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Michael Callahan
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THE EFFECTIVENESS OF USING FLORIDA VIRTUAL HIGH SCHOOL COURSE DATA
DURING THE COLLEGE ADMISSION PROCESS AS A PREDICTOR OF DEGREE
COMPLETION WITHIN SIX YEARS.

by

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A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Education in Higher Educational Leadership
in the Department of Child, Family, and Community Sciences
in the College of Education and Human Performance
at the University of Central Florida
Orlando, Florida

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Major Professor: Kathleen King

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ABSTRACT

The admission process at higher education institutions has not adapted for online distance education classes taken in high schools, such as those offered by the Florida Virtual School. The purpose of this study was to determine whether online distance education courses taken in high school can serve as an indicator of student success in post-secondary education. An honors program at a large public research university provided the data examined. This honors program stored online distance education information in a database, which allowed for analysis. Presently, the institution's primary undergraduate admission office does not collect or store this type of information. I used SPSS Statistics to calculate logistical regression on this data. My goal was to discover what effect the high school online distance education variables had on the outcome of graduating in four or six years. Graduation rate is a key metric for colleges and universities as an indicator of success. For this reason, I wanted to determine through this study whether high school online distance education assisted in predicting which students will graduate. At least two stakeholders will find this information useful. Admission officers and, more specifically, honors admission officers will gain more insight into the student selection process as this study examines students in the top 10% of the incoming class. The other group, future researchers, will learn from this study and other new studies for even more understanding on this topic. Although the results indicated that high-achieving Florida Virtual School students do not graduate at higher rate than students who have not completed distance education classes, more research is required to understand how the other 90% of student applicants are affected by distance education courses completed in high school.

This work is dedicated to my wife Lauren and my sons Shawn, Luke, and Logan.

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LIST OF ACRONYMS (OR) ABBREVIATIONS

ACT: American College Test

AP: Advanced Placement

DE: Dual Enrollment

FTIC: First-Time in College

FVS: Florida Virtual School

GPA: Grade Point Average

IB: International Baccalaureate

SAT: Scholastic Aptitude Test

VHS: Virtual High School

CHAPTER ONE: INTRODUCTION

General Background

Admission requirements have been a part of American higher education since Harvard was founded in 1636 (Brubacher & Rudy, 1999). Over the years, these requirements have changed to fit the needs of higher education institutions. In the early 1900s, institutions started to organize and address the need for similar requirements (Beale, 2012; Kelly, Franzier, McNeely, & Ratcliffe, 1940). Beale (2012) noted that the admission process that most institutions use today was created in the late 1950s. Today, an admission office will examine a broad range of student data when making a final decision regarding student admission, including grade point average (GPA), Scholastic Aptitude Test (SAT) scores, American College Test (ACT) scores, advanced placement (AP) courses, International Baccalaureate (IB) programs, and Dual Enrollment (DE) courses.

Since the 1950s, higher education has continued to adapt and change how students are taught. In 1992, the introduction of the World Wide Web provided institutions a new way of reaching students by using online distance education. Since then, many sources have outlined the different types of online distance education (Allen & Seaman, 2013; Garrison & Kanuka, 2004; Hill, 2012; Moore, Dickson-Deane, & Galyen, 2011). For this study, fully online courses were the primary focus area. The evolution of online distance education has resulted in many states now offering these types of classes in K–12. Florida, for example, offered 120 different online courses in the 2013–2014 academic year (Florida Virtual School, 2014).

Other researchers have also examined K–12 online distance education. Kirby, Barbour, and Sharpe (2012) considered the advantages of high school online distance courses and found that they provide students access to a larger variety of classes. Due to the large number of high

schools and geographic zoning that requires students to attend specific schools, many schools have a limited number of highly qualified teachers in some subject areas (Kirby, Barbour, & Sharpe, 2012). Online distance education teachers can reach a larger number of students who might not have access to a qualified teacher in their high school (Kirby et al., 2012). Smaller schools often do not have the resources to offer specialized courses or a wide variety of AP or honors classes. With online education, these classes are available to students in small schools where there may be no teachers available for specialized or honors courses (Kirby et al., 2012).

Admission officers try to admit the most competitive students. These admissions officers hope the students they accept have the skills and ability to graduate in fewer than six years (Adelman, 2000; Astin & Oseguera, 2003; Oseguera, 2005). For this reason, the admission process is crucial for a higher education institution. The role of admissions has become even more critical with the advent of performance-based funding in Florida in 2013 (Dougherty & Reddy, 2013). Within this model, the students who are not admitted do not affect these institutions' benchmarks. Once a student is admitted, however, it is in the best interest of the institution to do everything possible to help the student graduate in the six-year window, due to performance-based funding metrics (Dougherty & Natow, 2015).

Statement of the Problem

From 2000 to 2010, online distance education grew about 10% per year, while higher education overall has grown 2.6% per year (Allen & Seaman, 2013). With this level of growth, there should be a better understanding of how online distance education affects the higher education system (Hill, 2012; Windes & Lesht, 2014). In a study on perceptions of online courses, Allen and Seaman (2013) found that many academic leaders view online courses positively. They noted that the percentage of leaders with a positive viewpoint increased during

the decade that Allen and Seaman evaluated online distance education. This increase in positive views of online courses may have led the Florida Department of Education (2011, 2015) to require online education for many students graduating from public high schools across the state. Because of this policy, in 2014, Florida ranked first in online high school education enrollment across the country (Watson, Pape, Murlin, Gemin, & Vashaw, 2014).

In recent years, there has been a great deal of research about online distance education. However, the few studies that examined how online distance education spans high school and higher education – such as Kirby, Barbour, and Sharpe (2012) and Rovai (2003a) – did not focus on how online education affects admission and graduation rates for higher education institutions. The need to improve the admission process is revealed in the changes to funding at public higher education institutions (Dougherty & Natow, 2015). State funding models and the metrics used to measure the success of a university make it critical for a university to admit students who are likely to graduate on time.

Theoretical Framework

This study used systems theory as the theoretical framework to examine the admission process at higher education institutions. Bertalanffy (1968) and Birnbaum (1988) explain systems theory as the process of observing a larger system that is composed of multiple subsystems, which each have inputs, processes, and outputs. Inputs are the items that are supplied to the system. To understand systems further, consider the combustion system in a car. The gas, air, and spark are the input. The process is what the system does with the inputs. In the combustion system example, the combination of the gas, air, and spark create the explosion in the engine. Combustion (the process) is the purpose for which the engine system was built. The final step in systems theory is the output, which is the result of the process. This action can differ

drastically for each system, depending on what the system is intended to do. In the combustion example, the output is the power the engine creates to move the car. Breaking down a larger system into subsystems allows for better understanding of the subsystem being examined.

When applying systems theory to higher education, the primary system in this example is higher education, and it is comprised of many subsystems, such as advising, housing, athletics, and admissions. Each of these subsystems has inputs, processes, and outputs. In the case of admissions, the input is the data on the application, the process is the act of making a decision, and the output is the incoming freshman class admitted to the institution.

Understanding the admission process and the effect that online distance education could have on the process would be problematic if examined at a higher level. In this study, I examined the admissions inputs, processes, and outputs in greater detail by applying systems theory (see Figure 1) and breaking down the admission process to the subsystem level.

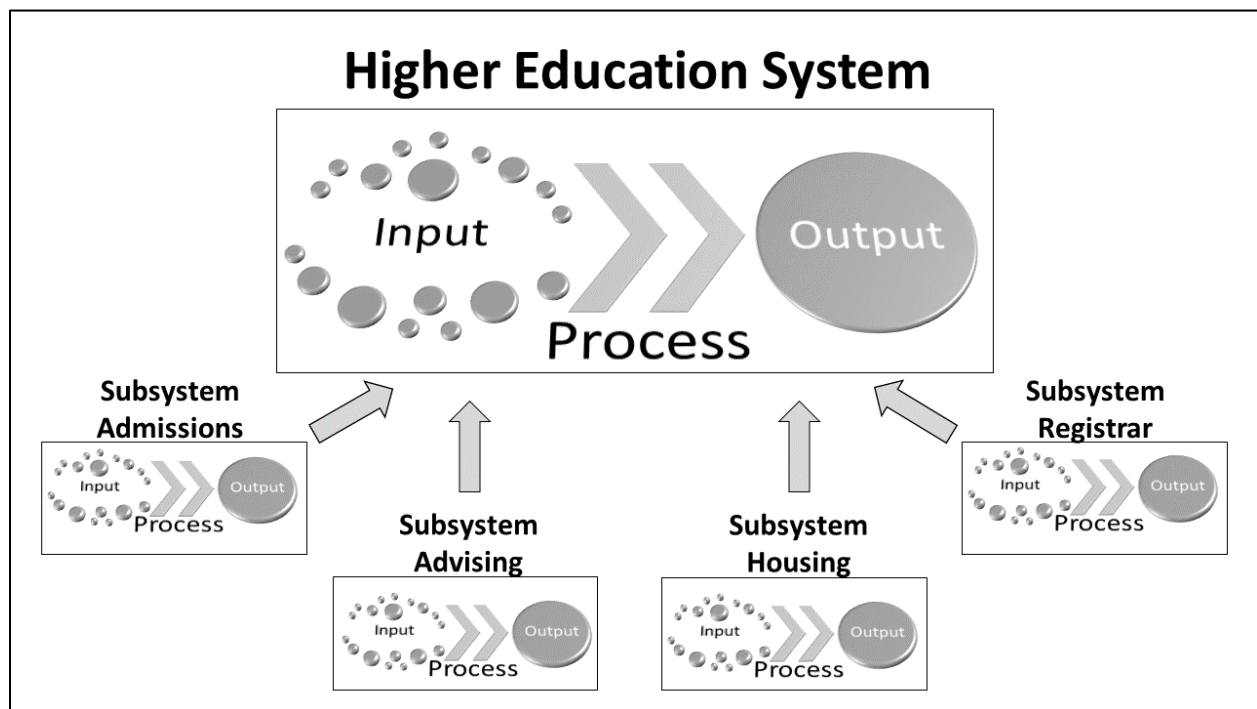


Figure 1. Higher education system and subsystems example.

My strategy was to change the information provided during the input step of systems theory. The new variables added to the input included online distance education classes taken in high school. The online distance education variables could be included in the institution's admission application form. This addition, in turn, changed the process stage to include this new information in the admission decision process. The output of the admission system – the students admitted – could change based on this new input and process. My goal was to examine whether by changing one input variable (and therefore the related process), the system would produce a different output that helps increase an institution's graduation rate.

Significance of the Study

The purpose of this study was to identify whether there was any relationship between taking Florida Virtual School (FVS) online distance education in high school and completing a four-year undergraduate degree in fewer than six years at a large public research university in the state of Florida. Due to the variations among online distance education programs, I limited this study to examining FVS courses. I studied online distance education courses at the high school level, as opposed to the college level, because these are the courses a college admission officer would review.

The honors admission office at the institution being examined has indicated that admission offices are the gatekeepers for many institutions. Researchers like Olivas (1998) and, more recently, Zimdars, Sullivan, and Heath (2009) confirm this statement. If key identifiers determine student success or failure, it is the job of the admission office to act on the identifiers by either turning away or admitting students. After students are admitted to a large public research university, they must choose a major. Majors are structured for completion in four

years. Although some students obtain their degree in this time frame, the state uses a six-year time frame when ranking the institution's performance for funding (Oseguera, 2005).

Finally, I chose to examine honors program data for two reasons. First, the honors program is one of the few with the dataset needed to perform such a study. Second, a variation of the mediating variables would be limited. Creswell (2014) defined mediating variables as probable cause links between the dependent variable (whether students graduate in four or six years) and the independent variable (online distance education variables). In this study, the mediating variables include high school GPA, standardized test scores, and the number of advanced courses completed. Because the variation in the mediating variables is slightly more limited in the honors program, the research focused on the independent variable.

Should I discover through this research that online distance education has a positive impact on completion rates of students admitted, the admission criteria used by admission office personnel could change. For example, high schools across the county would need to update the format of their transcripts to identify online distance education courses, making it easier for the college admission officers to find the required information. In addition, admission office personnel would begin to track distance education in much the same way as GPA, SAT, ACT, AP, IB, and DE are tracked today. Finally, data systems would need to record the information and the decision matrix would need to be updated to include online education. The associate vice president and director of admissions at the school being examined indicated that high school online class information is not currently stored or recorded in a manner that is easy to track or report.

Although there have been some studies that focus on the high school-to-college transition (Kirby, Barbour, & Sharpe, 2012; Rovai, 2003a; Venezia & Jaeger, 2013), I concentrated on the

effect of distance education on the higher education admission process and graduation rates. By understanding what information is fed into the system and how that information is processed, a clearer picture can be formed of how the system works today. With this understanding, I examined how changes in the input and process affected the output of the selection of students who have a high chance of succeeding in their academic careers.

Purpose Statement

Using FVS classes as online distance education courses taken by high school students, I examined whether students' records of online distance education courses and their GPAs in those courses can provide the insight needed during the admission process to select the students most likely to complete their degree in four to six years. The objective of this study was to determine whether online distance education courses taken in high school can serve as an indicator of student success in post-secondary education. This indicator of success is important for higher education institutions because many of them are limited access, meaning that not all students who apply for admission are accepted. With limited access, it is the goal of the admission office to award these openings to the students most likely to complete their degrees.

In this quantitative study, I examined the effect of high school distance education on student success rate in higher education. By analyzing the four- and six-year success rates of students who completed at least one distance education class through FVS, this study could provide admission offices with an additional criterion in predicting and selecting successful students.

Understanding the Need for the Study

In this section, I discuss the need for this type of research by focusing on two main areas of literature. The first is graduation rate, as it is a significant indicator of success for an

institution of higher education. The second is performance-based funding, as this is how institutions in the state of Florida allocate the limited financial resources granted by the state and federal governments.

Graduation Rate

Allen and Seaman (2013) noted that as the number of students seeking higher education continues to grow, it becomes increasingly important to understand graduation rates, as once a student is admitted to an institution, the task begins for that student to graduate. According to Tinto (2006), many consulting firms specialize in helping colleges increase graduation rates. In the past, the research on graduation rates examined graduation in a four-year sliding window. At the turn of the 21st century, studies showed that it would be more effective to monitor degree completion in a six-year time frame (Adelman, 2000; Astin & Oseguera, 2003; Oseguera, 2005). A primary reason for this shift relates to income levels. With less state funding and rising tuition costs, lower-income individuals often cannot afford to be full-time students, as they frequently need to work, either part-time or full-time, while attending college (Tinto, 2006). As a way to encourage students to finish in fewer than six years, the Florida Legislature, in 2011, passed Florida Statute 1009.286, which allows universities to charge students an extra fee for credit hours that are taken beyond those needed for their degrees. One of the purposes of this statute is to limit the number of additional classes students take, thus, hypothetically, reducing the time they take to graduate (Grove, 2007).

Tinto (2006) highlighted how complex student retention is and noted that it is one of the most researched topics in higher education; however, it is still not fully understood. Because of this complexity, he suggests that researchers need to address the topic in new ways. There is a gap in the literature relating to examining distance education's role in admissions and its effect

on retention. If we could identify students without the motivation or desire to graduate in six years or fewer before they were admitted, graduation rates could increase beyond the historical norm. In this study, I examined whether having taken distance education courses in high school is a predictor of student success at the higher education level as evidenced by the six-year graduation rate. Tinto (2006) indicated that we have much more to learn about retention. Despite the vast amount of research, researchers need to find new and innovative ways to understand and improve retention.

Performance-Based Funding

The premise of performance-based funding is simple; in theory, it is a way of awarding funding based on the ability of higher education institutions to meet desired outcomes. These outcomes may include, but are not limited to, job placement rates, course degree completion rates, and retention. The funding does not account for the inputs, such as growth in enrollment, but rather the outputs of the institution, such as graduation rate. The funding authority is the group that will determine the metrics for award funding and how much each metric will be worth. The impetus behind this model of financing is to push higher education institutions to be more productive in the goals set by the finance authority and to reward productivity with financial incentives (Burke, 2002; Dougherty & Hong, 2006; Dougherty, Natow, Bork, Jones, & Vega, 2013; Layzell, 1999; Ruppert, 1995).

A key driver across the country in the performance-based funding model was the reduction in state revenues collected each year, along with the rising cost of higher education (Dougherty et al., 2013; Zumeta, 2001). With the increase in the college-age population in the 21st century, more people than ever were choosing to attend college. This increase in college attendance, in combination with the growth in cost-per-student, surpassed the states' limited tax

revenues (Burke, 2002; Dougherty et al., 2013; Zumeta, 2001). Solving these problems required a new model, and performance-based funding for higher education was the solution for some states.

The state of Florida adopted performance-based funding for higher education for the first time in 1996. When it was first adopted, two-year public colleges used this budget model because it was still under evaluation for its effectiveness. Performance-based funding lasted until 2008, when this funding model was suspended because of the economic recession. Performance-based funding returned in 2013, this time affecting both four-year and two-year public colleges (Dougherty & Reddy, 2013; Dougherty & Natow, 2015).

In a study presented to the Florida Board of Governors (2016), online distance education reduced the amount of time it takes for a student to graduate with a four-year degree. Because the six-year graduation rate is used as a metric in the performance-based funding model, this finding could help institutions reduce the time students take to graduate and increase the six-year graduation rate, in turn increasing state funding.

Research Questions

I hypothesize that online education in high school has a positive effect on the completion of a four-year undergraduate degree. By exploring the existing literature, defining the background, and recognizing the current situation, in this study, I answered the following questions:

1. What effect does completing Florida Virtual School academic online classes, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of first time in college (FTIC) honors

students completing a four-year undergraduate degree at a public research university in four and six years?

2. What effect does the number of Florida Virtual School academic online classes completed, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of FTIC honors students completing a four-year undergraduate degree at a public research university in four and six years?
3. What effect does Florida Virtual School GPA, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of FTIC honors students completing a four-year undergraduate degree at a public research university in four and six years?
4. What correlation do the current academic achievement variables (standardized test scores, GPA, and advanced coursework) have with the new Florida Virtual School admission variables (attended, the number of courses, GPA) toward completing a four-year undergraduate degree at a public research university in four and six years?

Null Hypotheses

For Research Question One, the null and alternative hypotheses are as follows:

- Null – There will be no difference in graduation rates between students who completed Florida Virtual School classes and those who did not.
- Alternative – There will be a difference in graduation rates between students who completed Florida Virtual School classes and those who did not.

For Research Question Two, the null and alternative hypotheses are as follows:

- Null – There will be no difference in graduation rates between students who completed one Florida Virtual School class and those who completed several classes.
- Alternative – There will be a difference in graduation rates between students who completed one Florida Virtual School class and those who completed several classes.

For Research Question Three, the Null and Alternative Hypotheses are as follows:

- Null – There will be no difference in graduation rates between students who had high Florida Virtual School GPAs and those who had low GPAs.
- Alternative – There will be a difference in graduation rates between students who had high Florida Virtual School GPAs and those who had low GPAs.

For Research Question Four, the Null and Alternative Hypotheses are as follows:

- Null – There will be no correlation in the current admission variables compared to the new Florida Virtual School admission variables.
- Alternative – There will be a correlation in the current admission variables compared to the new Florida Virtual School admission variables.

Definition of Terms

- Academic online course or class – A class taken online for core academic value, such as English, algebra, or Spanish.
- ACT – American College Testing college readiness assessment is a test for sophomore, junior, and senior high school students. Professor E.F. Lindquist from the University of

Iowa developed this test in 1959. Today, ACT Inc. administers and publishes the test (ACT Inc., 2016).

- AP – Advanced Placement is a high school class offered by the College Board that offers college credit based on scores on an exam at the end of the course.
- College – Refers to all forms of higher education, both two-year and four-year institutions.
- DE – Dual enrollment refers to students enrolled in a college course while attending high school.
- Distance learning – Instruction where the student and the faculty are not located in the same room.
- Face-to-face instruction – Instruction where the student and the faculty are located in the same room.
- FTIC – First time in college refers to students who have recently completed high school and are attending college for the first time.
- FVS – Florida Virtual School is the largest public virtual school in the country.
- GPA – Grade point average is an average of all class grades received.
- IB – International Baccalaureate is a high school program overseen by an international educational foundation headquartered in Geneva, Switzerland.
- SAT – Scholastic Aptitude Test is a test for sophomore, junior, and senior high school students. The College Board administers and publishes the test. Carl Brigham originally authored the test in 1926, and it was first administered to students applying to Yale, Pennsylvania, Princeton, Smith, Wellesley, Vassar, and Harvard, among others (Fuess, 1950).

