

**A QUANTITATIVE STUDY OF COURSE GRADES AND RETENTION  
COMPARING ONLINE AND FACE-TO-FACE CLASSES**

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## ABSTRACT

Since distance education was first introduced in higher education, there has been controversy attached to whether it is as effective as face-to-face instruction. The explosion of Internet-driven instruction has only accelerated the discussion. This study was undertaken in a Midwestern university technology administration program, a bachelor's degree completion program for students with an existing occupationally oriented associate degree. Eight-hundred eighty-five students were identified for the sample. A two-factor ANOVA was used to answer the first research question: Is there a statistically significant difference between students' grades in online classes and traditional face-to-face classes? Results showed no significant difference between the grades of online and face-to-face students. Chi-square analysis was used for Research Question 2: Is there a statistically significant difference between course retention in online classes and traditional face-to-face classes? No significant difference was found between course retention in online classes and face-to-face classes. Last, Research Question 3 was answered utilizing chi-square analysis. Research Question 3 was, Is there a statistically significant difference between program retention for students entering the program enrolled in online classes and students entering the program enrolled in traditional face-to-face classes? The data showed no significant difference in course retention of students who began the program in online courses and students who began in face-to-face courses. Implications for further action include recommendations for expansion of online courses and programs supported by the research data. Analysis of existing data of other online courses and programs is recommended. Recommendations for further research included analyzing different delivery variations and continued study

of bachelor's degree completion programs. Additional recommendations consisted of further analysis of specific retention factors affecting students in online education, including factors such as age, gender, and GPA on entering the program.

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## CHAPTER ONE

### INTRODUCTION

Historically, postsecondary education in the United States was founded on the principles of the European system, requiring the physical presence of professors and students in the same location (Knowles, 1994). From 1626, with the founding of Harvard University (The Harvard Guide, 2004), to the development of junior colleges and vocational schools in the early 1900s (Cohen & Brawer, 1996; Jacobs & Grubb, 2003), the higher education system developed to prepare post-high school students for one of three separate tiers. The college and university system in the United States developed its own set of structures designed to prepare students for baccalaureate and graduate degrees. Junior colleges were limited to associate degrees, while vocational education institutions offered occupational certificates. In many cases, there was inadequate recognition of the postsecondary education offered at junior colleges and vocational education institutions, resulting in the inability of students to transfer to 4-year institutions (National Center for Education Statistics, 2006).

In the mid-20<sup>th</sup> century, some junior colleges began to provide academic, vocational, and personal development educational offerings for members of the local communities. During this same period, junior or community colleges developed a role as transfer institutions for students who, because of time, preparedness, economics, or distance, could not begin their postsecondary education at a 4-year institution (Cohen & Brawer, 1996). Until the mid-1990s, the majority of transfer programs involved Associate of Arts (AA) and Associate of Science (AS) degrees. Associate of Applied Science (AAS) degrees were developed during the 1990s. The AAS degree was granted to those

who successfully completed the majority of their college program in vocational education. The creation of a variety of applied baccalaureate degrees allowed students who had previously thought of the AAS degree as a terminal program to complete a baccalaureate degree (Kansas Board of Regents, 2002-2003).

Online education also became a strategy for students to access higher education in the 1990s (Allen & Seaman, 2007b). The proliferation of online courses alleviated some of the location-bound barriers to higher education, but online education was criticized as less rigorous than traditional classroom-based course work by traditional academicians. Russell attempted to address this argument with his 1999 meta-analysis of studies dating from the 1920s and covering multiple delivery models, including online education. Russell concluded there was no statistically significant difference in student achievement between courses offered online and those offered in the traditional classroom setting.

Since the development of correspondence courses in the 1920s, researchers have attempted to ascertain if students participating in distance education are being shortchanged in their educational goals. No significant difference in grades has been found in the majority of studies designed to address this issue. Studies analyzing online student retention have shown significantly lower retention for online students. In the last 10 years, research studies have expanded to include variations of online education. These include strictly online, hybrid courses, Web-assisted classroom settings, and the traditional higher education course offered only as face-to-face instruction (Carmel & Gold, 2007).

