other socially-related aspects being predictive of successful vertical transfer. For instance, Bailey and Alfonso (2005) reported counseling and advising strategies and learning communities being most predictive of success. Likewise, Cejda and Kaylor (2001) found that nearly half of the community college students interviewed mentioned faculty interactions as an important factor.

The analyses used in this study established significant differences in native and community college transfer students with native students having significantly higher persistence rates, ACT composite scores, high school grade-point averages, final overall grade-point averages, and upper-level biology course grade-point averages. Furthermore, the data suggest the community colleges in this study are accomplishing one their primary functions of preparing community college students for successful vertical transfer to four-year institutions (Mourad & Hong, 2011; Wood et al., 2012).

### *Recommendations*

According to Dewitt (2015) 46% of students enrolled at four-year institutions had been previously enrolled at a community college. With this large number of students enrolling at community colleges, a more seamless and reliable vertical transfer process is important. More successful transfer programs would benefit both community colleges and four-year institutions. The front-end benefit for community colleges would be the potential of increased enrollment if prospective students feel the community college can provide a quality two-year education with

the advantages of lower financial burden, smaller class size, and campus interaction. The back-end benefit for four-year institutions would be a more prepared and more motivated student. Research has shown that an increased course load at the community college attendance can significantly increase the likelihood of baccalaureate degree attainment (Mourad & Hong, 2011).

The purpose of this study was to investigate differences between native and community college transfer students and identify factors that influenced upper-level biology course grade-point average and final overall grade-point average at a four-year institution in biological sciences. Therefore, the significance is to provide a foundation for a more seamless transfer pathway between community colleges and four-year institutions in biological sciences by better alignment of curricula between institutions. This study may prove useful to administrators and faculty in aspects of recruitment, retention, and student success thus increasing persistence to graduation.

#### *Future Research*

**Math Grade-Point Average.** Friedl et al. (2012) found students who transferred a math credit from the community college had significantly higher grades in that course than did those native students who took the same course at a four-year institution. Subsequently, however, the transfer students earned poorer grades in successive math courses. Aptitude in math is an important component of success in biological sciences with upper-level biology courses relying largely on more advanced math concepts. Students who struggle with lower-level math, specifically during the first two years of college, would certainly struggle with more complex concepts seen in upper-level courses. This could lead to a lower mean grade-point average for upper-level biology courses as well as in the final overall four-year grade-point average. Math grade-point

averages were not considered in this study but should be include in future univariate and multivariate analyses. The following research concerning math grade-point averages is suggested:

- Compare mean math course grade-point averages between persisting and nonpersisting students at the primary four-year institution.
- Comparison of mean math course grade-point average between persisting and nonpersisting community college transfer students.
- For native students only, compare mean math course grade-point averages between persisting and nonpersisting students.
- Compare mean math course grade-point averages between native and community college transfer students.

**Remedial Education.** Remedial education was not considered in this study. However, at the community college level, a large proportion of students must take remedial math education. In a 2016 study of nearly 70,000 students, 80% of those students reported feeling they were academically prepared for higher education. However, 67% of those students were enrolled in remedial education. Furthermore, 40% of students enrolled in remedial education reported received a grade of A minus in that subject area in high school (CCCSE, 2016). In a study of nearly 1,000 students, D'Amico et al. (2013) found lower division success to be a predictor of posttransfer success. With that, future research should include remedial education and math grade-point average. The following research concerning remedial education is suggested

- Compare persistence between students who required remedial education and those who did not.

- Compare remedial education requirements between native and community college transfer students.
- Compare mean high school grade-point averages between those students who required remedial education and those who did not.
- Compare mean overall math grade-point average between those students who required remedial education and those who did not.
- Compare mean upper-level biology course grade-point averages between those students who required remedial education and those who did not.
- Compare mean final overall grade-point average between those students who required remedial education and those who did not.

The following research concerning math grade-point average and persistence, upper-level biology course grade-point average, and final overall grade-point average is suggested

- Assess gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, math grade-point average, remedial education, and transfer status as significant predictors of upper-level biology course grade-point average.
- Assess gender, high school grade-point average, Pell eligibility, first generation status, ACT composite score, math grade-point average, remedial education, and transfer status as significant predictors of final overall grade-point average?

**Nondemographic Variables.** This study was strictly quantitative using archival transcript data and as such could not estimate the significance of social aspects on the success of native and

transfer students at a four-year institution. As the literature revealed, a variety of qualitative variables effect overall success of students (Webb et al., 2014). Educational perspective (Adelman, 2006; Townsend & Wilson, 2006), campus environment differences (Carlan & Byxbe, 2000), psychological factors (Stewart & Martinello, 2012), and student support on campus (Mery & Schiorring, 2011) have all been investigated as possible links to overall success. Therefore, it is further recommended a mixed-methods study be conducted to pair both quantitative data and qualitative factors in an attempt to determine the extent that nondemographic variables influence vertical transfer success for community college transfer students.

### *Practical Implications*

The findings from this study may be used by science division faculty for better curricular alignment between the primary four-year institution and the area community colleges to increase persistence and overall success. The findings may also be used by community college and four-year administrators to adjust transfer agreements to both better prepare community college students as well as provide a more inclusive set of student services posttransfer. With community college transfer students in this study having lower high school grade-point average and ACT composite scores, there is an inherent disadvantage for transfer students to succeed at a four-year institution. This difference between native four-year and community college entrants is both a hurdle for community colleges but also creates the opportunity to close the initial preparedness gap between student types. There is no singular metric for vertical transfer success and thus there is no singular solution. The dynamics of transfer as well as the keys to success are

complex and multifaceted; however, it is at the benefit of all to continue to investigate this topic.

The impetus is on both community colleges and four-year institutions.

- Community colleges should strive to close the gap for transfer students and better prepare them for success.
- Four-year institutions should end the perceived stereotype of community college transfer students being less prepared than native students.

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