- University – Refers to four-year bachelor’s degree-awarding institutions.

Summary

By following Ludwig von Bertalanffy’s (1968) systems theory model, in this study I explored the impact of online distance education on the admission process at a large public research institution in Florida. Through changing which factors are used as an input for admissions decisions and how that information is processed, the expectation is that institutions would observe students graduate in six years or fewer at a higher rate, resulting in an output of higher performance metrics to report to the state.

Online distance education is a relatively new concept in the history of higher education. There is still much we need to learn. Many researchers attempt to answer a question on the subject, only to find that this only leads to more questions. Such was the case with Amro, Mundy, and Kupezynski (2015)’s study that examined a traditional versus an online algebra class. The literature review of this study revealed that some previous research showed that students in online classes outperform students in traditional classes, while other researchers have found the opposite results (Amro, Mundy, & Kupezynki, 2015).

There is a need for more research on online distance education to better understand this relatively new method of instruction. Many agencies and institutions use the graduation rate of students in six years or fewer as one of the performance metric used to gauge success (Dougherty & Reddy, 2013). For this reason, any approaches that could improve this success marker should be explored and studied. As academia changes, researchers must investigate higher education practices to find improvements.

By observing and researching the admission process, and introducing the online distance education variables to this process, we can build new knowledge on the firm foundation of existing research. The need for the questions I outlined above will be evident when graduation rates and performance funding are examined in the literature. In the next chapter, a literature review will highlight the admission process and distance education. This literature review will close with an understanding of the theoretical framework used in conducting the research. This baseline understanding will help to develop a future understanding of how distance education in high school effect higher education graduation rates.

CHAPTER TWO: LITERATURE REVIEW

Introduction

In this chapter, I examine the literature germane to the research questions asked in Chapter One. Higher education growth, needs, graduation rate, funding models, admissions, distance education, and systems theory are examined in detail.

This chapter begins with the history of higher education, admissions, and distance education, which reveals the impact these questions had in the area of higher education. In addition, I deconstruct the admission process. First, it is necessary to understand the admission process and its evolution. The next step is to explore undergraduate applicants and the information they provide. The last step is to examine information processing and how admissions offices attempt to select the most deserving students. Depending on the results of this study, the findings might influence how the admission process is completed at higher education institutions.

Online distance education is the next category reviewed. In a few short years, online education grew at a compounded rate of 17.3% per year from 2003 to 2013 (Allen & Seaman, 2013, p. 18). Although this growth has occurred in online distance education as a whole, online distance education classifications have been formed to group similar styles of classes together for analysis. I examine online education immediately after traditional education, so it is easy to compare and contrast. Next, I explore Florida Virtual School (FVS) to understand how it has grown to be the largest online public high school in the country (Catalanello & Sokol, 2012). The last two topics are predicting success and course completion. There are issues that relate to the admission process that needs to be explored. Predicting success and course completion will

demonstrate that online distance education has the potential to provide insight into student performance.

The final section of Chapter Two is the relevance of systems theory. Through this lens of systems theory, the input of information, the processing of that information, and the outcomes will become clear. Making small adjustments to the input phase of systems theory and recognizing how the outcome is affected can demonstrate the effect of change within the confines of the system.

Historical Background

In this section, I examine the growth of higher education, the evolution of admissions, and the development of online distance education. These are the three most important areas reviewed in this research study. In order to move forward, a strong understanding of the past is needed.

Higher Education Growth

Higher education in the United States is growing. Cole (2009) found that over 1.4 million undergraduate degrees were awarded in the country during the 2004–2005 academic year (p. 182). In the same year, over 140,000 professional and doctoral degrees were awarded (p. 182). In the last five years of available data, the United States Census Bureau reported that the number of people age 25 and older who have earned at least a bachelor's degree has grown from 58,573,000 in 2009 (United States Census Bureau, 2009) to 66,879,000 in 2014 (United States Census Bureau, 2014). During the same period, the “some college, no degree” category grew from 33,832,000 in 2009 (United States Census Bureau, 2009) to 34,919,000 in 2014 (United States Census Bureau, 2014). Although higher education, in general, is growing, Allen and Seaman (2013) revealed that in the ten-year span from 2002 to 2011, online education had a compound

annual growth of 17.3% (p. 18). They point out that this form of higher education is growing much faster than higher education overall which has a growth rate of 2.6% (p. 18).

The United States is encouraging a greater percentage of the population to obtain bachelor's degrees each year; however, the country has not experienced a significant change in retention rate. Student retention has been widely studied since the 1960s; yet, even with all the research completed, papers and books published, and conferences held, the retention rate has changed very little (Tinto, 2006). The six-year graduation rate still hovers in the 60% range, depending on the year (Kena et al., 2015, p. 28). The National Center for Educational Statistics (2005) confirmed this finding by completing a five-year study where four-year higher education public schools had just under a 55% graduation rate (p. 7).

The Evolution of College Admission Requirements

When the first several American colleges formed from 1642 to 1650, the admissions process was simple – students only had to demonstrate proficiency in Latin and Greek. This standard continued for over 100 years; however, arithmetic was added as a requirement in the 18th century (Beal, 2012; Brubacher & Rudy, 1999). With few colleges and a limited need for college graduates, these admission criteria were all that were evaluated when admitting new students.

As the demand for college graduates grew over time, so did the number of colleges. Private colleges began opening their doors, and soon every college had their own admission requirements. Secondary schools and applicants struggled to understand what each school wanted, and it was difficult to apply to more than one or two schools (Beale, 2012). From 1890

to 1920, accreditation agencies were tasked with finding common admission requirements across all colleges (Beale, 2012; Kelly, Franzier, McNeely, & Ratcliffe, 1940).

It would take until 1956 for college admission requirements to become similar for most colleges and universities. Six main areas became the focus of admissions: high school graduation, required core subjects, class rank, high school principal recommendation, admission interview, and aptitude test scores (Beale, 2012). GPA and standardized test scores became a standard way of measuring academic achievement in terms of measuring students as an admission indicator for higher education (Steinmayr, Meibner, Weidinger, & Wirthwein, 2015). By the 1960s, once the standard was in place, admission directors would begin to account for personal attributes such as character, leadership, and emotional stability. Once admission offices started comparing these attributes, in addition to the standard requirements, students could differentiate themselves from those with the same grades because the student character evaluation allows students to make a deeper impression on admission officers (Beale, 2012).

The Evolution of Online Distance Education

Four major communication inventions have revolutionized teaching: writing, printing, the telegraph, and computer communication (Harasim, 2000). The world changed in 1992 with the public release of the World Wide Web. This development left an impact on almost everything. For centuries, traditional higher education used face-to-face communication as the primary means of teaching students. Distance education allows a transition away from this face-to-face communication. Online distance education started with the U.S. Army when it began using the internet to train soldiers all over the world. With this success, in 2001 the Army developed “eArmyU,” its degree-earning branch of online distance education (McMurray, 2007).

One of the many points addressed by Harasim (2000) in his historical research involved new patterns of student engagement. By examining Virtual-U (an online education platform), which has “over 439 courses taught by 250 faculties to 15,000 students,” (p. 41) Harasim found that online distance education changed the way asynchronous communication could be delivered. With the internet, asynchronous communication allowed for learning through active engagement. This new model allowed students to work at their individual pace. The platform helps the professor provide asynchronous support at any time (Harasim, 2000; Kena et al., 2015). Furthermore, research demonstrated that in an online class, communications were more evenly distributed between the faculty and the students (Harasim, 2000).

With these changes, the landscape of higher education was transformed forever. Computer networks were being used to teach and share knowledge in ways that had never before been possible. Online education had taken a foothold in the mainstream as a way to educate (Bozkurt et al., 2015; Harasim, 2000). In a relatively short period of time, institutions and organization introduced and tested the medium as a supplemental learning tool. Today, students can earn a degree entirely online, without attending a physical classroom (Harasim, 2000). As Harasim (2000) stated, “Not all shifts along the tectonic plates create earthquakes of great magnitude, but eventually they cause the global landmass to change shape. Shift in educational models is also definitely happening in the same way” (p. 60).

Summary

With changing policies and the growth of higher education, there is a need to discover better ways to identify students during the admission process, students who will work to complete their degree in six years or fewer. For many public universities, state funding levels are based on graduation rates, along with a few other performance-based metrics. The literature

supports this idea. In the next section, I will examine the efforts to address the need for students to graduate in six years or fewer and what gaps exist that, when addressed, might improve the system in the future.

College Admission Process

The Senior Honors Admission Specialist at the institution in question shared that admission practices range on a scale of open access to highly selective, limited access. It was explained that open access would be similar to the admission process in a state or community college, where the goal is to grant admission to as many people as possible. On the other end of the spectrum are the highly selective, limited access schools. These institutions have rigorous standards that students must meet and sometimes exceed. Ivy League schools often have exceptionally high admission criteria. When applying this information to this study, the selected institution is about halfway between open and limited access. This institution has a limited number of students it can admit, and there are GPA and test score requirements to assist in the selection process. The Honors Program from which data was collected is more selective than the institution as a whole, but not as restrictive as the Ivy League schools.

Three main areas are explored regarding the admission process in this section. First I review of studies that examined how admission offices were able to predict the success of students in higher education. Next I review the research deliberating the use of high school GPA and standardized tests. Finally, I examine the SAT and ACT tests more carefully to learn how they affect admission decisions .

Admission Prediction of Success

There has been a significant amount of research on how to predict success regarding college admissions. Because of research efforts in the 1950s and 1960s, many admission offices still use GPA and SAT scores as a means of admission today. Burton and Ramist (2001) reviewed and compared studies that examined this topic and concluded that SAT and GPA scores are the best predictors of success when examining incoming students. These predictors were determined by reviewing research data extending from 1980 through the late 1990s. Another study by Rohr (2012) examined 803 FTIC students at small liberal arts colleges admitted from 1992 to 1998 and followed them until the students left the institution. By investigating GPA and SAT scores as common data points, Rohr (2012) found that for each point the GPA and SAT increased, there was a direct correlation in the retention of students in the STEM (science, technology, engineering, and math) fields. Oseguera (2005) studied over 60,000 FTIC students at more than 300 institutions to understand the effect that different racial and ethnic groups have on the indicators of graduation during the admission process. She discovered that institutional culture for racial and ethnic groups was a better indicator of degree completion than the incoming scores. Rohr (2012) expanded her research to explore minority and religious groups and found that standardized tests such as the SAT are not as reliable an indicator of success for racial and religious minority students.

Rohr (2012) determined it to be easier to predict those students who will not graduate than those students who will graduate. This prediction of graduation has almost 90% accuracy when observing high school GPA and SAT scores of students in the fields of science, technology, engineering, mathematics, and business. Rohr (2012) discovered that when a student's high school GPA rose by one point, his or her chance of meeting the graduation

requirements doubles. The data from SAT scores was helpful but not as precise as the GPA data. Higher SAT scores did increase the graduation rate of students, but only slightly. For each point a student's SAT score increased, the chance of that student being retained would increase 0.3%. According to Rohr (2012), SAT scores do help in predicting retention; however, GPA was considered a much better predictor. With an increase in the number of students applying to institutions, admission offices have attempted to find better ways to evaluate students who have applied. High school GPA and SAT scores have proven to be reliable metrics based on the research (Oseguera, 2005; Ramist, 2001; Rohr, 2012).

Admissions beyond GPA and Standardized Tests

Beyond GPA and SAT scores, there is another important part of the admission process today. The advanced placement (AP) program started in 1955 as a way for high school students to earn college credit in high school (Geiser & Santelices, 2006). AP classes did not weigh heavily in the admission process until the 1980s, after which the admission process began to change quickly. A recent study by the National Research Council (as cited in Geiser & Santelices, 2006) reported that 264 institutions use AP and other honors courses to identify students who are the most qualified to be admitted.

A study conducted by Kretchmar and Farmer (2013) demonstrated how AP, International Baccalaureate (IB), and Dual Enrollment (DE) have changed how college admissions officers evaluate students applying for college. The question that Kretchmar and Farmer (2013) wanted to address was whether a student who took a greater number of advanced courses would be more likely to graduate than a student who took fewer advanced courses. The idea that high school alone will prepare you for college is slowly drifting away; in its place, students are compared to each other based on how many college-level classes they have taken (Kretchmar & Farmer,

2013). Geiser and Santelices (2006) revealed that examining the number of AP and honors courses students take has become the accepted norm in the admission process. AP and IB courses are regarded as more rigorous, and institutions are weighing this information more heavily as part of a quantitative admission process.

To examine advanced coursework and discover whether more college-level classes mean higher levels of success, Kretchmar and Farmer (2013) conducted a study of 3,626 students at University of North Carolina–Chapel Hill (UNC Chapel Hill) in 2010. Fewer than 2% of these students took more than 15 college-level classes; these students were not included in the study. The remaining students ranged from completing zero to 15 AP classes. The number of AP classes the students had taken was correlated with their GPA at the end of their first year at UNC Chapel Hill (Kretchmar & Farmer, 2013). Students who took five college-level classes in high school performed almost as well as those who took 15 college-level classes in high school, suggesting that taking more AP classes was not a significant predictor of success. However, there was a significant college GPA difference between those who took no college-level classes in high school and those who took five college-level classes in high school. Kretchmar and Farmer (2013) suggested that admission offices should weight students who took five college-level classes greater than those who took less, but after that, students should be free to explore outside the classroom to find ways to stand out as an applicant. Not all students have the opportunity to take many college-level classes, and it is unfair to compare these students to those who took more than five (Geiser & Santelices, 2006; Kretchmar & Farmer, 2013). Other factors should be examined to find the most qualified students for admission (Kretchmar & Farmer, 2013). However, it is what the admission office does with the application information and how this information is interpreted that affects colleges the most.

Understanding SAT, ACT, and the Admission Decision

When high school students wish to attend an institution, one of their first interactions with that institution is often the admission office. The admission office needs to gain as much information as possible on the prospective student before the admission decision is made. An admission office does not want to discourage students with tough entry requirements; however, the institution needs to make informed decisions. Klasik (2013) revealed more about the process of applying for college by studying which high school students apply for college. He examined the data for trends to predict who would apply for college and found that completing the SAT or ACT was an excellent predictor of which students would apply to an institution of higher education and which ones would not. Based on this type of research, several states created State College Entrance Exam requirements for graduating from high school. States such as Colorado, Illinois, and Maine wanted to remove barriers to college admission by making the SAT or ACT a requirement for graduating from high school. The idea was that completing one of these tests would encourage high school graduates to apply for college (Klasik, 2013).

When the data generated from this policy was collected and examined, it showed very little change in enrollment levels. However, when the data were broken down to display enrollment in two-year versus four-year and public versus private institutions in the three states examined (Colorado, Illinois, and Maine), the results revealed that four-year enrollment increased and two-year enrollment decreased. In addition, private schools not public schools saw the most growth in enrollment (Klasik, 2013).

These states' attempts to change the high school requirements to include completing the SAT or ACT failed to increase the number of high school graduates going to college. Klasik (2013) concluded that other factors were at play in determining who attends college and who

does not. Financial aid was cited as another factor influencing how many high school graduates attend college. In today's tough economic climate, states need to ensure they are spending their money wisely – paying for every student to take an entrance exam as a prerequisite to graduation could be regarded as an unwise economic choice based on the admission data (Klasik, 2013).

Atkinson and Geiser (2009) compared standardized testing to high school GPA in a historical review of admission practices. While many feel that GPA is not as good a predictor due to the inconsistencies between schools, Atkinson and Geiser (2009) reported that GPA was a better predictor than standardized testing in higher education success. Kirst (1998) recommended that the SAT II (as it was called then) should replace the SAT I as an admission requirement to higher education, as it was expected to reflect higher standards. Almost ten years later, Atkinson and Geiser (2009) made the same suggestion, noting that the SAT was redesigned in an effort to increase its ability to predict college success. Despite the efforts to make the SAT a better predictor of college success, studies by the College Review Board revealed no difference between the old SAT test and new versions. Atkinson and Geiser (2009) found the ACT to have the same shortfalls as the SAT and suggested that many higher education institutions use these exams to rank students against one another. Atkins and Geiser (2009) suggested that these tests cannot determine mastery of the content learned in high school.

Admission Summary

The literature reveals how the admission process has evolved into its current form. It also reveals some predictions about how successful a high school graduate will be in college. However, there is a noticeable gap in this research – discovering whether admission offices can use distance education as a predictive indicator in the same way they have used GPA, SAT, ACT, AP, IB, and DE. Because distance education has not been studied like these other

indicators, there is support for examining this hypothesis. Does taking an academic education class increase the six-year graduation rate within college?

Online Distance Education

In this section, I examine online distance education in detail, beginning with a comparison of distance and traditional education. Types of online distance education, the growth of online distance education, and success factors in online distance education will be addressed in the next three sections. I will explore the FVS before addressing predicting online distance education success and online distance education completion of courses and degrees.

Distance Education vs. Traditional Education

Understanding the differences between online distance education and traditional classes is essential for establishing the background of this research topic. With this understanding, administrators and faculty can make better choices regarding which courses should be offered online and which should not. By investigating the curriculum as a whole, and online distance education as a strategy for learning, we can identify and fill gaps. One example of this approach is adding online learning classes to increase all students' comfort with learning online. Higher education cannot assume that all students will have the computing skills needed to be successful in an online distance education course. Adding online classes to the high school curriculum or as a pre-requisite are examples to ensure all students learn the skills they need to be successful in this mode of learning (Robinson & Doverspike, 2006).

Robinson and Doverspike (2006) found that student attitudes were a major factor in understanding who would take an online distance education class. Many students want to interact with faculty. Sitting in a face-to-face class provides this interaction with relatively little planning

needed to make it happen. Meanwhile, online distance education classes can have a high level of interaction between faculty and students, but this interaction will not occur without the faculty deliberately including it in the class structure.

Next, Maki and Maki (2002) noted that students did not show much excitement for online distance education classes. They found that if given a choice, students would rather attend a traditional lecture-based course. They pointed out that most students are more familiar with the traditional lecture classes. This familiarity with traditional lecture classes does not mean that students feel they would suffer in an online class; however, most students favor the traditional setting (Maki & Maki, 2002; Robinson & Doverspike, 2006).

However, in a more recent study, Allen and Seaman (2011) compared attitudes about online classes to face-to-face classes, they found that one-third of institutional leaders feel face-to-face classes are still a better way of teaching students, and that online education learning outcomes are not as high as their face-to-face counterparts. The percentage of respondents who expressed that online classes are equivalent to or better than face-to-face classes has increased from 57% in 2003 to 67% in 2011 (Allen and Seaman, 2011, p. 5). Along with this growth in faculty acceptance of online education as a legitimate form of education, Allen and Seaman (2011) discovered that one-third of the chief academic officers in higher education institutions believe the faculty value online education.

The existing research on traditional versus online distance education has identified areas where more research is needed. Mann and Henneberry (2012) suggested that a greater understanding was needed on the effects of Web 2.0 technologies, including how they affect the format in which students want to take a class. As information systems continue to advance the

tools used for online education, developers are creating viable ways to bring classes like science labs to the world of online distance education.

With the online distance education population growing, there is a need to understand it better. Howland and Moore (2002) studied the perceptions and experiences of those students who enrolled in online distance education classes. Students reported both positive and negative experiences. Students who reported a positive experience liked the independence and responsibility that online learning gave them. On the other hand, students with a negative experience indicated that they were overwhelmed and that they had the same mental model approaching the online distance education class as they had for a face-to-face class.

When comparing traditional education to online distance education, learning strategies and communication were the keys. Students found that managing time and tasks, along with the organization of information, were the keys to their success when taking an online distance education class (Howland & Moore, 2002). Students reported in their self-assessments of their learning that the online instructor did not adequately teach them. Many students felt that the instructor abandoned them to learn on their own. Because of the feeling of abandonment, students reported communication as another key factor. Similar to the study completed by Robinson and Doverspike (2006), Howland and Moore (2002) found that instructors and students must interact to facilitate learning. In a face-to-face class, direct communication is accomplished via the lecture, but in an online class, direct communication must occur through online discussions, email, phone, and other forms of distance communication. Without this communication, students reported difficulties and unnecessary challenges in the course (Howland & Moore, 2002).

As noted in the previous studies, traditional students tend to prefer face-to-face classes. On the other hand, non-traditional students have been attracted to many of the online distance education classes because of their flexibility and convenience –one of the most commonly stated benefits of distance education is access. Fontenot, Mathisen, Carley, and Stuart (2015) also found that scheduling and timing were the most significant predictors of enrolling in online classes for marketing undergraduate students. This result is similar to many other studies on the topic of online indicators.