Online education continues to proliferate at the same time the number of secondary students in the United States overall is projected to increase (National Center

for Education Statistics [NCES], 2006). The projected increase of potential postsecondary students and online postsecondary options provides opportunities for increases in online education programs and courses. In 2000, NCES reported that over 65% of students in higher education were participating in online courses. In a 2007 study, Allen and Seaman estimated only 16% of those enrolled in online education courses are undergraduate students seeking their first degree, counter to the projected increase in traditional-age students. The majority of enrollees in online education are adults updating or advancing their credentials, creating an additional educational market for colleges and universities seeking to expand enrollment without adding physical space (Allen & Seaman, 2007a). For states and localities faced with a contradictory traditional-age enrollment decrease, these figures present an untapped market for higher education courses and programs.

### Background

Researchers attempted to analyze the efficacy of distance education as far back as the 1920s when correspondence courses were created to meet the need of students not willing to attend a traditional classroom-based higher education setting. A meta-analysis of these studies resulted in “The No Significant Difference Phenomenon,” reported by Russell (2001). The results of over 355 studies were compiled, comparing various modes of delivery including correspondence, audio, television courses, and the newest wave of computer-facilitated instruction. Following analyses of studies completed prior to 2001, Russell concluded there was no difference in learning between students enrolled in distance education and those completing courses in the traditional setting.

Studies completed since then have provided mixed results. Summers, Waigand, and Whittaker (2005) found there was no difference in GPA and retention between the

online and traditional classroom. Arle (2002) found higher achievement by online students, and Brown and Liedholm (2002) found GPA and student retention better in a traditional classroom setting.

Student retention is an integral part of the student achievement conversation and is an issue for all forms of higher education. Degree-seeking students' overall retention has been reported as less than 56% by NCES (2001). Long considered a problem in higher education, attention to the distance education model has shown even lower retention rates in online students than in students attending at the traditional college setting (Phipps & Meristosis, 1999). Research on different modalities, such as fully online and hybrid online courses, has produced mixed results (Carmel & Gold, 2007). No significant trend toward increased retention of students in any of the online modalities has been documented.

Retention studies of transfer students have primarily included traditionally defined students transferring from a community college. Statistics have consistently shown a lower retention rate for students transferring from a community college to a 4-year university than for students who began their post-high school education at a 4-year institution (NCES, 2006). Townsend's studies of transfer students at the University of Missouri-Columbia also showed a lower baccalaureate retention rate for students who had completed an AAS degree than for students beginning their education at a 4-year institution (Townsend, 2002).

Occupationally oriented bachelor's degree completion programs are relatively new to higher education. Transfer programs in the liberal arts from community colleges to 4-year institutions were common by the 1990s. Townsend (2001), in her study

conducted at the University of Missouri–Columbia, observed the blurring of the lines between non-transferrable occupationally oriented undergraduate degrees and undergraduate degrees and certificates that were easily transferred. The study conducted by Townsend was among the first to recognize that many students who began their education at community and technical colleges had bachelor's degree aspirations that grew after their completion of an occupationally-oriented degree. Laanan proposed that the increase in institutions offering AAS degrees necessitated new ways to transfer undergraduate credits (2003).

The setting of this study is a medium-sized Midwestern campus located in Topeka, Kansas. Washburn University enrolls approximately 6000 students a year in undergraduate and graduate programs, including liberal arts, professional schools, and a law school (Washburn University, 2008). The Technology Administration (TA) program selected for the present study began in the 1990s as a baccalaureate degree completion program for students who had received an occupationally oriented associate degree at a Kansas community college or through Washburn's articulation agreement with Kansas vocational-technical schools. This program provided students who previously had obtained an Associate of Applied Science degree in an occupational area an opportunity to earn a bachelor's degree.