Fontenot et al. (2015) researched the effect of online distance education on 165 out of 438 students who responded to a survey. The Bureau of Labor Statistics reported in 2012 that marketing students have strong communication skills, interpersonal skills, and a strong ability to adapt to change. As in other studies regarding traditional students, researchers discovered that students had more negative views of online distance education classes compared to traditional classes. Thirty-four percent of the students who had participated in an online distance education class responded that they liked the face-to-face classroom setting better than an online distance education class. Furthermore, the students perceived that the quality of learning was lower in the online classes compared to the face-to-face classes (Fontenot et al., 2015).

Although online classes may be the future for many colleges and universities, Fontenot et al. (2005) found that traditional marketing students desire an online distance education experience that is more comparable to a face-to-face class. In using partial least-squares analysis, these researchers discovered that scheduling was the main deciding factor for students when choosing traditional education or online distance education (Fontenot et al., 2015). The results of this study indicate that different majors could have different reasons for choosing online courses.

Definition and Types of Distance Education

Distance education has changed substantially over the years. Many consider William Rainey Harper to be the father of distance education in America. As president of the University of Chicago in the late 1800s, Harper recognized the value in distance education, and during his tenure as president, he supported this form of education (Bower & Hardy, 2004). In the United States, the first form of distance education involved using the Postal Service. Distance education evolved to delivery via the radio, television broadcasts, satellite communications, CD-ROMs, and finally to the internet, in the form of online distance education (Duncan, 2005; Hoskins, 2013; McMurray, 2007). Understanding online distance education is relevant to this study because this is the method of curriculum delivery for FVS (Catalanello & Sokol, 2012).

Defining online distance education has been a challenge for educators, researchers, and theorists. Several authors have defined online distance education (Allen & Seaman, 2013; Hill, 2012; Garrison & Kanuka, 2004; Moore, Dickson-Deane, & Galyen, 2011). Allen and Seaman (2013) and Garrison and Kanuka (2004) defined online distance education with similar categories. The first type is called “Web Facilitated” by Allen and Seaman (2013) and “Enhanced” by Garrison and Kanuka (2004). In this method of online distance education, the online component is a minority of the class, with up to 29% of the class time spent online (Allen & Seaman, 2013). In these classes, a majority of the learning is still completed face-to-face.

The second type, called “Blended” or “Hybrid,” features from 30% to 79% of class delivery online (Allen & Seaman, 2013). Face-to-face learning is still used, but the online component is more than a support role. This method uses discussions and content delivery to achieve learning objectives.

The third type is a fully online class, with over 80% of the class time spent online (Allen & Seaman, 2013). In many fully online classes, face-to-face meetings do not occur at all. All of the course content is delivered online, and all learning objectives are achieved online as well. For this research study, the fully online class is the target that I will examine (see Figure 2). FVS uses this fully online course structure. Garrison and Kamuka (2004) and Allen and Seaman (2013) defined online distance education with similar terms; however, Allen and Seaman (2013) gave a more comprehensive definition by providing the percentage breakdown in each category, illustrating the differences between the online course types.

<i>Proportion of Content Delivered Online</i>	<i>Type of Course</i>	<i>Typical Description</i>
0%	Traditional	Course where no online technology used — content is delivered in writing or orally.
1 to 29%	Web Facilitated	Course that uses web-based technology to facilitate what is essentially a face-to-face course. May use a course management system (CMS) or web pages to post the syllabus and assignments.
30 to 79%	Blended/Hybrid	Course that blends online and face-to-face delivery. Substantial proportion of the content is delivered online, typically uses online discussions, and typically has a reduced number of face-to-face meetings.
80+%	Online	A course where most or all of the content is delivered online. Typically have no face-to-face meetings.

Figure 2. Course type. Used with permission.

Source: Allen, I. E., & Seaman, J. (2013). *Changing course: Ten years of tracking online education in the United States*. (p. 7). Needham, MA: Sloan Consortium. Retrieved from ERIC database. (ED541571)

While Garrison and Kamuka (2004) and Allen and Seaman (2013) defined these four categories for online distance education, Moore, Dickson-Deane, and Galyen (2011) define the

categories of distance learning, e-learning, and online learning. Distance learning is defined as learning that is completed at a distant location, while e-learning is described as learning completed with the use of technology. There are many definitions of online, depending on the author and study examined. Nine different authors offer definitions, which highlights that online education could range from fully online, as described by Allen and Seaman (2013), to a class taught through an online learning management software tool, as explained by Volery and Lord (2000).

Hill (2012) divided online distance education into seven categories. He noted that although all higher education institutions are using online tools in some form, most people regard courses as being either face-to-face or fully online. Hill's seven online distance education types included fully online, ad hoc, education as a service, industry partnership, competency-based learning, hybrid or blended learning, and Massive Open Online Class (MOOCs).

Fully online is the type of online course most people are used to, in which over 95% of the content is taught online. In most cases, student testing is the only time in which some form of face-to-face interaction is required. Within this category, there are two different types of classes. The first is the traditional class model, where every instructor builds his/her own class. The second model is called the master section, in which a team of highly skilled educators construct the class and then replicate it to teach more classes of students. The concept behind this model is that lower-paid adjuncts can teach the class without taking a lot of time to build a similar course (Hill, 2012).

Ad hoc is the third of the seven online modes. This method allows teachers the freedom to use online options as they wish. This gives faculty the opportunity to try new methods and

allows those who have not taught online before to become comfortable with the technology before teaching a larger class in another mode (Hill, 2012).

The next two methods of online distance education are education as a service and industry partnership. Both of these online distance education methods take building the course content out of the hands of the institutions. The first method, education as a service, includes an outside entity that creates common courses and sells them to higher education institutions, allowing these institutions to focus on the teaching instead of the course-building process. Industry partnership is similar to the first mode. The difference is that an industry expert will build a course on a topic in their industry and the course is then given to and taught by the industry partner in collaboration with the higher education institution. Cisco Networking Academy is a great example. In return for their course building, the higher education institution is only required to buy the needed networking equipment for the class to be taught (Hill, 2012). Hill (2012) noted that the industry partnership is the mode that confuses the most people.

A newer online concept is competency-based learning. This form of online learning removed credit hours from the curricular-learning equation. When content is placed online, this method of learning will teach students the concept; once they are able to master the concept, they are able to move on to the next course. This mastery of competencies could take up to a year for some people, while someone who has been in the field for a while could complete it in a few days or weeks (Hill, 2012).

Hybrid or blended learning is the mix of face-to-face and online learning. Between 20% and 80% of the class can be taught online, while the rest uses the traditional face-to-face method (Allen & Seaman, 2013; Hill, 2012). In this model, more of the face-to-face time is ideally used to solve complex problems as a group and answer questions. Meanwhile, online time is utilized

for the more lengthy lecture and distribution of the content. This approach makes much better use of the face-to-face time (Hill, 2012).

The final method of online learning is MOOC, or a Massive Open Online Class. The concept of a MOOC is that one instructor is able to teach content to an infinite number of people. This new approach challenges the way online learning is delivered. However, there are still many issues that need to be worked out for MOOCs to gain wide acceptance at accredited universities (Fontenot, Mathisen, Carley, & Stuart, 2015; Hill, 2012).

Despite the numerous ways in which online distance education is defined, I focused this research study on the format of a fully online distance education course. To meet the definition of fully online distance education course, over 95% of the class must be taught online. Because FVS used this format, this study exclusively examined fully online distance education courses.

Distance Education Growth

Online classes are driving the distance education process in colleges and universities today. Allen and Seaman (as cited in Mann & Heenberry, 2012) found that from 2002 to 2008, both public and private universities saw a growth of 260% in the proportions of online distance education enrollment compared to face-to-face enrollment. Part-time students saw the largest growth in colleges and universities, much of which is due to the fact that these part-time students need the flexibility offered in an online environment (Howland & Moore, 2002).

Four factors that have contributed to the growth of online distance education learning include expanding access, capitalizing on emerging market opportunities, alleviating capacity constraints, and serving as a catalyst for institutional transformation (Volery & Lord, 2000). In 2010, the percentage of total higher education enrollment in online classes was 31%, a number

that has grown every year since 2002 (Allen & Seaman, 2011, p. 12). In the fall of 2012, another study by the U.S. Department of Education (2014) found that across the Title IV institutions, 25.8% of their students were enrolled in some form of distance education course (p. 4). Meanwhile, Watson et al. (2014) found that in K–12, it was estimated that 16% of students were doing the same (p. 5). Watson et al. (2014) later noted that a larger percentage of high school students attended online distance education than elementary students. With a large proportion of high school students taking some form of online distance education, and with this number increasing (Watson et al., 2014), there is a gap in the research that does not explain how high school online distance education classes affect the retention and course completion of college students.

Recently, the growth rate in online classes has been increasing. Allen and Seaman (2010, 2011, 2013) found that when reviewing traditional college students, the number of students who reported taking an online class doubled between 2008 and 2010. They determined that “the rate of growth of online enrollments has tempered somewhat, but continues to be far in excess of the rate for the total higher education student population” (2011, p. 4). The researchers of studies discerned additional details about this growth in online classes. First, as a student’s age increased, so did his or her likelihood of taking an online distance education class. This finding indicated that older, nontraditional students are more likely to enroll in an online class than is an 18-year-old high school graduate. However, when removing student age from the equation, and investigating class standing, freshmen and sophomores were more likely to select an online distance education class than juniors and seniors. Finally, as the number of both credit hours taken per semester and hours worked per week increased, the likeliness of taking an online class increased as well (Mann & Henneberry, 2012).

When observing why colleges are moving to online classes, Allen and Seaman (2007) reported that cost reductions were not the main reason for online distance education. Instead, colleges were finding that online education helped with degree completion. Many colleges identified student access as a major benefit of online education when justifying why institutions were making the switch (Allen & Seaman, 2007). Allen and Seaman (2007) examined barriers to adoption of online education and noted that one of the obstacles was faculty acceptance. Until a college has adopted online distance education, the data suggested that achieving faculty adoption of the new way of teaching was a significant barrier to overcome. Higher costs for setting up online distance education and the lack of presumed support by potential employers to faculty were two of the other obstacles reported (Allen & Seaman, 2007).

Training is necessary for faculty acceptance and adoption when offering distance education online classes. Allen and Seaman (2011) found that 6% of the colleges that offer online distance education classes do not have any support or training programs for the faculty (p. 6). Seventy-two percent of the colleges offer training administered locally at the college, while 58% of the colleges offer a mentoring program as a training method (p. 6). They also noted that smaller colleges were more likely to explore outside training resources than to create training internally.

Distance Education Success Factors

Volery and Lord (2000) surveyed 46 students in a Global Business 650 WebCT course at Curtin Business School. They found that six factors were the keys to the success of online education. The first two factors related to how students interacted with the distance learning system. The first was ease of access and navigation. Students should have access to the system twenty-four hours a day, seven days a week, and when using the system, it should be easy for

students to find what they need. The second factor was the interface; since students spend a lot of time in the online learning environment, it should be visually structured and designed well (Volery & Lord, 2000).

The remaining four factors related to the faculty. The third factor was interaction. Online distance education is a virtual classroom, and the course must include ways to create the same type of interaction achieved in the physical classroom. The fourth factor was the instructor's attitude toward students. Instructors must be willing to be flexible and find creative ways to resolve individual student questions and be prepared to respond to students' needs quickly. The next success factor was instructor technical competence. Instructors must not only know their subject area but must also master and support the technology used for teaching. The last factor was classroom interaction, in which the faculty must find ways to cultivate students' interaction and participation in the class. Without office hours and a set class time, communication must occur asynchronously. This change was a fundamental shift for faculty, as they were no longer on stage teaching their knowledge in a classroom, but rather becoming a learning catalyst. Faculty must find ways to demonstrate to students they have the tools to learn and that they are able to discover the knowledge on their own (Volery & Lord, 2000).

Florida Virtual School

As seen in Figure 3, the State of Florida has over three-and-a-half times the high school course enrollment of North Carolina, the second-highest state for virtual school course enrollment in the country (Watson, Pape, Murlin, Gemin, & Vashaw, 2014, p. 30). FVS has just fewer than 200,000 unique students who enrolled in classes in the academic year 2013–2014. This enrollment earns FVS and the State of Florida the first place ranking in course enrollment across the country (Watson et al., 2014).

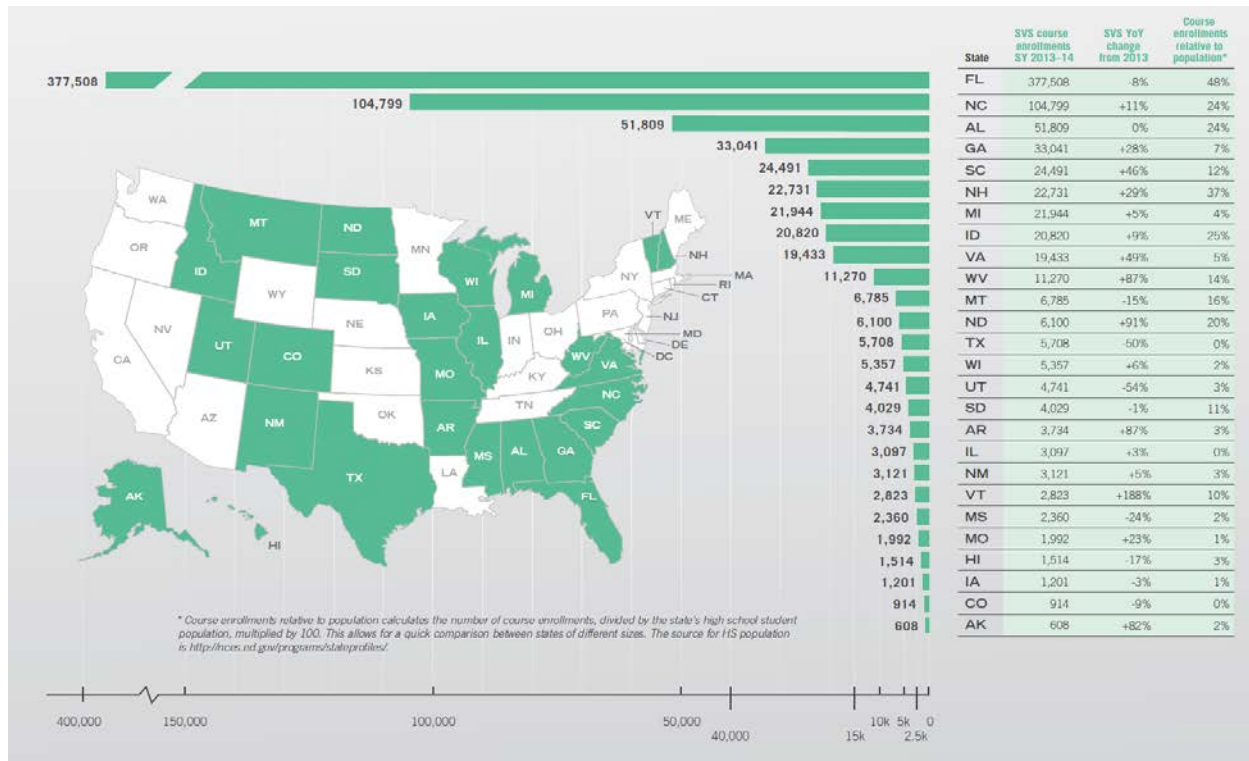


Figure 3. 2014 states with virtual schools. Used with permission.

Source: Watson, J., Pape, L., Murlin, A., Gemin, B., & Vashaw, L. (2014). Keeping pace with K–12 digital learning, An annual review of policy and practice. (p. 30). Retrieved from http://www.kpk12.com/wp-content/uploads/EEG_KP2014-fnl-lr.pdf.

Many high schools are open 180 days a year, from Monday through Friday, from 7:00 a.m. to 3:00 p.m. FVS is open twenty-four hours a day and seven days a week. Teaching in this environment requires adapting to current trends. Teachers must acquire expertise with the most up-to-date technologies, be flexible in scheduling, and be willing to adapt to change (Johnston, 2000). Communication is important for both students and teachers. Providing feedback builds on this need for communication, as the face-to-face feedback that students would typically receive in a classroom setting is not available. In addition, Watson et al. (2014) advised that students and teachers communicate via telephone every few weeks. This additional form of communication allows for a conversation that might not be as effective over email (Johnston, 2000).

Along with communication, FVS encourages consistency. Uniformity in giving directions about the course allows students to access instruction without having to search for it. Consistency in due dates and office hours will allow students to find a routine that works for them. FVS also stresses that teachers and students both need to understand that distance learning is different from face-to-face classroom. Johnston (2000) pointed out that the only requirement for FVS was an internet connection and a computer, available at a student's zoned school or a library if they were not accessible at home. In this environment, zoning and district requirements are no longer applicable, and students have control over what they want to learn. Online teachers must be open to doing things differently to meet student expectations for online distance education.

Distance Education Predicting Success

Researchers have sought to determine whether there is a way to predict the success of a high school student in an online class. One study examined 135 students in 13 schools who were taking online distance education classes and tracked their progress. The classes included approximately 50% male and 50% female students, they were between 16 and 17 years old, and most identified as white. In the end, the researcher had a complete dataset of 94 students (Roblyer & Marshall, 2002). When the data were collected, the researchers grouped the students into two groups, successful and unsuccessful. Successful students had earned a grade of A, B, or C, while the unsuccessful students had earned a D, F, or withdrew from the class completely. In the end, 77% of the students were successful in their online class, while the other 23% were unsuccessful (Roblyer & Marshall, 2002, p. 246).

Once the data were examined, there was no evidence that personality characteristics could provide any insight into the success of students. However, personality characteristics and

key attitude differences did provide insight regarding the success of the students studied (Roblyer et al., 2002). The characteristics and attitudes that identified who would be successful and who would not included study environment, motivation, and computer confidence (Osborn, 2001; Roblyer & Marshall, 2002). The findings uncovered in this study and the data obtained from Virtual High School (VHS) faculty, provide evidence that a predictive model was possible. It is important to note that this was a preliminary study on the topic and that more studies on a wider population are needed for the results to be more generalizable (Roblyer & Marshall, 2002).

Summary

Determining whether a student will complete a class is not the only indication of success. Another topic for examination is whether using technology to achieve learning objectives is another predictor of success. Creative methods are required when reviewing how online distance education can fill the void created by not attending a face-to-face class. The literature has revealed that using technology is effective for achieving the same learning objectives as face-to-face classes. More importantly, it has revealed that study environment, motivation, and computer confidence were indicators of whether students would do well in online classes, and that, with the right model, predictions of success and failure have been successful. Therefore, students who do well in online distance education classes may rate high in those areas needed to succeed in higher education. Based on the literature, should admission offices decide to make online distance education in high school a part of the selection criteria, the outcome could result in higher degree-completion rates.

Distance Education Course and Degree Completion

In this section, I examine course and degree completion, as well as prediction. The first of the literature reviewed explores course completion. This literature examines whether a student has completed the class and explores the student's attributes to identify what we can learn from the attributes of the student completing the course. Course prediction is the next literature reviewed. These researchers studied what can be examined before a student takes a class to anticipate who will complete the online distance education class. These two sections differ regarding when the data is studied. Prediction happens before and during a course, while completion occurs after students have taken or dropped the course. Finally, the literature explored degree completion and the role online distance education plays within it.

Distance Education Course Completion

Before online distance education, there was distance education. During this time, researchers were exploring course completion in all forms of distance education. Coggins (1998) studied how students chose to further their education following this nontraditional path. The goal was to identify if there were any factors that could predict who would complete a course and who would not.

Coggins' (1998) results revealed that there were differences between the students who completed the class and those that did not. Three factors proved to be reliable indicators of course completion: education level before the distance education class was taken, intention to complete a degree, and length of time since the last college course was taken. Coggins (1998) suggested that length of time since the last college credit course is likely tied to an indication that a student has the traits of lifelong learning. The shorter the time since the last college credit, the

more likely the student has lifelong learning traits. This trait may better prepare a student to go back to school and make an effort to complete the class.

Although this study found some reliable factors for identifying who will complete an online distance education course, there is still a great deal of uncertainty and more research needed on the factors that allow students to complete online distance education classes. Coggins (1998) found that distance from campus did not have a significant effect on who completed the class and who did not. This finding differs significantly from studies conducted by Korhonen (1986) and Meadors (1984). While Coggins continued to explain why these results might have varied, these disparate results confirmed that more research was needed on the topic and that identifying what makes students successful in their education is challenging.

As distance education evolved with time, online distance education classes became the primary method of teaching from afar. Research has revealed that the retention rate of online distance education classes is less than that of face-to-face classes (Carr, as cited in Cochran, Campbell, Baker, & Leeds, 2014). Several researchers have investigated reasons that might lead to this lower retention rate. In these studies, researchers sought to identify students at-risk of withdrawal before the withdrawal happened, to identify ways to help the student stay in the class (Cochran et al., 2013). The study completed by Cochran et al. (2014) examined over 2,300 undergraduate students enrolled in online classes and used logistical regression in the analysis. Wolf et al. (2013) tracked three typical online modules comprised of over 8,000 students. Researchers tracked and reviewed over five million online mouse clicks in the study to investigate students' engagement. The following sections describe these studies in depth.

Cochran et al. (2014) discovered that academic experience was the strongest indicator of whether a student would withdraw from a distance education class. A senior was more likely to

complete a class than a junior, and a junior was more likely to complete a class than a sophomore. However, the authors noted that no existing research indicated that an upperclassman was more likely to complete an online distance education class than a lowerclassman.

Next, Cochran et al. (2014) examined over 300 undergraduate students enrolled in online classes to understand if participation in online distance education classes varied according to different majors and levels of financial aid. They discovered that education majors were less likely to withdraw if they had need-based grants or loans. Education majors without a grant or loan were more likely to withdraw. Health majors withdrew at a higher rate if they had need-based grants, which is the opposite of the findings for education majors. Science and math students with loans were more likely to withdraw (Cochran et al., 2014).

Course completion research can provide detailed documentation of the potential factors that can lead students to withdraw from online classes. The findings from Cochran et al. (2014) can be used to adjust some of the current educational practices to encourage more students to complete online distance education classes. For example, colleges could require students to be sophomores or higher before allowing them to take online distance education classes.

Rovai (2003a) completed a key study on the completion of online distance education courses. Tinto's (1993) student integration model and Bean and Metzner's (1985) student attrition model were used as a basis for the creation of a new model accounting for the differences in online distance education. Based on these frameworks, Rovai (2003a) examined the different learning management platforms used and built a framework for evaluating each one. One of the first items he discussed was how schools reported conflicting data regarding completion rates. Some schools reported that more than 80% of students completed their online

distance education courses, while other studies indicated that fewer than 50% of students were able to complete their online distance education courses (p. 2). With so many distance education software platform choices, Rovai (2003a) indicated it was important to use the appropriate software so that it does not become an obstacle to class completion.

Predicting Distance Education Course Success

Wolf et al. (2013) conducted a study at Open University, one of the largest online distance education institutions, exploring the perception that low retention relates to lack of contact with the student. Previous research has shown that telephone contact with students helps increase the retention rate in these online classes. Wolf et al. (2013) tracked three typical modules, comprised of over 8,000 students, to learn if there is a way of predicting who would be successful in an online class and who would drop out based on their activity in the class. By investigating a student's engagement through the number of mouse clicks inside the online learning system and the instructor's grades of the student's progress, they created a model to predict student success. Researchers tracked and reviewed over five million mouse clicks. Early in the semester, this model revealed engagement in online learning to be a better way of predicting success in the class than did instructor grading. The model became even more accurate when both engagement and grades were surveyed to determine student success. Once the model was made, researchers added demographic information to find out whether this would improve the accuracy of the model, but this information was found to have minimal effect on the outcome of students.

Although understanding what students click on can help predict who will drop out, it does not provide a complete view. Wolf et al.'s research (2013) noted that some students download classwork and complete it outside the learning environment. This work cannot be

tracked and can provide false predictions. The researchers indicated that more investigation is required with regard to online distance learning, based on the different methods of learning (Wolf et al., 2013).

Rovai (2003b) argued that understanding a student's persistence was not simple. Although there was no formula, and it had been shown that researching a single factor was not likely to affect persistence, there are several factors that researchers have found to have an impact on persistence.

Rovai (2003b) discovered that the first factor needed in evaluating student persistence was the student's online skills. When taking an online course, students needed to have basic online skills. If students did not have these skills before admission, then students could acquire these skills through training early in their degree program and instructors could add appropriate expectations or prerequisites in their coursework. In addition, offering hybrid classes allowed for a combination of approaches, as students had face-to-face time with the faculty and the flexibility of online learning outside the classroom. By building this training into the "freshman experience," students could acquire the skills they needed to be successful early in their academic career (Rovai, 2003b).

Non-school factors represent the next factor affecting student persistence. Rovai (2003b) noted that childcare, work, and money all played roles in how well students did in school. Instructors had to understand that many students have these outside pressures, and they should find ways to build the needed support structures to help their students succeed.

The final factor Rovai (2003b) found was discipline and self-direction. Students needed to allocate time to study and navigate the online environment. In an online setting, an instructor

does not interact with and support the student each day, and there is no schedule to which students must adhere. Although the instructor needs to be organized, it is the student's responsibility to dedicate the time required to successfully follow through with course completion.

Online Distance Education Retention

Numerous researchers have revealed that several factors have an effect on the retention of students enrolled in an online distance education class. Doherty's (2006) research goal was to identify the areas that had the most influence on improving retention for online courses offered at a community college. Doherty examined the data in the information system at the community college, which included over 10,000 students who took online distance education classes. In the first part of the study, Doherty used chi-square and binary logistical regression on the data to evaluate its significance. In the second part of the study, Doherty sent out surveys to students in 36 courses, and 426 completed surveys were returned. Doherty (2006) highlighted three main factors that had a significant impact on the success rate of students completing online distance education classes. The first was over-commitment. Students are responsible for their schedules and effectively managing their time. If a student could not do this, then completing the course became difficult. Online distance education classes do not have a standard meeting time. Doherty (2006) revealed that finding the time to do classwork on their own was difficult for those students who lacked time management and scheduling skills.

The next major factor that Doherty (2006) discussed was self-selection. Many students select online distance education classes because they are not able to attend face-to-face classes. Not being required to attend class is a primary advantage of online distance education classes. Although this is a great benefit, the selection of online distance education classes over face-to-

face is tied very closely to students becoming overcommitted, and this over-commitment leads to students withdrawing.

The third factor Doherty (2006) identified involved the instructor. Instructors need to be effective communicators. Without this, students may become lost, and even the best of students may struggle to succeed. Doherty (2006) further noted that the primary reason for students not being successful is the lack of instructor support. Instructors need to be responsive in an online distance education class to overcome the lack of instant feedback students experience in a face-to-face class. Doherty (2006) indicated that this information could help institutions better understand how to make online distance education classes successful for both the student and institution. By understanding student needs, institutions can change processes to ensure that students enroll in the appropriate classes (Doherty, 2006).

Graduation Completion

A presentation on the 2025 Strategic Plan for online education by the Affordability Workgroup to the Florida Board of Governors (2016) revealed that students who completed a greater number of their classes through distance education reduced degree completion time. Table 1 reveals that students who only enrolled in face-to-face classes graduated in over four years, while students who enrolled in over 40% of their classes as distance education graduated in under four years. The students in this study were all first time in college students, all of whom were working toward 120 credit-hour undergraduate degrees during the 2014–2015 academic year. The data sample included over 22,500 students. Within the sample, no significant number of students completed a degree with more than 60% of their degree earned by completing distance education classes.

Table 1

Degree Completion

Modified from Source: Florida Board of Governors (2016)

Distance Education Percentage of Total Degree	Time to Degree Completion in Years
Face-to-Face Only	4.3
1 to 20% of Courses Taken via Distance Education	4.1
21 to 40% of Courses Taken via Distance Education	4.0
41 to 60% of Courses Taken via Distance Education	3.9

In another study, Müller (2008) examined the persistence that women had when completing online degree programs. Outside factors were considered regarding what contributed to degree completion. Müller did not suggest that online distance education made degree completion faster than face-to-face, but rather that the access model of online distance education made higher education possible for these women.

Distance Education Summary

The literature shows a gap that needs to be explored. With all that we know about online distance education, there is no research on how to use this data in the higher education admission process. If online distance education in high school is an admission indicator to identify students who have the drive to finish their undergraduate degree in fewer than six years, it could be as revolutionary to admission as the SAT, ACT, AP, IB, and DE were in the 1960s when the standardization of admissions occurred.

Theoretical Framework

In this section, I explore general systems theory and then apply that theory to online distance education. I demonstrate that general systems theory has a relevant place in higher education studies, specifically studies examining online distance education.

General Systems Theory

Ludwig von Bertalanffy introduced general systems theory 1968. The concept is that complex systems or, in this case, organizations can be broken down into systems of various degrees of detail. With systems being examined on this level, the correct information or output can be provided to the requesting source (Bertalanffy, 1968).

I followed a systems theory model while studying high school academic online distance education's effect on the completion of a four-year undergraduate degree. In Ludwig von Bertalanffy's (1968) *The Meaning of General System Theory*, he discussed the feedback scheme and Norbert Wiener's cybernetics system. He demonstrated that these systems could be broken down into three stages: inputs, processes, and outputs, illustrated in Figure 4.

First, I examined the inputs. Today, these are GPA, SAT, ACT, class rank, and advanced coursework, to name a few. This study included the high school online distance education courses taken at the FVS. Second, I examined what admission officers evaluate and analyze during admission decision making. It is the input and process step in the model that I propose to change with this study. The final step of the model is the output. In the case of this study, the output related to whether the student selected to attend a four-year public state university

graduated with an undergraduate bachelor's degree in fewer than six years. See Figure 5 below for an illustration of this application of the systems theory.

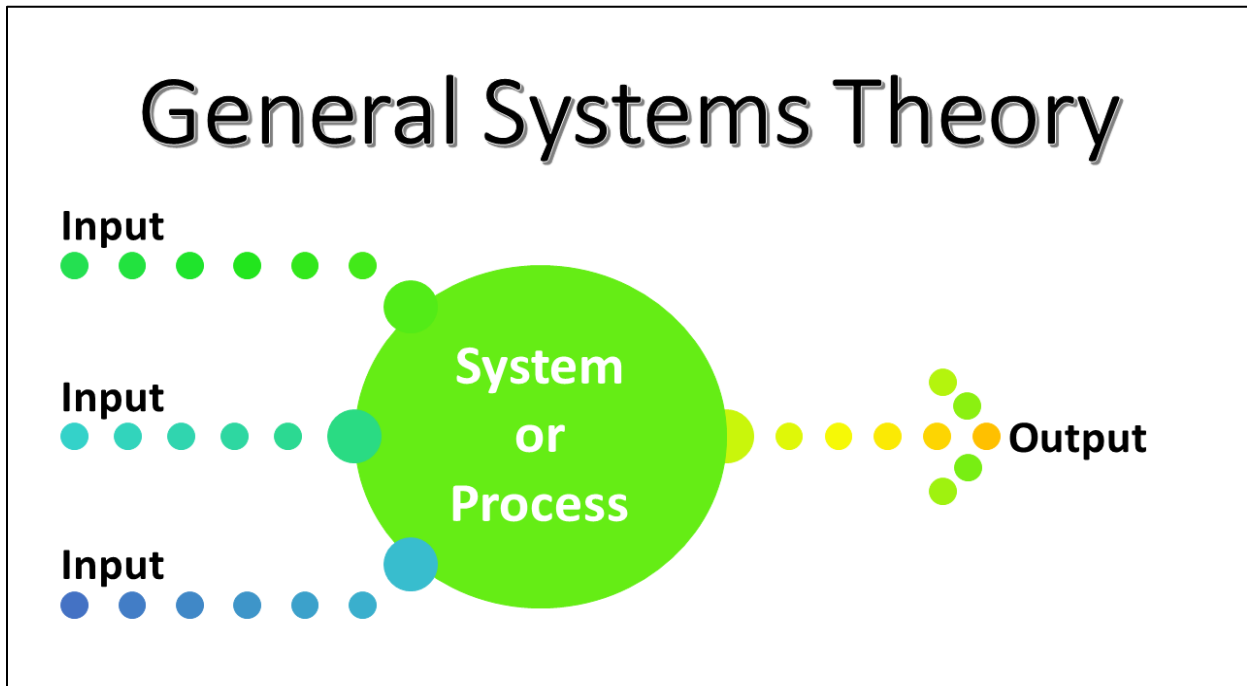


Figure 4. General systems theory schematic.

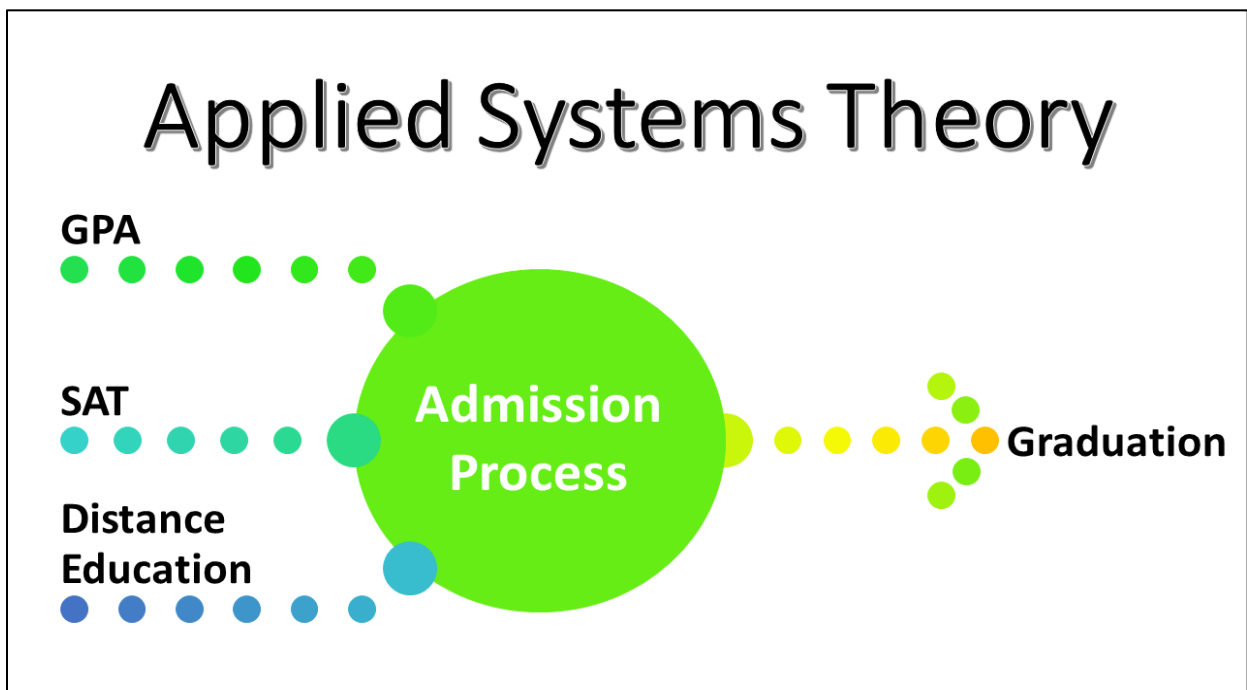


Figure 5. Applied systems theory schematic

Saba (1999) demonstrated that the use of the systems approach is applicable to almost anything, including the British Royal Air Force. When applying this systems theory to higher education, we can identify a large number of systems. A single course, financial aid, advising, distance education, and admissions are a few examples that can be broken down into smaller subsystems of the larger system known as higher education.

Potts and Hagan (2000) provided another example of applied systems theory for distance education that embraced the inputs to include the environment, technology, topic, and students. These factors then moved to the process stage. In this example, students communicate with the admission and orientation teams to sign up for classes. The students are required to pay a fee, content is delivered to the student, and finally, the student provides feedback about the course. The output that results from distance education includes student learning, the grades that are distributed, student feedback in a course evaluation, and the data produced as a whole. The input, throughput, and output are the core of the systems theory, and each subsystem has the same three steps (Potts & Hagan, 2000).

As the examples above demonstrate, and the literature to follow reveals, general systems theory is relevant to higher education. By exploring the admission process and examining the inputs of distance education, this study will determine whether there is a measurable difference in the output of students admitted to a college.

General Systems Theory in Distance Education

In the 1960s, the scientific community recognized systems theory. Anderson and Carter (1990) defined a system as a structured whole made up of components that interrelate in a way that is different from their contact with other objects (as cited in Potts & Hagan, 2000). We can

easily apply this to distance education. There are many smaller systems that make up the larger system of online distance education, and online distance education is a subsystem of higher education as a whole. First, there is the classroom, which is another example of a subsystem. Then there is the interaction with other participants while working on an activity. Finally, the program used for learning is also a subsystem of the online distance education system. This theory will ensure that each subsystem is tested and improved one by one, making the system as a whole better (Moore & Kearsley as cited in Rovai, 2003a; Potts & Hagan, 2000; Saba, 1999).

In the book *The Fifth Discipline*, Peter Senge (2006) posited that institutional leaders do not concentrate their attention on the finer details of the systems that make up the organization. Leaders focus on the high-level details and leave the lower-level details to lower management. If this balance falters, the chance to improve the organization's systems is significantly reduced (Barr & Tagg, 1995).

Change needs to happen to improve the organization or to keep it from falling behind. Old systems can kill the best of ideas and innovation because they are not able to adapt. Either new systems must be created, or old systems must be updated in order for new ideas to be successful within the organization. Implementing new systems requires effort and dedication, but it can allow new ideas to grow. Barr and Tagg (1995) addressed this shift in higher education in their popular article "From Teaching to Learning: A New Paradigm for Undergraduate Education."

When researching distance education in the 1970s, Saba (1999) used the model described below to build a new distance education system. He discovered that televisions needed to be placed in locations where education is intended to be received; the program's theme needed to be designed, created, and produced; and a telecommunication satellite was required to reach all of

the education locations (Saba, 1999). Each of the items needed for distance education is a separate subsystem that has to work together with the other subsystems to make the whole distance education system function. The TVs, programming, and satellite were three small systems that, when working together, provided distance education nationwide (Saba, 1999). The changes to the systems (the medium in which courses are taught) that Saba (2009) showed are perfect examples of the changes that Barr and Tagg (1995) addressed. The process used today is similar; it just uses new technology in the subsystems. Computers have replaced the TVs, online learning software has replaced the programming, and the internet has replaced the satellite. These changes have allowed new ideas to improve the distance education system as a whole.

Moore and Kearsley (2011) showed that, by applying the theories learned in systems theory to distance education, systems theory is still applicable today in the area of online distance education. They addressed fully online as well as more traditional institutions, and they show that this theory can be applied to both types of institutions. They demonstrated that because of the human and technical elements needed for online distance education, a systems theory approach is the best fit.

Conclusion

In this chapter, I examined the history and background of online distance education to demonstrate how distance learning in higher education has developed. Next, I surveyed the admission process and demonstrated that the admission process uses prediction of success. Studies examining the use of GPA and standardized testing as predictors of student success revealed indicators institutions could use in making effective admission decisions. The final admission area I examined related to SAT and ACT scores and how they are tied to the

admission decision. In this section, I made an important conclusion that Kretehment and Ferman (2013) proved that AP classes alone could be a strong indicator of higher education success.

Researchers have examined online distance education in depth, covering topics such as the definitions of online distance education, the different types of distance education, the growth of online distance education, and the success factors that aid students in online distance education courses and graduation. My study focused on the FVS; therefore, the next section provides insight on FVS. I explored using online distance education as a predictor of higher education graduation; as such, I examined predicting success, course completion, and degree completion and their relation to online distance education at the end of this section.

Researchers have completed dozens of studies in higher education using general systems theory, and many of these researched topics involve online distance education. Researchers examining online distance education have attempted to determine the skills and traits needed for a student to complete courses and excel in online distance education courses. Online distance education has even revealed a reduction in the duration of time for a student to finish a degree when students complete a greater number of online distance education courses. However, there are no studies yet published that combine these two areas. Observing online distance education as a predictive tool for academic success and a factor in the admission process may be the next step in the admission evolution. Researchers need to determine if the skills needed to complete an online distance education course are similar to those required to complete a higher education degree. If this is true, it could result in evaluating students who completed online distance education as part of the admission process to increase the rate of degree completion.

CHAPTER THREE: METHOD

Introduction

Distance education is changing the higher education landscape. When examining these institutions' admission processes, however, it seems that the same change is not occurring. There is a reason that both secondary and higher education are utilizing distance education more. Admission offices need to be aware of the changes that are happening at their home institutions. High schools nationwide are adding distance education to their curricula (Watson, Pape, Murin, Gemin, & Vashaw, 2014). These changes should be reflected in the admission criteria admission officers use to evaluate which students to admit. The purpose of this study was to determine whether using distance education information as part of the admission process has any effect on graduation within six years. In addition, this study explored how distance education affects four-year graduation rates. By understanding the relationship between distance education and graduation rates, institutions can improve their admission process by selecting more appropriate applicants. This improvement can help increase retention and reduce student dropouts prior to a student's active participation in school and before any financial expenditure for assisting student graduation.