Peterson, Dean of Continuing Education, Washburn University, stated that in early 1999, Washburn University began online courses and programs at the behest of a neighboring community college (personal communication, April 18, 2008). Washburn was asked to develop an online bachelor's degree completion program for students graduating from community colleges and technical colleges with an Associate of Applied

Science degree. The TA program was among the first programs to offer the online bachelor's degree completion option. The TA program offered its first online courses in Spring 2000.

Online education at Washburn expanded to other programs and courses, to include over 200 courses (Washburn University, 2008). The original online partnership with two community colleges expanded to include 16 additional community colleges and four technical colleges in Kansas, as well as colleges in Missouri, California, Wisconsin, South Carolina, and Nebraska (Washburn University, 2008).

An initial study in 2002 of student's course grades and retention in online courses offered at Washburn showed no significant difference between students enrolled in online courses and students enrolled in traditional face-to-face course work (Peterson, personal communication, April 18, 2008). No studies of program retention have been completed.

In 2008, Atkins reported overall enrollment at Washburn University decreased 6.7% from Fall 2004 to Fall 2008, from 7400 to 6901 students. During the same period, online course enrollment patterns increased 65%, from 3550 students to 5874 in 2007-2008 (Washburn University, 2008). Atkins also reported that between 1998 and 2008, the ratio of traditional post-high school age students to nontraditional students enrolling at Washburn University reversed from 40:60 to 60:40. The shift in enrollment patterns produced an increase in enrollment in the early part of the 21<sup>st</sup> century; however, Washburn University anticipated a decrease in high school graduates in Kansas through 2016, based on demographic patterns of the state. The state figures are opposite the anticipated increase of traditional-age students nationally (NCES, 2008). The increase in

distance education students in relation to the anticipated decline in traditional-age students provided the focus for the study.

### Purpose of the Study

Online education has become an important strategy for the higher education institution that was the setting of this study. First, the purpose of the study was to determine if there was a significant difference between the course grades of students participating in TA online courses and their traditional classroom-based counterparts. The second purpose of the study was to determine if there was a significant difference between course retention of students participating in TA online courses and their traditional classroom-based counterparts. The second part of the study was a replication of studies comparing modes of online course delivery to traditional classroom-based instruction (Carmel & Gold, 2007; Russell, 1999). A third purpose of the study was to determine if there was a significant difference between program retention of students who began the TA program in online courses and those who began the program enrolled in traditional face-to-face courses. The study's purpose was to expand the knowledge base concerning online education to include its efficacy in providing baccalaureate degree completion opportunities.

### Research Questions

Roberts (2004) stated research questions guide the study and usually provide the structure for presenting the results of the research. The research questions guiding this study were:

1. Is there is a statistically significant difference between students' grades in online classes and traditional face-to-face classes?
2. Is there a statistically significant difference between course retention rates in online classes and traditional face-to-face classes?
3. Is there a statistically significant difference between program retention for students entering the program enrolled in online classes and students entering the program enrolled in traditional face-to-face classes?

### Overview of the Methodology

A quantitative study was utilized to compare grades by course, course retention, and program retention of students enrolled in the online and traditional face-to-face TA program at Washburn University. Archival data from the student system at Washburn University were utilized from comparative online and traditional face-to-face classes in two separate courses. In order to answer Research Question 1, a sample of 885 students enrolled in online and traditional face-to-face courses was identified. The sample included students entering the program in the Fall semesters of 2002, 2003, 2004, 2005, and 2006 in both the online and traditional face-to-face classes. Two instructors were responsible for concurrent instruction of both the online and face-to-face classes for the period analyzed. A two-factor analysis of variance was used to analyze for the potential difference in the dependent variables, course grades due to delivery method (online and face-to-face), instructor (instructors A and B), and the potential interaction between the two independent variables (Research Question 1). A chi-square test for differences among proportions was used to analyze course and program retention (Research Questions 2 and 3).



### Delimitations

Roberts (2004) defined delimitations as the boundaries of the study that are controlled principally by the researcher. The delimitations for this study were

1. Only data from 2002 through 2008 from Technology Administration online and face-to-face courses were utilized.
2. The study was confined to students enrolled at Washburn University in the Technology Administration program.
3. Only grades and retention were analyzed.