Research Questions

The following research questions offer direction to this study:

1. What effect does completing Florida Virtual School academic online classes, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of first time in college (FTIC) honors students completing a four-year undergraduate degree at a public research university in four and six years?

2. What effect does the number of Florida Virtual School academic online classes completed, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of FTIC honors students completing a four-year undergraduate degree at a public research university in four and six years?
3. What effect does Florida Virtual School GPA, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of FTIC honors students completing a four-year undergraduate degree at a public research university in four and six years?
4. What correlation do the current academic achievement variables (standardized test scores, GPA, and advanced coursework) have with the new Florida Virtual School admission variables (attended, the number of courses, GPA) toward completing a four-year undergraduate degree at a public research university in four and six years?

Null Hypotheses

For Research Question One, the null and alternative hypotheses are as follows:

- Null – There will be no difference in graduation rates between students who completed Florida Virtual School classes and those who did not.
- Alternative – There will be a difference in graduation rates between students who completed Florida Virtual School classes and those who did not.

For Research Question Two, the null and alternative hypotheses are as follows:

- Null – There will be no difference in graduation rates between students who completed one Florida Virtual School class and those who completed several classes.

- Alternative – There will be a difference in graduation rates between students who completed one Florida Virtual School class and those who completed several classes.

For Research Question Three, the null and alternative hypotheses are as follows:

- Null – There will be no difference in graduation rates between students who had high Florida Virtual School GPAs and those who had low GPAs.
- Alternative – There will be a difference in graduation rates between students who had high Florida Virtual School GPAs and those who had low GPAs.

For Research Question Four, the null and alternative hypotheses are as follows:

- Null – There will be no correlation in the current admission variables compared to the new Florida Virtual School admission variables.
- Alternative – There will be a correlation in the current admission variables compared to the new Florida Virtual School admission variables.

Research Design

I used a quantitative research design for this study. Gall, Gall, and Borg (2005) define quantitative research as a study of samples that make up a population where statistical methods are the primary method to analyze the data. Another significant aspect of the study is prediction, and Gall, et al. (2005) defined prediction research as a way to decide whether information collected at a point in time is able to predict things that could occur in the future. Admission to an institution is an example of prediction research that they use. Creswell (2014) explained another definition of quantitative research as a way of exploring theories by investigating the relationship that exists between the variables involved. For this study, I examined the effect that

participation in high school distance education had on graduation from a higher education institution.

Lomax and Hahs-Vaughn (2012) noted that a dependent variable would account for the effect of the independent variable, while independent variables are manipulated to change the outcome of the dependent variable. For the purpose of this study, the dependent variable for questions one, two, and three was whether or not the student had graduated from the institution in four or six years. An admission office has many different factors that it must examine when admitting a student. Although distance education is the independent variable I was specifically interested in for this study, the other data points in current use for admission decisions should still be included to ensure they are not correlated to the online distance education variable and that they do not affect the outcome more than the distance education variable. Because there were multiple variables being included in the model, Creswell (2014), Gall, Gall, and Borg (2005), and Stevens (2007) all suggested the use of that a multivariable regression test. In Research Question One and Two, the whole in-state sample was used with the independent variable of whether the student attended Florida Virtual School or Not (Yes or No). For Research Question Three, the sample used included students who took FVS classes. In Research Question Two, the independent variable was the number of distance education courses in which the student enrolled. For Research Question Three, the independent variable was the GPA for FVS distance education courses in which the student enrolled. Research Question Four addressed the correlation between the variables used today for admission to the new online distance education variables that are being examined in Research Question One, Two, and Three.

Table 2

Research Population Sample Breakdown

Research Question	Sample Admit Year	Delimiting
One	2010 for six-year 2010, 2011, 2012 for four-year	In-state students only
Two	2010 for six-year 2010, 2011, 2012 for four-year	In-state students only
Three	2010 for six-year 2010, 2011, 2012 for four-year	In-state students and students who have taken Florida Virtual School distance education classes
Four	2010 for six-year 2010, 2011, 2012 for four-year	In-state students only and In-state students and students who have taken Florida Virtual school distance education classes

Because the dependent variable is not a ratio or interval measurement scale, multivariable linear regression cannot be used. Cox (1958) developed logistic regression to handle the situations where the dependent variable is mutually exclusive, such as male/female, active/inactive, or in the case of this study graduated/not graduated. Because the dependent variable in this study was a nominal variable with a value of either yes (the student graduated) or no (the student did not graduate), I used multivariable logistic regression. Hahs-Vaughn (2016) noted that even though the dependent variables are dichotomous, logistic regression is still a valid tool for prediction and has become a popular method for research in recent years.

To ensure that the values and models produced by the logistic regression are valid, Lomax and Hahs-Vaughn (2012) noted that there are several assumptions to address:

- Noncollinearity is required where multiple predictors are used, and
- The dataset must be error-free.

Lomax and Hahs-Vaughn (2012) also addressed several conditions to meet for a logistical regression.

- The dependent variable must be nominal/dichotomous,
- The sample size should be greater than 100,
- Dichotomous category variables should have both sides represented,
- Nonseparation of data should exist, and
- Outliers and influential data points should be removed.

For this study, the sample size requirement for logistical regression was addressed with the dataset being requested consisting of between 500 and 1,500 students. Once I received the data, I performed tests to ensure that each category of the independent variable was represented by values in all categories. I screened the data for outliers and removed these cases from the sample and recalculated the test, as the logistic regression method suggests.

Setting

The setting for this study was a large public research university in Florida with a student population greater than 30,000 students. This institution grants degrees at all three higher education levels in over 100 different programs. The institution has also incorporated distance education in the curricula for over 10 years. As a Florida school, the university depends on performance-based funding, with one of the performance metrics being graduation rate. To

receive credit from the state for a student graduating this year, the student must have applied to the university no more than six years ago (Adelman, 2000; Astin & Oseguera, 2003; Oseguera, 2005). Florida is also a leader in distance education in high school. Florida has had a virtual high school since 1997, giving high school students access to online classes. In 2011, Florida passed the Digital Learning Act, which required students entering high school to complete an online class to graduate (Florida Virtual School, 2014). There is a financial incentive to increase the graduation rate at the university, and with the established virtual high school and the graduation requirement of having to take at least one online class, a large number of in-state students will have taken an online class prior to entering the university. For these reasons, this is the ideal setting for this type of study.

Population and Participants

Best and Kahn (2006) defined a population as any group that has similar characteristics in common, and these characteristics are important to a researcher. The population of this study is the whole student body at the institution enrolling in the fall semesters of 2010, 2011, and 2012 and graduating before fall 2016. All of the students enrolled in the institution have gone through the admission process and were accepted to the institution. The students in the population were admitted without consideration of distance education classes taken in high school. Students who enrolled in 2010 allowed for the evaluation of six-year graduation rate questions. All students in the sample allowed the assessment of the four-year graduation rate questions.

Sample

Fowler (2009) defined a sample as a subset of the population. Best and Kahn (2006) added to this definition by stating that this subset is selected for observation and analysis. Lomax and Hahs-Vaughn (2012) defined a sample as a large or small group that consists of any portion

of a population. This study examined the honors students at the university as a subset of the population. Although not used as part of the honors admission process, I collected distance education information on students for the three years examined in this study. With the information provided, the sample will have approximately 500 students in each test that is examining a six-year period, and the sample will have approximately 1,500 students for research questions examining four-year periods. This historical data are de-identified, ensuring that the identity of each student was protected. Table 3 includes a list of data points requested.

Table 3

Study Variables: Name, Type, Use

Variable Number	Variable	Data Type	Used in Research Question	Used in Variable Creation	Used in Sample for Research Question
01	Random Student Identifier	Number		Identifier	
02	Did Student Take Florida Virtual Course in High School	Yes/No	1		3
03	Total Number of Florida Virtual Courses taken	Number	2		
04	List Florida Virtual Classes (include the following)	Text	3		
04a	Class Name	Text		Identifier	
04b	Credit Hours	Number		5	
04c	Class Grade Earned	Text		5	
05	Florida Virtual School GPA	Number	3		
06	Enter Status to Institution (First Time in College or Transfer)	Text			1, 2, 3, 4
07	Enter Semester	Text		19, 20	1, 2, 3, 4
08	Enter Year	Number		19, 20	1, 2, 3, 4
09	Number of AP Classes Taken	Number		12	
10	Number of IB Classes Taken	Number		12	
11	Number of DE Classes Taken	Number		12	
12	Total Number of Advanced Course Work Completed	Number	1, 2, 3, 4		
13	Best ACT Score	Number		15	
14	Best SAT Score	Number		15	
15	Highest Standardized Test Score Converted to Standard SAT score	Number	1, 2, 3, 4		
16	High School GPA	Number	1, 2, 3, 4		
17	Institution Graduation Semester	Text		19, 20	
18	Institution Graduation Year	Number		19, 20	
19	Graduated in Four Years	Yes/No	1, 2, 3, 4		
20	Graduated in Six Years	Yes/No	1, 2, 3, 4		
21	Instate	Yes/No			1, 2, 3, 4

Delimiting Techniques

Best and Kahn (2006) defined delimitations as a way of identifying boundaries of a study and ensuring that these characteristics are present in the sample. I used this technique to select a sample from the population to ensure that students were in-state. In Research Question Three it was used to ensure that the sample had completed at least one FVS class. Because this was a historical study, each student already had the data points stored in a database. This method was a viable option, according to Best and Kahn (2006), because the staff at the institution had this information.

When selecting a representative subset of the population, the following criteria were required for a student to be included in the delimited sample. First, the student needed to be an honors student. For this study, this is the group of students identified at this large public research university for whom high school distance education information has been collected in a way that can be evaluated without requesting the original high school transcript and coding the data by hand. In addition, investigating high-achieving students limited the variation of mediating variables. The Honors Admission Specialist at the institution shared that all students studied in the sample had an above-average high school GPA, high SAT and ACT scores, and an average class rank in the top 20% of their high school. These were many of the same data points used for admission to higher education institutions nationwide. Second, the student needed to have graduated from a Florida high school. This study focused on distance education taught through the FVS. Although there are many online programs in the United States, these programs have different standards. Even within states, online programs differ. In an attempt to limit the number of variables that affect the outcome of the study, I evaluated students from one online virtual school (Florida Virtual School) in this study.

Data Collection Methods

I requested the data needed for this study from the honors program at the university. The requested data elements appear in APPENDIX A. I sought information for students accepted in 2010, 2011, and 2012. Moreover, de-identified information was required so that the information could not be linked to individual students.

When I requested dataset, I sent an email to the director and assistant director of the honors program. APPENDIX B provides a copy of this email. When I received a response and the data file from the director of the honors program, I sent a thank-you email to all parties involved. APPENDIX C provides a copy of the thank you email.

Statistical Conclusion Validity

I used logistic regression and systems theory to analyze high school distance education data points and compare them to graduation rates. Creswell (2014) identified statistical conclusion invalidity occurring when statistical violations occur. One such error could be using the wrong statistical test for the situation being tested or not following the statistical assumptions needed for the proper test. Previous research demonstrated that both logistic regression and systems theory are valid tests and theories in the area of higher education.

Researchers have addressed how to use statistical equations to evaluate mutually exclusive nominal data, also known as dichotomous variables. Cabrera (1994) investigated the different methods used for dichotomous variables and found four tests that were applicable to this type of data. Cabrera (1994) then showed the natural fit of logistic regression in the area of higher education. In this study, he highlighted several other studies in the area of higher education that date back to the late 1960s and used logistic regression that involved dichotomous variables. These included studies whose focus encompassed, but were not limited to, students

who received a grant compared to those who did not, effects of student aid in college attendance, and degree completion. In each of these studies, the higher education variables were ones in which the value was either a yes or no and was mutually exclusive, and in each of these studies Cabrera (1994) pointed out that logistic regression provided the statistical analysis.

In many higher education studies, researchers have used logistic regression. Peng, So, Stage, and John (2002) explored higher education journals to determine how often logistic regression had been used. In their study, they investigated three of the most prestigious higher education journals: *Research in Higher Education*, *The Journal of Higher Education*, and *The Review of Higher Education*. Data were extracted from January of 1988 to December of 1999. When they researched key terms linked to logistic regression, they found 90 abstracts out of 233 (38.63%) in these journals (Peng, So, Stage, & John, 2002, p. 260). They then explored how many articles used logistic regression. Further examination revealed 52 articles used logistic regression from 1988 to 1999. Of these, Peng et al, discovered that 29 of the articles (or 55.77%) focused on enrollment and retention, and 10 of the studies (or 19.23% of them) addressed admission and application of college (Peng, So, Stage, & John, 2002, p. 273). Logistic regression has been used in higher education since the 1980s, and Peng et al.'s findings support its use for enrollment and retention is supported.

Higher education as a whole is an extensive and complicated environment. Because of the complexity of the higher education system, dividing the system can make understanding how it works easier. Systems theory is one way in which this division can be accomplished. Saba (1999) used systems theory to evaluate distance education in the 1970s. Potts and Hogan (2000) and Rovai (2003a) examined distance education in the modern era and applied systems theory to how online distance education systems work and evaluate success. Higher education strategic

planning, program evaluation (Rovai, 2003a), and change (Watson & Watson, 2013) are areas in which systems theory has been shown useful.

Alignment of Research Questions to Data Collected

In the logistical regression model used for these research questions, several variables are included to ensure the model addresses not only distance education variables but also the academic achievement variables used as a standard for many admission offices today. Table 4 lists the independent variables examined for significance along with their corresponding research question. Other academic success independent variables were in the question to ensure that they are in place to represent their proper relationship with the independent variable under examination (Lomax & Hahs-Vaughn, 2012). I examined these academic success independent variables in Research Question Four for correlation with the three distance education variables used in Research Questions One through Three.

Table 4

Research Question to Independent Variable, Mediating Variables, and Sample Variables

Research Question	No. - Independent Variable (Field)	No. - Academic Achievement Variables (Field)	No. - Sample Variables (Field)
1	02 - Florida Virtual School (Yes/No)	12 – Total Number of Advanced Course Work Completed (Number) 15 – Highest Standardized Test Score Converted to Standard SAT Score (Number) 16 – High School GPA (Number)	06 – Enter Status (Text) 21 – In-state (Yes/No)
2	03 - Number of Florida Virtual School Courses (Number)	12 – Total Number of Advanced Course Work Completed (Number) 15 – Highest Standardized Test Score Converted to Standard SAT Score (Number) 16 – High School GPA (Number)	06 – Enter Status (Text) 21 – Instate (Yes/No)
3	05 - Florida Virtual School GPA (Number)	12 – Total Number of Advanced Course Work Completed (Number) 15 – Highest Standardized Test Score Converted to Standard SAT Score (Number) 16 – High School GPA (Number)	02 – Did Student Take a FVS Course in High School (Yes/No) 06 – Enter Status (Text) 21 – Instate (Yes/No)
4	03 - Number of Florida Virtual School Courses (Number) 05 - Florida Virtual School GPA (Number)	12 – Total Number of Advanced Course Work Completed (Number) 15 – Highest Standardized Test Score Converted to Standard SAT Score (Number) 16 – High School GPA (Number)	06 – Enter Status (Text) 21 – Instate (Yes/No)
For all questions, the dependent variable will be the following variables 19 – Graduated in Four Years 20 – Graduated in Six Years			

Note: FVS, Florida Virtual School; GPA, grade point average.

Analysis Methods

For the purpose of this study, I used SPSS 24 to analyze the data. Once provided, the data was analyzed using simultaneous logistic regression method. Research Questions One through Three used the same logistic methods to answer the questions. According to Lomax and Hahs-Vaughn (2012), this test is appropriate when it is unsure if some variables are more influential than others in the outcome of the dependent variable. This test allowed me to include the academic success variables studied today with the new distance education variables. By including both online distance education variables and current admission variables, logistic regression ensured the proper analysis. The regression has the ability to identify if a distance education variable is influential in the dependent variable outcome when accounting for all the independent variables included in the model. Including other similar academic success independent variables, the regression will be less likely to produce a false positive from another independent variable used in the admission decision process.

Once the model was created, a goodness-of-fit test needed to be calculated to learn how well each of the regression coefficients created fit within the model. Archer, Lemeshow, and Hosmer (2007), Hosmer and Lemeshow (2000), and Lomax and Hahs-Vaughn (2012) suggested that the one tool successful at providing goodness-of-fit for logistical regression is the Hosmer-Lemeshow goodness-of-fit test. This test produces a chi-square test. A good model fit is identified by the level of statistical significance to be above $p > .05$ (Lomax & Hahs-Vaughn, 2012, p. 717). When this test returns a statistical significance result less than $p < .05$, the model is then deemed a bad fit for the equation. The SPSS program can calculate the Hosmer-Lemeshow goodness-of-fit test as part of the logistic regression. Archer, Lemeshow, and Hosmer

(2007) confirmed that the Hosmer-Lemeshow goodness-of-fit test is used in studies to identify good or bad model fit.

When evaluating the effect size of the model and the variables, logistical regressions r , r^2 and the odds ratio (OR) can be used. When examining r and r^2 , Cohen (1988) identified a small effect exists when $r = .1$ or $r^2 = .01$, a medium effect exists when $r = .3$ or $r^2 = .09$, and a large effect exists when $r = .5$ or $r^2 = .25$. In addition to r and r^2 , the odds ratio can be used to determine the effect size. Hahs-Vaughn (2016) provides the instruction on running an SPSS logistic regression calculation where the odds ratio as $\text{Exp}(B)$. An odds ratio of 1 indicates the variable in question does not have an effect on the outcome. The further the number is away from 1, the greater the odds of the outcome affecting the dependent variable. This effect could be in either a positive and negative direction depending on the effect on the outcome (Hahs-Vaughn, 2016). The larger the effect size, the larger the relationship between the independent variable and the dependent variable.

To ensure that the values produced by the logistic regression are valid, Lomax and Hahs-Vaughn (2012) noted that there are several assumptions to address:

- Noncollinearity is required where multiple predictors are used and
- The dataset must be error-free.

Lomax and Hahs-Vaughn (2012) also addressed several conditions that must/should be met for a logistical regression.

- The dependent variable must be nominal/dichotomous,
- The sample size should be larger than 100,
- Dichotomous category variables should have both sides represented,

- Nonseparation of data should exist, and
- Outliers and influential data points should be removed.

Once the dataset was supplied, the sample size was confirmed for all questions to be larger than 100. Outliers were identified with SPSS, and the identified cases were removed for each question they identified. The dependent variable was confirmed to be dichotomous where all values were either a No a student did not graduate or a Yes they did graduate in the period specified. With all the assumptions and conditions met, the dataset was ready for the logistic regression to be calculated and evaluated. The SPSS output for each question are available in chapter four.

Limitations of the Study

In this study, as in all research, there are limitations. These limitations are in both the design and analysis of the study. The biggest design limitation and obstacle was finding viable data in a format that allowed analysis. Because distance education information is not used and accepted as an admission data point in higher education, finding the information in a database was difficult. Had this honors program not already had the data already, the alternative would have been to request the transcripts of all the students and manually code each student's distance education classes one by one. Fortunately, the honors program had the data to provide for this study. No other study has evaluated this type of data in this way, and the outcomes were unknown. Once complete, this study had the potential to provide the needed rationale to compile more data to expand on the study.

The next design limitation of the study is the variance that exists when students are enrolled at the institution. The goal of the study was to examine the students when they applied. This study did not take into account what major the student chose to pursue, within which

extracurricular activities the student participated, or what support the student received while enrolled. These were data points available to admission offices when admission was granted, but these data points could influence the outcome of whether a student graduates.

If more distance education data were available in databases, researchers could examine how distance education courses in high school affect students of different majors. In addition, with additional data points, researchers could examine students who follow very similar higher education experiences and learn if differences in high school distance education affect the outcome. In this study, I attempted to reduce the impact of these variances by examining students enrolled in the honors program. Nonetheless, by examining only honors students did one cannot assume that the students completed the honors program or used the provided support tools available to honors students.

The final design limitation of the study was the fact that I only evaluated FVS. There are hundreds of other distance education programs in which high students enroll, both in the state of Florida and across the United States. Each of these programs has different standards, and trying to compare them to one another and confirm that each one had accreditation from the corresponding agency would greatly increase the complexity and variance of the study. If this study demonstrated that distance learning had a significant influence on the graduation of students, admission offices could adapt their current practices asking questions about distance education on the application to provide the data needed for more in-depth research in coming years.