### Assumptions

Assumptions are defined as those things presupposed in a study (Roberts, 2004).

The study was based on the following assumptions:

1. Delivery of content was consistent between online and face-to-face courses and instructors,
2. Course objectives were the same for paired online and traditional face-to-face courses,
3. All students enrolled in the TA program met the same criteria for admission to the University,
4. All data entered in the Excel spreadsheets were correct,
5. All students enrolled in the TA program met the same criteria for grade point average and program prerequisites.

## Definitions

The following terms are defined for the purpose of this study:

*Distance education.* Education or training courses delivered to remote locations via postal delivery, or broadcast by audio, video, or computer technologies (Allen, 2007).

*Dropout.* A dropout is defined as a student who has left school and discontinued studies (Merriam-Webster's Collegiate Dictionary, 1998).

*Face-to-face delivery.* This is a course that uses no online technology; content is delivered in person, either in written or oral form (Allen, 2007).

*Hybrid course.* This course is a blend of the online and face-to-face course. A substantial proportion of the content is delivered online, typically using some online discussions and some face-to-face meetings (Allen, 2007).

*Online course.* This defines a course where most or all of the content is delivered online via computer technologies. Typically, there are no face-to-face meetings (Allen, 2007).

*2+2 PLAN.* The Partnership for Learning and Networking is a collaborative set of online 2+2 baccalaureate degree programs developed by Washburn University. The programs require completion of an associate degree from one of the partner community or technical colleges (Washburn University, 2008).

*Retention.* This term refers to the completion of a course by receiving a letter grade in a course, or a certificate of completion or degree for program completion (Washburn University, 2008).

*Web-assisted.* A course that uses Web-based technology to facilitate what is essentially a face-to-face course (Allen, 2007).

### Organization of the Study

This study consists of five chapters. Chapter One introduced the role of distance education in higher education. Chapter One included the background of the study, the research questions, overview of the methodology, the delimitations of the study, and the definition of terms. Chapter Two presents a literature review, which includes the history of occupational postsecondary education, distance education, and studies relating to grades and retention of students involved in distance education. Chapter Three describes the methodology used for the research study. It includes the selection of participants, design, data collection, and statistical procedures of the study. Chapter Four presents the findings of the research study. Finally, Chapter Five provides a discussion of the results, conclusions, and implications for further research and practice.

## CHAPTER TWO

### LITERATURE REVIEW

This chapter presents the background for research into the efficacy of distance education in the delivery of higher education. Research studies have focused primarily on grades as a measure of the quality of distance education courses as compared to traditional face-to-face instruction. Utilizing grades has produced a dividing line among education researchers concerning the use of distance education as a delivery model. Retention in distance education has focused primarily on single courses, with little program retention data available. Data from retention studies in higher education have focused primarily on the traditional 4-year university student. Retention studies of community college students have produced quantitative results; however, these studies have been directed at community college students who identify themselves as transfer students early in their community college careers. Retention studies of students enrolled in occupationally oriented programs are limited.

Statistical data of higher education shows an increased use of distance education for traditional academic courses as well as occupationally oriented courses. The increase in distance education courses and programs has provided a new dimension to studies of both grades and retention. The recognition of this increase, as well as questions concerning its impact on student learning and retention, produced the impetus for this study.

The following review of the literature represents the literature related to this research study. Through examination of previous research, the direction of the present study was formulated. Specifically, the chapter is organized into four sections: (a) the

history of occupational transfer programs; (b) the history and research of distance education, including occupational transfer programs utilizing distance education; (c) research utilizing grades as an indicator of student learning in online education; and (d) research focusing on student retention in higher education, including student retention issues in transfer education and online transfer courses and programs.

### History of Occupational Transfer Programs

The measure of success in higher education has been characterized as the attainment of a bachelor's degree at a 4-year university. Occupationally oriented education was considered primarily a function of job preparation, and until the 1990s was not considered transferrable to other higher education institutions. Occupational transfer programs are a recent occurrence within the postsecondary system that provides an additional pathway to bachelor's degree completion.