The analysis method limitations are based on the statistical method that was used. As identified by Lomax and Hahs-Vaughn (2012), logistical regression has required assumptions and conditions. Because of these assumptions, it would be ideal to have a larger sample of data

designed especially for this study. However, this strategy proved unwarranted once time and effort were compared to benefits. As long as this limitation is noted, future studies can learn from this one and make the needed adaptations to build on the outcomes of this study.

Summary

In this quantitative research study, the effect of high-school distance education courses was examined to determine how undergraduate admission office could use this information during the admission process. Until this study, no one had explored how the benefits of distance education could apply to the postsecondary admission process. The data provided by one honors program at a large institution allowed for this examination. By using delimitation to select a sample of students for evaluation, I hoped to limit the variance of students and provide the highest possible probability that the distance education variables resulted in an effect on the outcome under review. The primary purpose of this study was to determine whether distance education could assist in creating new recommendations for college admission offices. The purpose of such recommendations would be to increase student college graduation rates, which many higher education institutions strive to improve.

CHAPTER FOUR: FINDINGS

In this quantitative research study, I examined the use of high school distance education information as an admission indicator for graduation. I examined whether completing distance education, number of credits, or distance education GPA can provide evidence that a student is more likely to graduate in four or six years before the student completes a single class at the institution where he or she has applied for admission.

Chapter One provided the background of the study, while Chapter Two provided the literature on admissions and distance education to identify the gap that this research study addresses. Chapter Three addressed the research methods that were followed and provided the detail on the requested dataset. The data provided was analyzed using general systems theory to discover if changing the inputs (adding distance education) employed in the admission process would result in a greater output (higher graduation rate).

In this chapter, the data analysis findings will be shared from the four research questions listed in Chapters One and Three. With the data provided, logistic regression results are analyzed and findings shared.

Sample Description

I requested admission data from the years 2010–2012 from the honors program of the institution that was examined. Of the 1,494 admission records provided, 475 were for 2010, 516 were for 2011, and 503 were for 2012. Research Questions One, Two, and Three each consist of two parts. The first part of each research question examined a four-year time frame; these used all 1,494 records. Students admitted in 2010 would have to have graduated before summer 2014, students admitted in 2011 would have to have graduated before summer 2015, and students admitted in 2012 would have to have graduated before summer 2016. The second part of each

research question examined a six-year time frame; these questions used the 475 records from the admission year 2010, analyzing whether the students graduated by summer 2016.

As stated in Chapter Three, Lomax and Hahs-Vaughn (2012) addressed several conditions that must/should be met for a logistical regression. Table 5 displays the conditions and corresponding data characteristics.

Table 5

Logistic Regression Conditions

Conditions	Data
The dependent variable must be nominal/dichotomous	The dependent variable for all equations was set to either a 0, meaning the student did not graduate, or a 1, meaning that the student did graduate.
The sample size should be larger than 100	The smallest sample size in all the questions was greater than 100.
Dichotomous category variables should have both sides represented	For every dichotomous variable used, both 0's and 1's were found in the sample meaning that both sides were represented.
Nonseparation of data should exist	Nonseparation of data existed in this dataset, as the number of cases reviewed significantly exceeded the number of variables used, and no one variable was directly correlated to the dependent variable.
Outliers and influential data points should be removed	Outliers were identified in each questions dataset by SPSS and were removed.

Research Question One

The first research question of this study was: *What effect does completing Florida Virtual School academic online classes, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of first time in college (FTIC) honors students completing a four-year undergraduate degree at a public research university in four and six years?* In this study, I examined the following null and alternative hypotheses. The null hypothesis is – There will be no difference in graduation rates

between students who completed Florida Virtual School classes and those who did not. The alternative hypothesis is – There will be a difference in graduation rates between students who completed Florida Virtual School classes and those who did not. This question has two parts: a four-year and a six-year analysis. The first analysis will examine the four-year period.

Four-Year Graduation Rate

When I analyzed the data for the four-year period, 1,359 of the 1,481 cases met the needed criteria of being an in-state student, as seen in Table 6.

Table 6

Question 1: Four-Year In-state Students - Summary

Unweighted Cases		N	Percent
Selected Cases	Included in Analysis	1,359	91.8
	Missing Cases	0	.0
	Total	1,359	91.8
Unselected Cases		122	8.2
Total		1,481	100.0

The sample of in-state students (n = 1359) had 549 cases in which students did not graduate within four years and 810 cases in which students completed their degree within four years or fewer. Examining the four-year graduation rate revealed that the dataset had a range from 0 to 1 and a standard deviation of .491, meaning that the whole sample fell within two standard deviations. The SPSS data analysis confirmed that, of these 1359 cases, there were no outliers that fell more than two standard deviations away from the mean.

The next test calculated was the Hosmer and Lemeshow test. It should be noted that this test finds a good model fit if the p -value of the test is not below $p = .05$. This finding is the

opposite of how many other statistical tests find significant values. I determined that a good model of fit existed after examining the significant results of the Hosmer and Lemeshow test, as it yielded a non-statistically significant p-value of $p = .288$. Table 7 displays these results.

Table 7

Question 1: Four-Year In-state Students – Hosmer and Lemeshow Test

Chi-square	df	p
9.680	8	.288

As seen in Table 8, using Cohen (1988), I deduced the effect size of the four-year model to be medium, with a Cox and Snell R^2 of .069 and a Nagelkerke R^2 of .093.

Table 8

Question 1: Four-Year In-state Students - Model Summary

-2 Log Likelihood	Cox & Snell R-square	Nagelkerke R-square
1736.269	.069	.093

Overall, the logistic regression model included four variables/predictors (Total Advanced Coursework, SAT High Score, Weighted High School GPA, and Florida Virtual School Yes or No). This model, as displayed in Table 9, was accurate in predicting the correct outcome 63.4% of the time. When predicting the outcome of graduation in four years, the model was accurate 84% of the time, and when predicting the outcome of non-graduation, the model was correct 33% of the time.

Table 9

Question 1: Four-Year In-state Students – Classification Table

		Selected Cases		
		Four-Year Grad		Percentage Correct
		No	Yes	
Four Year Grad	Did not Graduate	181	368	33.0
	Graduated	130	680	84.0
Overall Percentage				63.4

After examining the results of the logistic regression in the model, with an alpha of .05, only one of the predictors was found to be statistically significant: weighted high school GPA (Wald = 66.952, $df = 1$, $p < .001$). Table 10 also reveals that the distance education predictor (Wald = .001, $df = 1$, $p = .976$) was not statistically significant and therefore does not provide evidence that it affects the outcome. In addition, the non-significant p-value and the low Wald value demonstrate that the distance education variable has a minimal unique contribution. If these co-variables were added to the same model, the distance education variable would not add any value to the predictive outcome of the model.

Table 10

Question 1: Four-Year In-state Students – Variables in the Equation

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	<i>OR</i>
Total_Adv_Coursework	.028	.015	3.602	1	.058	1.028
SAT_High	-.002	.001	3.554	1	.059	.998
HS_GPA	1.667	.204	66.952	1	.000	5.294
FL_VS_Bit	-.004	.131	.001	1	.976	.996
Constant	-4.788	1.346	12.653	1	.000	.008

Six-Year Graduation Rate

As seen in Table 11, when I analyzed the data for the six-year period, 435 of the 1,481 cases met the needed criteria of being an in-state student.

Table 11

Question 1: Six-Year In-state Students – Summary

Unweighted Cases		N	Percent
Selected Cases	Included in Analysis	435	29.4
	Missing Cases	0	.0
	Total	435	29.4
Unselected Cases		1,046	70.6
Total		1,481	100.0

Among the total sample of 435 in-state students, 60 students did not graduate within six years, and 375 students completed their degree within six years or fewer. The six-year graduation rate sample also had a range of 0 to 1 with a standard deviation of .345. In this sample, the mean (mean = .86) was skewed closer to 1. A greater number of students graduating than students not graduating means that not all cases are two standard deviations from the mean.

SPSS used the logistic regression output to highlight outliers in the casewise list. This data analysis revealed that of these 435 cases, there were 26 outliers that fell more than two standard deviations away from the mean. I calculated logistic regression with the remaining 409 cases. The sample with the outliers removed had 34 students who did not graduate in six years and 375 students who completed their degree in six years or fewer. I determined that a good model of fit existed after examining the significant results of the Hosmer and Lemeshow test.

Specifically, as seen in Table 12, this test yielded a non-statistically significant p-value of $p = .300$.

Table 12

Question 1. Six-Year In-state Students – Hosmer and Lemeshow Test

Chi-square	df	p
9.522	8	.300

Using Cohen (1988), I deduced the effect size of the six-year model to be a medium to large, with a Cox and Snell R^2 of .120 and a Nagelkerke R^2 of .276. Table 13 represents these results.

Table 13

Question 1: Six-Year In-state Students – Model Summary

-2 Log Likelihood	Cox & Snell R-square	Nagelkerke R-square
181.767	.120	.276

Overall the logistic regression model included four variables /predictors (Total Advanced Coursework, SAT High Score, Weighted High School GPA, and Florida Virtual School Yes or No). This model, as seen in Table 14, was accurate in predicting the correct outcome 90.5% of the time. When predicting the outcome of graduation in six years, the model was accurate 98.4% of the time, and when predicting the outcome of non-graduation, the model was correct 2.9% of the time.

Table 14

Question 1: Six-Year In-state Students – Classification Table

		Selected Cases		
		Six Year Bit		Percentage Correct
		No	Yes	
Six Year Grad	Did not Graduate	1	33	2.9
	Graduated	6	369	98.4
Overall Percentage				90.5

Next, I calculated the logistic regression to determine significance of weighted high school GPA, which revealed statistical significance with an alpha of .05, for two of the predictors: weighted high school GPA (Wald = 33.888, df = 1, $p < .001$) and total advanced coursework (Wald = 5.135, df = 1, $p = .023$). Table 15 also reveals that the distance education predictor (Wald = .365, df = 1, $p = .546$) was not statistically significant and therefore does not provide evidence that it affects the outcome. In addition, the non-significant p-value and the low Wald value demonstrate that the distance education variable has an extremely small unique contribution. If these co-variables were added to the same model, the distance education variable would not add any value to the predictive outcome of the model.

Table 15

Question 1: Six-Year In-state Students – Variables in the Equation

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	<i>OR</i>
Total_Adv_Coursework	.145	.064	5.135	1	.023	1.156
SAT_High	-.004	.003	1.326	1	.249	.996
HS_GPA	3.432	.618	33.888	1	.000	30.946
FL_VS_Bit	-.284	.470	.365	1	.546	.753
Constant	-7.032	5.446	1.667	1	.197	.001

Research Question Two

The second research question of this study was: *What effect does the number of Florida Virtual School academic online classes completed, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of FTIC honors students completing a four-year undergraduate degree at a public research university in four and six years?* The study will be examining the following null and alternative hypothesis. The null hypothesis is – There will be no difference in graduation rates between students who completed one Florida Virtual School class and those who completed several classes. The alternative hypothesis is – There will be a difference in graduation rates between students who completed one Florida Virtual School class and those who completed several classes. This question has two parts: a four-year and a six-year analysis. The first analysis will examine the four-year period of the research question.

Four-Year Graduation Rate

As indicated in Research Question One, the number of cases meeting the four-year requirement for in-state students was 1,359 of 1,481 (see Table 6). In this sample, 549 students

did not graduate in four years or fewer while 810 students completed their degree in four years or fewer. SPSS data analysis revealed that, of these 1,359 cases, there were no outliers that fell more than two standard deviations away from the mean. The four-year graduation variable had a range of 0 to 1 with a standard deviation of .491. I determined that a good model of fit existed after examining the significant results of the Hosmer and Lemeshow test, as it yielded a non-statistically significant p-value of $p = .447$. Table 16 displays the Hosmer and Lemeshow results.

Table 16

Question 2: Four-Year In-state Students – Hosmer and Lemeshow Test

Chi-square	df	p
7.862	8	.447

As seen in Table 17, when determining the statistical strength of the four-year model using Cohen (1988), I reasoned the effect size to be medium, with a Cox and Snell R^2 of .069 and a Nagelkerke R^2 of .094.

Table 17

Question 2: Four-Year In-state Students – Model Summary

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1,736.269	.069	.094

Overall, the logistic regression model included four variables/predictors (Total Advanced Coursework, SAT High Score, Weighted High School GPA, and Total Distance Education Credits). This model, as seen in Table 18, was accurate in predicting the correct outcome 63% of the time. When predicting the outcome of graduation in four years, the model was correct 83.8%

of the time, and when predicting the outcome of non-graduation, the model was accurate 32.2% of the time.

Table 18

Question 2. Four-Year In-state Students – Classification Table

		Selected Cases		
		Four-Year Grad		Percentage Correct
		No	Yes	
Four-Year Grad	Did not Graduate	177	372	32.2
	Graduated	131	679	83.8
Overall Percentage				63.0

After examining the results of the logistic regression in the model, with an alpha of .05, only one of the predictors was found to be statistically significant: weighted high school GPA (Wald = 66.661, $df = 1$, $p < .001$). Table 19 also reveals that the distance education credit hours predictor (Wald = .294, $df = 1$, $p = .587$) was not statistically significant and therefore does not provide evidence that it affects the outcome. In addition, the non-significant p-value and the low Wald value demonstrate that the distance education variable has a small unique contribution. If these co-variables were added to the same model, the distance education variable would not add any value to the predictive outcome of the model.

Table 19

Question 2. Four-Year In-state Students – Variables in the Equation

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	<i>OR</i>
Total_Adv_Coursework	.027	.015	3.388	1	.066	1.027
SAT_High	-.002	.001	3.525	1	.060	.998
HS_GPA	1.661	.203	66.661	1	.000	5.263
Dist_Ed_Total_Cred	.040	.074	.264	1	.587	1.041
Constant	-4.779	1.347	12.596	1	.000	.008

Six-Year Graduation Rate

When I analyzed the data for the six-year period for Research Question Two, 435 of the 1,481 students met the criteria of being an in-state student. This result is the same finding as in Research Question One and can be seen in Table 11. In this sample, there were 60 cases in which students did not graduate in six years and 375 cases in which students completed their degree in six years or fewer. Research Question Two was similar to Research Question One in that it had a skewed mean on six-year graduation rate (mean = .86). With a range of 0 to 1 and a standard deviation of .345, all cases did not fall within the two standard deviations. When SPSS calculated the logistic regression, the analysis revealed that 26 cases were outliers on the casewise list of the 435 cases in the sample. I used Logistic regression analysis with the remaining 409 cases. The sample with the outliers removed contained 34 students who did not graduate within six years, while it contained 375 students who completed their degree in six years or fewer. As seen in Table 20, when examining the Hosmer and Lemeshow test, I determined that a good model of fit existed after consideration of the results, as it yielded a non-statistically significant p-value of $p = .274$.

Table 20

Question 2: Six-Year In-state Students – Hosmer and Lemeshow Test

Chi-square	df	p
9.876	8	.274

Using Cohen (1988), the effect size of the whole model was deduced to be medium to large, with a Cox and Snell R^2 of .135 and a Nagelkerke R^2 of .310. Table 21 displays these results.

Table 21

Question 2: Six-Year In-state Students – Model Summary

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
181.767	.135	.310

The logistic regression model created examining six-year graduation for the Research Question Two model included four variables /predictors (Total Advanced Coursework, SAT High Score, Weighted High School GPA, and Total Distance Education Credits). As seen in Table 22, this model was accurate in predicting the correct outcome 90.2% of the time. When predicting the outcome of graduation in six years, the model was accurate 97.6% of the time, and when predicting the outcome of non-graduation, the model was correct 8.8% of the time.

Table 22

Question 2. Six-Year In-state Students – Classification Table

		Selected Cases		
		Six-Year Grad		Percentage Correct
		No	Yes	
Six Year Grad	Did not Graduate	3	31	8.8
	Graduated	9	366	97.6
Overall Percentage				90.2

The results of the logistic regression in the model for the Research Question Two six-year graduation time frame, with an alpha of .05, was that three of the predictors were found to be statistically significant. The significant predictions were found to be the following: weighted high school GPA (Wald = 30.896, df = 1, $p < .001$), total advanced coursework (Wald = 5.632, df = 1, $p = .018$), and total distance education credits (Wald = 15.333, df = 1, $p < .001$). Table 23 reveals that the distance education predictor (B = -.902) was statistically significant and therefore provides evidence that it affects the outcome in a negative direction. In addition to the significant p-value, the higher Wald value demonstrates that the distance education variable has a unique contribution to the model. Therefore, if one added these co-variables to the same model as the distance education variable, it would provide value to the predictive outcome of the model.

Table 23

Question 2: Six-Year In-state Students – Variables in the Equation

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	<i>OR</i>
Total_Adv_Coursework	.160	.067	5.632	1	.018	1.173
SAT_High	-.005	.004	2.221	1	.136	.995
HS_GPA	3.520	.633	30.896	1	.000	33.801
Dist_Ed_Total_Cred	-.902	.230	15.333	1	.000	.406
Constant	-5.412	5.557	.949	1	.330	.004

Research Question Three

The third research question of this study was: *What effect does Florida Virtual School GPA, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of FTIC honors students completing a four-year undergraduate degree at a public research university in four and six years?* I examined the following null and alternative hypothesis. The null hypothesis is – There will be no difference in graduation rates between students who had high Florida Virtual School GPAs and those who had low GPAs. The alternative hypothesis is – There will be a difference in graduation rates between students who had high Florida Virtual School GPAs and those who had low GPAs. This question has two parts: a four-year and a six-year analysis. The first analysis will examine the four-year period of research question three.

Four-Year Graduation Rate

When I analyzed the data for this question, 364 of the 1,481 cases met the needed criteria of being an in-state student and having completed Florida Virtual School courses, as seen in Table 24. The additional constraint was added as SPSS would not calculate students in the

regression that did not have a Distance Education GPA. This condition is the reason that the additional constraint was added; this requirement resulted in the smaller sample.

Table 24

Question 3. Four-Year In-state Students – Summary

Unweighted Cases		N	Percent
Selected Cases	Included in Analysis	364	24.6
	Missing Cases	0	.0
	Total	364	24.6
Unselected Cases		1,117	75.4
Total		1,481	100.0

This smaller sample had 139 cases in which students did not graduate in four years and 225 cases in which students completed their degree in four years or fewer. Within the 364 cases, the four-year graduation variable had a range that started at 0 and ended at 1. I calculated that standard deviation to be .487. With the data calculations, it was revealed that of these 364 cases, no outliers were found that fell more than two standard deviations away from the mean. In addition, I found a good model of fit existed after examining the significant results of the Hosmer and Lemeshow test, as it yielded a non-statistically significant p-value of $p = .810$. Table 25 displays these results.

Table 25

Question 3: Four-Year In-state Students – Hosmer and Lemeshow Test

Chi-square	df	p
4.499	8	.810

As seen in Table 26, using Cohen (1988), I found the effect size of the six-year model to be in a range of small to medium, with a Cox and Snell R^2 of .039 and a Nagelkerke R^2 of .053.

Table 26

Question 3: Four-Year In-state Students – Model Summary

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
469.710	.039	.053

For this question, the logistic regression model included four variables/predictors (Total Advanced Coursework, SAT High Score, Weighted High School GPA, and Distance Education GPA). This logistic regression model, as seen in Table 27, was correct in predicting the outcome 62.4% of the time. When predicting the outcome of successful graduation in four years, this model was right 92.4% of the time, and when forecasting the outcome of not graduation, the model was accurate 13.7% of the time.

Table 27

Question 3. Four-Year In-state Students – Classification Table

		Selected Cases		
		Four-Year Grad		Percentage Correct
		No	Yes	
Four Year Grad	Did not Graduate	19	120	13.7
	Graduated	17	208	92.4
Overall Percentage				62.4

This study used an alpha of .05, after examining the results of the logistic regression in the model only one of the predictors was found to be statistically significant: weighted high school GPA (Wald = 10.501, $df = 1$, $p = .001$). In Table 28, the Distance Education GPA hours predictor

(Wald = .404, df = 1, $p = .525$) was found not to be statistically significant and therefore does not provide confirmation that it affects the dependent variable. In addition, the non-significant p -value and the low Wald value demonstrate that the distance education variable has an extremely small unique contribution. The outcome of these results identified that the distance education variable did not add any value to the predictive outcome of the model.

Table 28

Question 3: Four-Year In-state Students – Variables in the Equation

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	<i>OR</i>
Total_Adv_Coursework	.008	.026	.095	1	.758	1.008
SAT_High	-.001	.001	.691	1	.406	.999
HS_GPA	1.365	.421	10.501	1	.001	3.915
Dist_Ed_GPA	.174	.273	.404	1	.525	1.190
Constant	-4.451	2.582	2.972	1	.085	.012

Six-Year Graduation Rate

Next, I analyzed the data were for the six-year period, 117 of the 1,481 cases met the needed criteria of being an in-state student. These criteria resulted in the smallest sample in the whole study. As stated in the four-year examination of Research Question Three, SPSS would not calculate students in the regression that did not have a Distance Education GPA. For this reason, I added the additional constraint, causing the smaller sample. The sample had 15 cases in which students did not graduate in six years, and 102 cases in which students completed their degree in six years or fewer. When examining the dependent variable of six-year graduation the range was 0 to 1 with a standard deviation of .336 SPSS data analysis discovered that of these 117 cases, there were six casewise outliers that fell more than two standard deviations away from

the mean. Following the conditions set forth by Logistic regression, I created the model with the remaining 111 cases as seen in Table 29. The sample with the outliers removed contained nine students who did not graduate in six years, while it contained 102 students who completed their degree in six years or fewer.

Table 29

Question 3: Six-Year In-state Students – Summary

Unweighted Cases		N	Percent
Selected Cases	Included in Analysis	111	7.5
	Missing Cases	0	.0
	Total	111	7.5
Unselected Cases		1370	92.5
Total		1,481	100.0

As seen in Table 30, I determined that a good model of fit existed after examining the significant results of the Hosmer and Lemeshow test, as it yielded a non-statistically significant p-value of $p = .940$.

Table 30

Question 3: Six-Year In-state Students – Hosmer and Lemeshow Test

Chi-square	df	p
2.909	8	.940

Using Cohen (1988), I deduced the effect size of the whole model to be large, with a Cox and Snell R^2 of .249 and a Nagelkerke R^2 of .578. Table 31 reveals these analysis results.

Table 31

Question 3: Six-Year In-state Students – Model Summary

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
30.708	.249	.578

Overall, the logistic regression model included four variables/predictors (Total Advanced Coursework, SAT High Score, Weighted High School GPA, and Distance Education GPA). This model, as seen in Table 32, was accurate in predicting the correct outcome 94.6% of the time. When predicting the outcome of graduation in six years, the model was correct 98.0% of the time, and when predicting the outcome of non-graduation, the model was accurate 55.6% of the time.

Table 32

Question 3: Six-Year In-state Students – Classification Table

		Selected Cases		
		Six-Year Grad		Percentage Correct
		No	Yes	
Six Year Grad	Did not Graduate	5	4	55.6
	Graduated	2	100	98.0
Overall Percentage				94.6

After investigating the results of the logistic regression in the model, two of the predictors were found to be statistically significant when using an alpha of .05, weighted high school GPA (Wald = 4.420, df = 1, $p = .036$) and SAT high score (Wald = 11.253, df = 1, $p = .001$). Table 33 also highlights that the distance education predictor (Wald = 2.898, df = 1, $p = .089$) was not statistically significant and therefore does not provide evidence that it affects the outcome. More confirmation of this could be found in the low Wald value; this demonstrates that the distance

education variable has a minimal unique contribution. If these co-variables were added to the same model, the distance education variable would not add any value to the predictive outcome of the model.

Table 33

Question 3. Six-Year In-state Students – Variables in the Equation

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	<i>OR</i>
Total_Adv_Coursework	.323	.176	3.366	1	.067	1.173
SAT_High	-.035	.010	11.253	1	.001	.995
HS_GPA	3.463	1.647	4.420	1	.036	33.801
Dist_Ed_GPA	2.095	1.231	2.898	1	.089	.406
Constant	25.891	11.438	5.124	1	.024	1.755E+11

Research Question Four

The fourth research question of this study was: *What correlation do the current academic achievement variables (standardized test scores, GPA, and advanced coursework) have with the new Florida Virtual School admission variables (attended, number of courses, GPA) toward completing a four-year undergraduate degree at a public research university in four and six years?* The study will be examining the following null and alternative hypothesis. The null hypothesis is – There will be no correlation in the current admission variables compared to the new Florida Virtual School admission variables. The alternative hypothesis is – There will be a correlation in the current admission variables compared to the new Florida Virtual School admission variables. This question has two parts: a four-year and a six-year analysis. The first analysis will examine the four-year period.

Four-Year Graduation Rate

When I analyzed the data for the four-year period, 1,359 of the 1,481 cases met the needed criteria of being an in-state student, as seen in Table 6. I used this sample to examine the correlation of the Distance Education Yes/No variable along with the distance education total credit hour variable. In the correlation matrix in Table 34, it is expected that Distance Education Total Credit and Florida Virtual School Yes/No are highly correlated, with a correlation coefficient of $-.725$. These two variables reveal similar information to each other; Florida Virtual School Yes/No indicates whether a student has taken a distance education class, while Distance Education Total Credits reveals how many credits a student has taken. In examining the other correlations that exist between the variables, most values are close to 0, indicating no relationship between the variables. None of the correlation values, except for the Distance Education variables, exceeds $.3$, indicating that the highest correlation reveals a weak or moderate relationship at best. In summary, the Distance Education variables are not highly or moderately correlated to any of the three primary variables used today to measure academic achievement.

Table 34

Question 4. Four-Year In-state Students – Correlation Matrix Distance Education Credits

	Total_Adv_Coursework	SAT_High	HS_GPA	FL_VS_Bit	Dis_Ed_Total_Cred
Total_Adv_Coursework	1.000	-.159	-.296	-.013	-.055
SAT_High	-.159	1.000	-.053	.040	-.020
HS_GPA	-.296	-.053	1.000	-.044	.000
FL_VS_Bit	-.013	.040	-.044	1.000	-.725
Dis_Ed_Total_Cred	-.055	-.020	.000	-.725	1.000

When I analyzed the data for the four-year period, 364 of the 1,481 cases met the needed criteria of being an in-state student, as seen in Table 35. I used this sample to examine the correlation of the Distance Education GPA variable to the three academic achievement variables.

Table 35

Question 4. Four-Year In-state Students – Summary Distance Education GPA

Unweighted Cases		N	Percent
Selected Cases	Included in Analysis	364	24.6
	Missing Cases	0	.0
	Total	364	24.6
Unselected Cases		1,117	75.4
Total		1,481	100.0

In the correlation matrix in Table 36, most of the correlation values are close to 0, indicating no relationship between the variables. None of the correlation values exceeds .31, revealing that the highest correlation is a weak or moderate relationship at best. The Distance Education GPA variable does not meet the criteria to be considered highly or moderately correlated with any of the three main variables used today to measure academic achievement.

Table 36

Question 4. Four-Year In-state Students – Correlation Matrix Distance Education GPA

	Total_Adv_Coursework	SAT_High	HS_GPA	Dist_Ed_GPA
Total_Adv_Coursework	1.000	-.114	-.307	.091
SAT_High	-.114	1.000	-.134	-.009
HS_GPA	-.307	-.134	1.000	-.160
Dist_Ed_GPA	.091	-.009	-.160	1.000

Six-Year Graduation Rate

When I analyzed the data for the six-year period, 435 of the 1,481 cases met the needed criteria of being an in-state student, as seen in Table 11. I used this sample to examine the correlation of the Distance Education Yes/No variable along with the distance education total credit hour variable. In the correlation matrix in Table 37, it is expected that the Distance Education Total Credit and Florida Virtual School Yes/No variables are highly correlated, with a correlation coefficient of $-.757$. These two variables reveal similar information to each other; Florida Virtual School Yes/No indicates whether a student has taken a distance education class, while Distance Education Total Credits reveals how many credits a student has taken. In examining the other correlations that exist between the variables, most values are close to 0, indicating no relationship between the variables. None of the correlation values except for the Distance Education variables exceeds $.3$, indicating that the highest correlation is a weak or moderate relationship at best. The Distance Education variables do not meet the needed criteria need to be considered highly or moderately correlated to any of the three primary variables used today to measure academic achievement.

Table 37

Question 4. Six-Year In-state Students – Correlation Matrix Distance Education Credits

	Total_Adv_Coursework	SAT_High	HS_GPA	FL_VS_Bit	Dis_Ed_Total_Cred
Total_Adv_Coursework	1.000	-.258	-.220	.046	-.212
SAT_High	-.258	1.000	.088	-.078	.190
HS_GPA	-.220	.088	1.000	-.046	-.002
FL_VS_Bit	-.046	-.078	-.046	1.000	-.757
Dis_Ed_Total_Cred	-.212	.190	-.002	-.757	1.000

When I analyzed the data for the six-year period, 111 of the 1,481 cases met the needed criteria of being an in-state student, as seen in Table 38. I used this sample to examine the correlation of the Florida Virtual School GPA variable to the other three academic success variables.

Table 38

Question 4. Six-Year In-state Students – Summary Distance Education GPA

Unweighted Cases		N	Percent
Selected Cases	Included in Analysis	111	7.5
	Missing Cases	0	.0
	Total	111	7.5
Unselected Cases		1370	92.5
Total		1481	100.0

The correlation matrix in Table 39 reveals that SAT High Score and Weighed High School GPA are moderately correlated, with a $-.555$ correlation value. The Distance Education GPA is not highly or moderately correlated to any of the three primary variables used today to measure academic achievement.

Table 39

Question 4. Six-Year In-state Students – Correlation Matrix Distance Education GPA

	Total_Adv_Coursework	SAT_High	HS_GPA	Dist_Ed_GPA
Total_Adv_Coursework	1.000	-.384	-.079	.173
SAT_High	-.384	1.000	-.555	-.208
HS_GPA	-.079	-.555	1.000	-.063
Dist_Ed_GPA	.173	-.208	-.063	1.000

Summary

In this chapter, I outlined the findings of the four research questions. Research Questions One, Two, and Three used SPSS to calculate a logistic regression to evaluate the statistical significance of the output. I used the Hosmer and Lemeshow test to demonstrate that the model was a good fit. For Research Question Four, I used the correlation output tables provide by SPSS with its logistical regression output to provide evidence of a correlation between the three distance education variables and the three academic achievement variables used today. In Chapter Five, I will use this information to discuss the results, limitations, and recommendations from this study for admissions offices and future research.

CHAPTER FIVE: CONCLUSION

Overview

In this quantitative research study, I examined high school distance education and its effects on graduation rates. Specifically, I examined six-year graduation rates within a sample of 435 students and four-year graduation rates within a sample of 1,359 students. Using SPSS to perform the logistic regression resulted in statistically significant models with the outcomes of graduating within the specified periods. By applying general systems theory to the admission process, we can discover the effect of distance education variables as inputs by analyzing the output.

It was my hypothesis that online education in high school would have a positive effect on the completion of a four-year undergraduate degree. With four research questions, I examined the effect of the distance education variable on the admission process and other academic achievement variables used today by higher education admission offices. The research completed by Burton and Ramist (2001) provided evidence that GPA and SAT are the best of the academic achievement variables used today for predicting the success of incoming students. The purpose of this study was to better understand and apply distance education information to the undergraduate admission process to achieve higher graduation rates for both four-year and six-year graduation timelines. To achieve the knowledge of high schools distance education impact on graduation, I explored the following research questions:

1. What effect does completing Florida Virtual School academic online classes, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of first time in college (FTIC) honors

students completing a four-year undergraduate degree at a public research university in four and six years?

2. What effect does the number of Florida Virtual School academic online classes completed, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of FTIC honors students completing a four-year undergraduate degree at a public research university in four and six years?
3. What effect does Florida Virtual School GPA, in addition to academic achievement indicators used today (standardized test scores, GPA, and advanced coursework), have on the likelihood of FTIC honors students completing a four-year undergraduate degree at a public research university in four and six years?
4. What correlation do the current academic achievement variables (standardized test scores, GPA, and advanced coursework) have with the new Florida Virtual School admission variables (attended, the number of courses, GPA) toward completing a four-year undergraduate degree at a public research university in four and six years?

Method Summary

I completed this quantitative research study over the summer of 2017. Once the institutional review board approved the study, I sent the email in APPENDIX B to the director of the honors program being examined. The file that the director provided had information about students admitted in the years 2010, 2011, and 2012. I used this dataset to answer the four research questions stated above. Research Questions One through Three used a subset of the data in a logistic regression model to determine if the distance education variables had any statistical significance in predicting the outcome of students graduated. The theoretical framework used in

this study was General System Theory. In these three research questions, the input used in the framework was the sample that provided by the honors program. The logistic regression is the process that now includes the distance education variables. The output is the graduation of the students. In Research Question Four, I examined the correlation matrix that was part of the evaluation of the logistic regression to determine whether there exists a correlation between the distance education variable and the academic success variables used today by admission offices.

Findings by Research Question

The findings for each research question using the statistical test required for each question can be found in Chapter Four. The information from Chapter Four will be employed in this section to analyze the results and answer the four research questions being addressed in this research study. In this section, the finding will show that the null hypothesis was accepted. I will analyze these research questions by following the general system theory theoretical framework. This framework allows for the simplification of the complexities of the higher education system. The finding listed below will use the admission process of the higher education system as the baseline and starting point. Because of the premises of system theory, many other systems in higher education did not need examination. Although system theory offers a better understanding of the system being observed, the output that this study is researching does not occur in a vacuum. Because this study does not survey the interaction with other systems, there is much more to learn about this topic once the findings of the isolated system are learned.

Research Question One

With Research Question One, I examined whether taking a distance education class in high school increased the likelihood that a student would excel in higher education and graduate in either four or six years. This question was grounded in the research conducted by Kretchmar

and Farmer (2013). In their research, they revealed that taking five AP courses in high school would increase the first year GPA of a freshman in college. In creating Research Question One, the same type of logic was used, but I applied it to distance education course and tied the courses to graduation.

For this research question, I used logistic regression with a dependent variable value of 0 indicating that a student did not graduate and a dependent variable value of 1 indicating that a student did graduate. I included four independent variables, consisting of total advanced coursework (the number of AP, IB, or DE courses completed by the student), SAT high score (the highest standardized test score achieved by the student, either the SAT score or the ACT score converted to an equivalent SAT score), weighted high school GPA, and Florida Virtual School Yes/No a student completed a course (a 1 and 0 were used respectively to indicate Florida Virtual School had or had not been taken). The outcome was expected to be similar to the findings is found in the research completed by Kretchmar and Farmer (2013) in that, by taking distance education courses, a student would be more likely to graduate.

Once the logistic regression was calculated, I examined the casewise list, which highlighted any outliers that needed to be excluded. In the case of the regression that analyzed the six-year graduation rate, some outliers were identified. As a condition of logistic regression, I removed these cases from the model and recalculated the test with the sample that eliminated the outliers (Lomax & Hahs-Vaughn, 2012). Next, I calculated the Hosmer and Lemeshow Test to confirm that the model that was generated was statistically considered a good fit. In both the four-year and the six-year model, the results of the test confirmed that the model produced was a good fit.

With a good fit model in place, confirmed by the good fit found by the Hosmer and Lemeshow Test, the regression revealed that statistically the distance education variable Florida Virtual School Yes/No was not influential in the outcome of whether a student graduated in four or six years. For this variable to be significant, the p-value would need to be below .05. In the four-year regression, the p-value for Florida Virtual School Yes/No was $p = .976$, $df = 1$, and an $n = 1359$. In the six-year regression, the p-value for Florida Virtual School Yes/No was $p = .546$, $df = 1$, and an $n = 409$. For both the four-year and six-year regression, the null hypothesis was found to be true.

The correlation matrix that was produced to determine whether a correlation exists between the Florida Virtual School Yes/No variable and the three other academic achievement variables will be examined in Research Question Four.

When applying general systems theory to the higher education admission process, Research Question One added the input of Florida Virtual School Yes/No. The regression included this new variable to the process, and I evaluated the output as graduated or not graduated. It has been confirmed that, with this sample, Florida Virtual School Yes/No does not have a statistically significant effect on the outcome of graduating or not. Based on the sample provided by the honors program and the results of the logistic regressions for the four-year and six-year graduation periods, changing the admission process to examine if a student completed a Florida Virtual School course would not be justified.

It is important to note that these logistic regression results are from a sample of high-achieving honors students. It was determined that, with this sample, the results were not significant; however, this sample had a six-year graduation rate over 76%. Such a graduation rate is over five percentage points higher than the institution as a whole, whose graduation rate range

is 65–70%, data obtained on the fact pages of the institution. If a sample of data could be collected regarding a group of students more characteristic of the mainstream institutional graduation rate, the results may be different.

Research Question Two

In Research Question Two, I examined whether taking a distance education class in high school increased the likelihood that a student would excel in higher education and graduate in either four or six years. I used logistic regression, with a dependent variable value of 0, indicating that a student did not graduate and a dependent variable value of 1 indicating that a student did graduate. I included four independent variables in the model, consisting of total advanced coursework (the number of AP, IB, or DE courses completed by the student), SAT high score (the highest standardized test score achieved by the student, either the SAT score or the ACT score converted to an equivalent SAT score), weighted high school GPA, and Florida Virtual School Credits a student completed. As in Research Question One, this question was founded on the research conducted by Kretchmar and Famer (2013), only this time the input would specifically examine the exact number of courses taken by means of distance education and then examining the outcome of graduation.

Once I performed the logistic regression, the first test I examined was the casewise list, which highlighted any outliers that needed to be excluded. In the case of the regression that analyzed the six-year graduation rate, I identified some outliers. As a condition of logistic regression, I removed these cases from the model and recalculated the test with the sample that eliminated the outliers (Lomax & Hahs-Vaughn, 2012). Next, the Hosmer and Lemeshow Test was analyzed to confirm that the model that was generated was a good fit. In both the four-year and the six-year model, the results of the test confirmed that the model generated was a good fit.

With a good logistical regression model in place, the four-year regression revealed that the distance education variable Florida Virtual School Credits was not influential in the outcome of whether a student graduated in four years but was influential in six years. This variable is found to be significant when the p-value is below .05. In the four-year regression, the p-value for Florida Virtual School Credits variable was $p = .587$, $df = 1$, and an of $n = 1359$. However, the variable was found to be significant in the six-year graduation model. In the six-year regression, the p-value for the Florida Virtual School Credits variable was $p = .000$, $df = 1$, $n = 409$, and a $B = -.902$. This statistically significant result, combined with the negative coefficient, provides evidence that the greater the number of credits completed in the Florida Virtual School system in high school, the less likely a student is to graduate in six years. With this data, the null hypothesis was found to be true for the four-year regression model the alternative hypothesis was found true for the six-year regression.

The correlation matrix that was produced highlighting whether a correlation existed between the Florida Virtual School Credits variable and the three other academic achievement variables will be examined in Research Question Four.

When applying general systems theory to the higher education admission process, for this research question, I added the input of Florida Virtual School Credits. The regression included this new variable to the process, and the output was evaluated as graduated or not graduated. It has been confirmed that, with this sample, Florida Virtual School Credits does not have a statistically significant effect on the outcome of graduating or not within the four-year time frame. Based on the sample provided by the honors program and the results of the regressions for the four-year graduation period, changing the admission process to examine if a student completed Florida Virtual School credits would not be justified. The Florida Virtual School

Credits variable was found to affect the outcome when supplied as an input to the process of admission. The logistic regression provided evidence that as the input (the number of Florida Virtual School Credits) increased, the likelihood of a student graduating in six years decreases.

I answered this question using logistic regression results from a sample of high-achieving honors students. I determined that with this sample, the four-year results were not significant and the six-year results were significant. Nonetheless, this sample had a six-year graduation over 76%, and this is over five percentage points higher than the institution as a whole, whose graduation rate range is 65–70%, obtained from the fact page of the institution examined. As stated for Research Question One, the results might be different if the data was more characteristic of the higher education institution as a whole and not just representative of the top 10% of the incoming class.

Research Question Three

Research Question Three examined whether distance education GPA in high school increased the likelihood that a student would excel in higher education and graduate in either four or six years. This research question was based on the research that has been completed by Rohr (2012). In the study conducted by Rohr, it was found that high school GPA was the best predictor of student success in college. The premise for posing Research Question Three was that Distance Education GPA might have a similar insight into student success when evaluating graduation rates as high school GPA did in Rohr's (2012).