Historically, the postsecondary experience in the United States developed as a three-track system. Colleges were established in the United States in 1636 with the founding of Harvard College (The Harvard Guide, 2004). Junior colleges were first founded in 1901 as experimental post-high school graduate programs (Joliet Junior College History, 2008). Their role was initially as a transfer institution to the university. When the Smith-Hughes Act was passed in 1917, a system of vocational education was born in the United States (Jacobs & Grubb, 2003), and was designed to provide further education to those students not viewed as capable of success in a university setting.

Vocational education, currently referred to as occupational or technical education, was not originally designed to be a path to higher education. The first programs were designed to help agricultural workers complete their education and increase their skills.

More vocational programs were developed during the early 20<sup>th</sup> century as industrialization developed and as increasing numbers of skills were needed by workers in blue-collar occupations (Jacobs & Grubb, 2003).

In the mid-20<sup>th</sup> century, some junior colleges expanded their programs beyond academic selections to provide occupational development and continuing education. Because of the geographic area from which they attracted students, junior colleges developed a role as “community” colleges. They also solidified their role as transfer institutions for students who, because of time, preparedness, economics, or distance, could not begin their postsecondary education at a 4-year institution (Cohen & Brawer, 1996). Until the mid-1990s, the majority of transfer programs to 4-year universities involved traditional academic degrees, including the Associate of Arts (AA) and Associate of Science (AS) degrees. Occupational programs and continuing education were viewed as terminal and non-transferrable.

In 1984, Congress authorized the Carl Perkins Vocational and Technical Education Act (P.L. 98-524). In the legislation, Congress responded to employers’ concerns about the lack of basic skills in employees by adding academic requirements to vocational education legislation. Vocational program curriculum was expanded to include language arts, mathematics, and science principles, and the curriculum reflected the context of the program. The Secretary’s Commission on Achieving Necessary Skills (SCANS) was created in 1990 to determine the skills young people need to succeed in the world of work (U.S. Department of Labor, 2000). In the second Carl Perkins reauthorization in 1990 (P.L. 105-332), Congress responded to the report, which targeted academic and job skills, by outlining a seamless system of vocational and academic

education to prepare vocational students to progress into and through higher education. This emphasis led to the development of Associate of Applied Science (AAS) degrees during the 1990s. Granted to those who have successfully completed programs in the applied arts and sciences for careers, AAS degrees were seen as terminal (Kansas Board of Regents, 2002-2003).

But as one goal was attained, conversation turned to creating a pathway from occupational associate degrees to bachelor's degree completion. The desire of students to continue from technical degrees to a baccalaureate was not a new idea. In a paper presented in 1989 to the American Technical Association national conference, Troutt-Ervin and Morgan's overview of *2+2 programs* showed acceptance of AAS degrees at traditional universities was generally non-existent. Their suggestion for an academic bridge from early technical education to baccalaureate programs highlighted programs accepting AAS degrees toward baccalaureate completion were an exception rather than a rule (Troutt-Ervin & Morgan, 1989). It was not until the late 1990s that applied baccalaureate degrees recognized credits from technical degree students who had previously thought of themselves in a terminal program to complete their baccalaureate degree (Wellman, 2002).

Despite the advance of recognition of AAS degrees, standard definitions of transfer students continued to exclude students who completed technical programs. The U.S. Department of Education did not include students receiving an Associate of Applied Science degree in the definition of students preparing for transfer to 4-year colleges (Bradburn, Hurst, & Peng, 2001; Carnevale, 2006). Most states had comparable policies in place concerning core academic curriculum, articulation agreements, transfer of credit,

and statewide transfer guides. There was no general recognition of occupational credit transfer. Only a few states, including Kansas, Missouri, and Washington, allowed credits earned in occupationally oriented degrees to transfer to 4-year institutions (Townsend, 2001). No state had set clear goals for the transference of occupational credits between institutions or for the state as a whole (Wellman, 2002).