With Research Question Three, I used logistic regression, with a dependent variable value of 0 indicating that a student did not graduate and a dependent variable value of 1 stating that a student did graduate. I included four independent variables were included in the model,

consisting of total advanced coursework (the number of AP, IB, or DE courses completed by the student), SAT high score (the highest standardized test score achieved by the student, either the SAT score or the ACT score converted to an equivalent SAT score), weighted high school GPA, and Florida Virtual School GPA.

As performed in Research Question One and Two, the first test that was examined, after calculating the logistic regression, was the casewise list. This test highlighted any outliers that needed to be excluded as set forth as a condition of using logistic regression. This test found that in the model created for the six-year graduation rate outliers were identified which needed to be removed. Once these outliers were removed from the model, I recalculated the test (Lomax & Hahs-Vaughn, 2012). With the sample finalized, the next test evaluated was the Hosmer and Lemeshow Test. I used this test to confirm that the model generated is a good fit. Both the four-year and the six-year models were found to be good fits after reviewing the results of the Hosmer and Lemeshow Test. With a good model in place, the four-year regression revealed that the distance education variable, Florida Virtual School GPA, was not influential in the outcome of whether a student graduated in four or six years. To be found significant, the p-value would need to be below .05. In the four-year regression model, the p-value for Florida Virtual School GPA was $p = .525$, $df = 1$, and an of $n = 364$. In the six-year regression model, the p-value for the Florida Virtual School GPA was .089, $df = 1$, and $n = 111$. With these findings, I confirmed that the null hypothesis is true for Research Question Three.

The logistic regression output from SPSS included the correlation matrix for all variables used. This matrix is the focus of Research Question Four; therefore, I examine the matrix in detail in that section and it will not be considered here.

The theory used to examine the effects of Florida Virtual School GPA on the higher education admission process was general systems theory. The logistic regression added this new variable to the main three academic success variables that are used today, and the output was evaluated as graduated or not graduated. When the logistic regression was calculated, Florida Virtual School GPA was determined not to have a statistically significant effect on the outcome of graduating or not. Based on the high-achieving sample of students provided by the honors program and the results of the regressions for the four-year and six-year graduation periods, changing the admission process to include a student's Florida Virtual School GPA would not be justified.

The sample I used for this study does not represent that average institution student body or application pool. This sample is comprised of high-achieving honors students with a six-year graduation rate over 76%. This is over five percentage points higher than the institution as a whole, whose range is 65–70%, data obtained from the fact page of the institution being examined. It is reasonable to conclude that the results would vary if the same research was conducted with a dataset that represented the general application pool of the institution.

Research Question Four

With Research Question Four, I examined whether there is a correlation between any of the distance education variables and the three academic success variables. With this question, I sought to examine cases in which a student's high school GPA and high school distance education GPA were either high or low, consistently. If this was found to be the case and the results were found to be significant, it would be necessary to find evidence that the input to the Systems Theory model was significant on its own and not because it was correlated with another variable in the model.

Examining the Correlation Matrix in Chapter Four provided evidence that the three distance education variables are at most weakly correlated to the academic success variables according to Lomax and Hahs-Vaughn (2012). In examining the four-year graduation rate, The Florida Virtual School Yes/No variable's highest correlation score is a $-.044$, with the Weighed High School GPA variable. The Florida Virtual School Credits variable's highest correlation score is a $-.055$, with the Total Advanced Coursework variable. The Florida Virtual School GPA variable's highest correlation score is a $-.160$, with the Weighted High School GPA variable. The Florida Virtual School GPA variable has the highest correlation value of the three distance education variables; however, I expected this result, as Florida Virtual School GPA is part of the Weighted High School GPA.

In examining the six-year graduation rate, the Florida Virtual School Yes/No variable's highest correlation score is a $-.078$, with the SAT High Score variable. The Florida Virtual School Credits variable's highest correlation score is a $-.212$, with the Total Advanced Coursework variable. The Florida Virtual School GPA variable's highest correlation scores is a $-.208$, with the Weighted High School GPA variable. The Florida Virtual School GPA variable once again has one of the highest correlation values of the three variables, which is as expected, since Florida Virtual School GPA is part of the Weighted High School GPA. In the six-year sample, the variable with the highest correlation score is the Florida Virtual School Credits variable with the Total Advanced Course Work variable. Although these were the most correlated variables in the whole study, their correlation value was $-.212$. This correlation value does not reach the $.5$ that Lomax and Hahs-Vaughn (2012) indicated is necessary for variables to be considered moderately correlated. These findings confirm that, for this question, the null hypothesis is true for both four and six-year periods.

With the correlation matrixes revealing that the distance education variables are not closely correlated to the other academic success variables, I can conclude that all findings in Research Questions One through Three are based on the merit of the distance education variable and not on the fact that they are correlated to another variable's actual influence on the outcome. In addition to the correlation matrix, the only variable found to be significant was the distance education credit when predicting graduation in six years or fewer. The Wald for this variable was found to be $Wald = 15.333$, which means that once the variable in the model from the other variables has been accounted for, the unique effect that this variable is significant.

Again, as in the other research questions, the same word of caution applies here regarding this sample of high-achieving students. It is reasonable to assume that a dataset more representative of the whole student population would result in different findings and conclusions. Should another honors program have a similar student population to the sample used here, then the findings would be extremely relevant without the need to note the limitations inherent in the sample.

Limitations

I identified several limitations during the course of the study. One limitation was the lack of high school distance education information in university databases. The honors program that provided the data for this study seemed to be one of the few programs that maintained this type of information in a dataset. After meeting with the associate vice president of enrollment services and the director of admissions of the institution being examined, I learned that the institution as a whole had the high school transcripts for all the students. However, the distance education information was not entered into a database. To administer this study at the institutional level would have required reading each transcript and inputting the needed information by hand into a

dataset. I also attended a Florida distance education conference and spoke with members of several other higher education institutions who revealed that their institutions also did not track and store high school distance education information in a format that would permit ready access to perform this type of analysis. This information revealed that not storing high school distance education information was a routine, not isolated, practice.

Creswell (2014) and Wretman (2010) defined this type of sample as a nonprobability sample. This data limitation means that this study was only able to make deductions about high-achieving high school students, which limited the variance of high school GPA and SAT scores; however, it may have had some effect on the outcome of the study, as non-high-achieving students might have a different outcome.

Another limitation was the sample size of the six-year graduation rate dataset. Because this sample was comprised of one year, it did not provide the same depth of analysis as the sample did for the four-year graduation rate. The data met the required sample size for the statistical test used to analyze it, but it was consistently found that for each calculation with the smaller sample for the six-year graduation rate, outliers that were more than two standard deviations away from the mean were found. When calculating the analysis on the larger four-year sample, I found no outliers. As time passes, larger samples for six-year graduation rates can be obtained and data re-evaluated with a larger sample to determine whether there is a change in the results.

Yet another limitation was that this study only examined Florida Virtual School as the distance education provider and therefore solely analyzed data regarding high school students who lived in Florida. Many states have their own form of distance education for high school. It is possible that if this same study carried out in another state, it would result in different outcomes.

In order to extend this study to include distance education students in other states, the obstacle to overcome would be finding access to the requisite information. Based on my experience with this study, finding institutions that track distance education as part of their admission process and then matching up that information to the graduation information four and six-year later would be a difficult task.

In completing this study, I also discovered that while the method used provided a helpful introduction to distance education in the admission process, it did not account for what students experienced during the years they were enrolled at the higher education institution. Academic major, extracurricular activities, full-time or part-time status, and on- or off-campus living are all variables that could potentially affect graduation rate. Furthermore, the distance education classes taken in high school could have an impact on these aspects of being a student in a higher education institution. Because the general systems theory model identified the admission process as the process step and graduation as the output, I did not take these aspects of higher education into account in this research study.

Recommendations for Practice

When examining the results that highlighted in the previous chapter, an admission officer would want to know how these results affect their day-to-day operations. It is important to note that the findings in this study can only be applied to high-achieving students exiting from high school. The sample used consisted of students who were admitted to an honors program that accepts the top 10% of the incoming class each year, based on advanced coursework, SAT scores, and weighted high school GPA. The other 90% of the student body not included in this study's sample might have drastically different outcomes. The limitations noted in the previous section are critical to consider when reading the recommendations for practice.

Keeping these limitations mentioned above in mind, an admission officer could consider examining the number of distance education credits or, more specifically, Florida Virtual School credits students have and show preference to students with a lower number of distance education credit hours when all other criteria are the same. This recommendation is based on Research Question Two using the six-year graduation time frame. This question found that total distance education credits (Wald = 15.333, $df = 1$, $p < .001$) had a coefficient of (B = -.902) meaning that a student is less likely to graduate as the number of distance education credits increased.

The results of the other research questions provide evidence that Florida Virtual School variables have little to no impact on the graduation rate. If an admission department was considering updating an application to include distance education information to provide more insight on the likelihood of graduation for a high-achieving student, outside of the credit hour variable noted above, the other distance education information would not provide any significant insight into the likelihood of the student graduating. The literature covered in Chapter Two might leave some admission officers to speculate what effect distance education courses in high school would have on applicants. This study addressed this speculation; it provides evidence that including distance education information in the application would provide a little insight for selecting high-achieving students for admission.

Recommendations for Future Research

To date, no other researchers have examined high school distance education information and applied it to the undergraduate admission process to help select one student over another. Because of this dearth of research, I can make several recommendations for future research. I divide these recommendations into two sections: method and content.

Method Recommendations

The method used in this research study was a historical system theory approach. Although this method provided results without waiting six years for a student to graduate, it does examine distance education up to 10 years prior to college graduation. Chapter Two highlighted how distance education has evolved over time and how advancements in digital technology have created a distance education environment that is changing as quickly as the technology that hosts it. By changing the method, we could learn whether the evolution of technology over time could change the findings discovered in this research study. By gathering more information on the distance education types used in high school, we can learn more about how different types of distance education types can affect. Conducting survey research of students and admission offices could provide more insight into how students are being admitted today. We can learn what types of distance education courses – group focused, solo focused, or another type – has the greatest impact on higher education graduation. Based on the dataset used, the potential disparity between high school distance education and college course delivery (both online and face-to-face) needs to be better documented as it could explain the negative relationship discovered in this study. It was unknown how the distance education courses taken by students were taught. One teacher might teach a solo-focused course while another teacher in another section might incorporate group learning into the course material. The data collected for this does not reveal this information. Qualitative research can address new areas such as the method used to teach a course and gain insights into distance education using information obtained through a quantitative study such as this one.

After conducting this study, there is evidence that the evolution of distance education courses is changing at a faster rate than that of face-to-face classes. Future research in this area

could provide insight on the differences in the evolution rates of these two very different types of courses. While this study provides evidence of the outcome of high school distance education classes taken up to 10 years ago if it is discovered that distance education classes do evolve faster than face-to-face classes, it may be possible to conduct a similar study to this one evaluating courses taken more recently.

Content Recommendations

There are many recommendations that can be made regarding the content of future research. The sample used in this study focused on honors students who were in the top 10% of the incoming class. The first recommendation would be to find a data sample that represented the entire incoming class, not just the top 10%. With a data sample that included students beyond the top 10% of the incoming class, more generalized recommendations could be made to improve the admission process for all institutions and not just honors programs.

The next recommendation would be to examine a wider variety of distance education classes. Hill (2012) identified that there could be up to seven classifications of distance education while Allen and Seaman (2013) identified three types of distance education. In this study, I only examined Florida Virtual School, a fully online form of distance education; however, as highlighted in Chapter Two, many states have their own form of distance education and there are many other types of distance education that can be examined. Finding a dataset to include data from other states' distance education programs or collecting data from transcripts of a more representative sample would better address the wider population of students applying to college. The sample used in this study addressed students who lived in the state of Florida and took fully online distance education courses. Distance education courses and students from North Carolina, for example, might have a different outcome.

My the third content recommendation is to consider changing the evaluated outcome for the model. The first two recommendations address changing the inputs to the system. However, there might be benefits to changing the outcome. Evaluating first-year retention rate, first-year GPA, the success rate of distance education in college, and graduation GPA are just a few of the different outcomes that could be examined in a separate study. Although these suggestions involve changing the outcome, the process could be improved as well. Different institutions have various application methods. The application process for an online-only school is very different from a research university. A public institution could be different from a private institution. The process followed at each of these different postsecondary institutions could result in different research results being discovered.

The above recommendations assume the same method and process as the ones used in this study. Assuming a different model is used, future research could examine the difference between high school and college distance education programs. The differences between distance education programs across states is another area in which more research could be conducted to provide valuable information to admission offices across the country. For example, the software platform used by the Florida Virtual School was not the same as the higher education institution that was studied and could in part, or fully, account for the disconnect of benefit. While Harasim (2000) pointed out that the rate of change in higher education is often slow, in 10 short years Allen and Seaman (2013) highlighted how quickly higher education accepted the evolving technology of distance education. Such a record provides a need and foundation for a frequent research in this area.

Finally, researchers could examine international distance education. How well do high school distance education courses offered by other countries measure up as an admission

criterion? Do international high school distance education courses better prepare students for post-secondary education than that of high school distance education courses offered in the United States? These suggestions for future research demonstrate that there is still much to be discovered about how distance education courses impact undergraduate degree completion.

Conclusion

In this study, I explored distance education information and the implications it could have on the admission process. The foundation of this study was the literature that has preceded it. Rohr (2012) along with Kretchmar and Farmer (2013) provided the foundation for the questions examined in this study. I evaluated taking a distance education class, the number of distance education classes taken, and distance education GPA to attempt to improve the models used by admission offices to select students more likely to succeed in higher education and graduate in a four- or six-year window. Admission data were collected from an honors program at a Research 1 institution in the state of Florida because I discovered that very few admission offices store high school distance education information in a database. The results of this study were intended either to confirm that this information is not needed or to reveal an error in the thought process of admission offices and provide the basis for them to consider adding distance education information to students' applications.

Based on the literature I reviewed for this study, I expected to discover different results. My initial hypothesis was that distance education would provide a positive effect on the graduation outcome. Although this study did not support my initial hypothesis or the literature as expected, my research did provide evidence that there is still much to learn about the effects of distance education on students in both high schools and in higher education. In the sections above, I addressed that the sample may have had some impact on the finding. I also discussed

that the speed at which technology is evolving could influence the results. Allen and Seaman (2013) highlighted that distance education is growing faster than that of high education as a whole. Much more research is needed to better understand all the effects that this growth has on higher education as a whole.

My research revealed that, of the three high school distance education variables I examined, the one that provided insight into the likelihood of graduation was the total number of distance education credits when considering a six-year graduation rate. Even though distance education GPA and a yes/no variable for distance education were not found to be significant, these results provided confirmation that admission offices are not missing valuable insight on the future performance of the students who are being evaluated for admission by not including these variables in the undergraduate honors program admission application.

APPENDIX A – DATA ELEMENTS LIST

Data Elements List

Variable Number	Variable	Data Type	Used in Research Question	Used in Variable	Used in Sample for Research Question
01	Random Student Identifier	Number		Identifier	
02	Did Student Take Florida Virtual Courses in High School	Yes/No	1		2, 3, 4
03	Total Number of Florida Virtual Courses taken	Number	2		
04	List Florida Virtual Classes (include the following)	Text	3		
04a	Class Name	Text		Identifier	
04b	Credit Hours	Number		5	
04c	Class Grade Earned	Text		5	
05	Florida Virtual School GPA	Number	3		
06	Enter Status to Institution (First Time in College or Transfer)	Text			1, 2, 3, 4
07	Enter Semester	Text		19, 20	
08	Enter Year	Number		19, 20	
09	Number of AP Classes Taken	Number		12	
10	Number of IB Classes Taken	Number		12	
11	Number of DE Classes Taken	Number		12	
12	Total Number of Advanced Course Work Completed	Number	1, 2, 3, 4		
13	Best ACT Score	Number		15	
14	Best SAT Score	Number		15	
15	Highest Standardized Test Score Converted to Standard SAT score	Number	1, 2, 3, 4		
16	High School GPA	Number	1, 2, 3, 4		
17	Institution Graduation Semester	Text		19, 20	
18	Institution Graduation Year	Number		19, 20	
19	Graduated in Four Years	Yes/No	1, 2, 3, 4		
20	Graduated in Six Years	Yes/No	1, 2, 3, 4		
21	Instate	Yes/No			1, 2, 3, 4

APPENDIX B - INTRODUCTION EMAIL

Introduction Email

Subject: Distance Education Data for Dissertation Study on Admissions Systems

Message:

Date

Dear Honors Director and Assistant Director

I am currently working on my dissertation at the University of Central Florida (Dr. Kathleen King, Kathleen.King@ucf.edu is the dissertation chair) where my area of focus is on students who attend Florida Virtual distance education classes in high school. I am applying analysis to learn how this affects their graduation. It is my goal to determine if this affects retention in the same way it has been found that SAT, GPA, and Advanced Placement has in the past. If the data reveals any significates, admission offices would be able to take that information and apply it to how they admit students in the future.

I have been told that your Honors Program currently has this type of data and I feel it would help with this study. I'm not sure if you are aware, but today very few institutions track distance education information. With that in mind, I ask that you consider providing a copy of that data for me to use in my dissertation study. It is my intent to keep the identity of your institution, program, and the students unknown. The data requested below is for years 2010, 2011 and 2012. By having this data, this study can provide analysis of six-year graduation rates on students in the 2010 admission year, while it can also provide analysis of four-year graduation rates on all three cohorts.

The data points needed are listed below. If your information technology staff could supply the data in excel format that would be very helpful.

Data request

Data elements requested are as follows.

01	Random Student Identifier	Number
02	Did Student take Florida Virtual Classes in High School	Yes/No
03	Total Number of Florida Virtual Classes taken	Number
04	List of Florida Virtual Classes (Please include the following)	Text

04a	Class Name	Text
04b	Credit Hours	Number
04c	Class Grade Earned	Text
05	Florida Virtual School GPA	Number
06	Enter Status to Institution (First Time in College or Transfer)	Text
07	Enter Semester	Text
08	Enter Year	Number
09	Number of AP Classes Taken	Number
10	Number of IB Classes Taken	Number
11	Number of DE Classes Taken	Number
12	Total Number of Advanced Course Work Completed	Number
13	Best ACT Score	Number
14	Best SAT Score	Number
15	Highest Standardized Test Score Converted to Standard SAT score	Number
16	High School GPA	Number
17	Institution Graduation Semester	Text
18	Institution Graduation Year	Number
19	Graduated in Four Years	Yes/No
20	Graduated in Six Years	Yes/No
21	Instate	Yes/No

Should you have any questions, please do not hesitate to ask. My contact information is listed below, and I would be happy to provide any additional information that you request.

Thank you for your time and your help in providing the critical data needed for this study.

Sincerely,

Michael T. Callahan
 Doctoral Student
 University of Central Florida
 MikeCallahan@Knights.ucf.edu

APPENDIX C – THANK YOU EMAIL

Thank you Email

Subject: Thank you for your help

Message:

Date

Dear Honors Director and Assistant Director

I recently received the data needed for my dissertation study examining distance education in high school and its effects on graduation rates. Your help in providing the data has made the work needed to gain valuable insight on this topic much easier.

I will be sure to share my findings in the study with you if you wish when the analysis is done. Should you have any questions in the meantime, please do not hesitate to contact me with the information below.

Thank you for your time and your help in providing the critical data needed for this study.

Sincerely,

Michael T. Callahan
Doctoral Student
University of Central Florida
MikeCallahan@Knights.ucf.edu

APPENDIX D – IRB APPROVAL

IRB Approval



University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901, 407-882-2012 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

NOT HUMAN RESEARCH DETERMINATION

From : UCF Institutional Review Board #1
FWA00000351, IRB00001138
To : Michael Callahan
Date : June 12, 2017

Dear Researcher:

On 06/12/2017 the IRB determined that the following proposed activity is not human research as defined by DHHS regulations at 45 CFR 46 or FDA regulations at 21 CFR 50/56:

Type of Review: Not Human Research Determination
Project Title: THE EFFECTIVENESS OF USING FLORIDA
VIRTUAL HIGH SCHOOL COURSE DATA DURING
THE COLLEGE ADMISSION PROCESS AS A
PREDICTOR OF DEGREE COMPLETION WITHIN SIX
YEARS.
Investigator: Michael Callahan
IRB ID: SBE-17-13238
Funding Agency:
Grant Title:
Research ID: N/A

University of Central Florida IRB review and approval is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are to be made and there are questions about whether these activities are research involving human subjects, please contact the IRB office to discuss the proposed changes.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

A handwritten signature in black ink that reads "Renea C Carver".

Signature applied by Renea C Carver on 06/12/2017 04:22:10 PM EDT

IRB Coordinator

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