Despite the lack of recognition of occupational transfer credit at the federal level, a new definition of transfer education had emerged. Initially defined as the general education component of the first 2 years of a baccalaureate, the definition of transfer education now included any courses that transferred to a 4-year college, regardless of the nature of the courses (Townsend, 2001).

The line between vocational schools, community colleges, and 4-year institutions blurred in the United States as employers and students increasingly made business decisions regarding education and workforce development. Employers increasingly asked for employees with academic and technical skills, as well as critical thinking skills and personal responsibility (U.S. Department of Labor, 2000). Returning students themselves were more attuned to the demands of the 21<sup>st</sup> century workforce. Their desire to return to higher education, coupled with the economy and the variety of options available to them, required a more adaptive higher education system (Carnevale, 2006). There was growing demand among new and returning students for higher education opportunities responsive to their needs. The expanding needs of the returning student provided opportunities for higher education to respond by utilizing different delivery models.



## Distance Education

Online education became a strategy for postsecondary institutions when the first correspondence courses were initiated with the mail service in the early 20<sup>th</sup> century (Russell, 1999). As various technologies emerged, distance education utilized television and video models, in addition to paper-based correspondence courses. The expansion of distance education utilizing computer technologies renewed academic debate over the efficacy of the delivery model.

Online education utilizing the Internet became a significant factor in the 1990s, prompting renewed evaluation of the use of distance learning opportunities (Russell, 1999, Phipps & Meristosis, 1999). In 1999–2000, the number of students who took any distance education courses was 8.4% of total undergraduates enrolled in postsecondary education (NCES, 2000). In 2000, the report of the Web-Based Education Commission to the President and Congress concluded that the Internet was no longer in question as a tool to transform the way teaching and learning was offered. The Commission recommended that the nation embrace E-learning as a strategy to provide on-demand, high-quality teaching and professional development to keep the United States competitive in the global workforce. They also recommended continued funding of research into teaching and learning utilizing web-based resources (Web-Based Education Commission, 2000). The acceptance of the importance of the Internet for delivery of higher education opened new opportunities for research and continued the academic debate of the quality of instruction delivered in online education courses and programs.

In a longitudinal study from 2002-2007, The Sloan Consortium, a group of higher education institutions actively involved in online education, began studies of online

education in the United States over a period of 5 years. In the first study, researchers Allen and Seaman (2003) conducted polls of postsecondary institutions involved with online education and found that students overwhelmingly responded to the availability of online education, with over 1.6 million students taking at least one online course during the Fall semester of 2002. Over one third of these students took all of their courses online. The survey also found that in 2002, 81% of all institutions of higher education offered at least one fully online or blended course (Allen & Seaman, 2003).

In their intermediate report in 2005, Allen and Seaman postulated that online education had continued to make inroads in postsecondary education, with 65% of schools offering graduate courses and programs face-to-face also offering graduate courses online. Sixty-three percent of undergraduate institutions offering face-to-face courses also offered courses online. From 2003 to 2005, the survey results showed that online education, as a long-term strategy for institutions, had increased from 49% to 56%. In addition, core education online course offerings had increased (Allen & Seaman, 2005).

In Allen and Seaman's final report (2007b) for the Sloan Consortium, the researchers reported that almost 3.5 million students participated in at least one online course during the Fall 2006 term, a nearly 10% increase over the number reported in the previous year. Allen and Seaman also reported a 9.7% increase in online enrollment, compared to the 1.5% growth in overall higher education. They found by 2007, 2-year institutions had the highest growth rates and accounted for over the half the online enrollments in the previous 5 years. The researchers concluded, based on a survey

conducted as part of the research, institutions believed that improved student access was the top reason for offering online courses and programs (Allen & Seaman, 2007b).

Community colleges began embracing distance education in the 1920s as part of their mission to provide low-cost, time-effective education. Community colleges initially provided correspondence courses by mail, but later switched to television and video courses as technology improved (Cohen & Brawer, 1996). In 2001, over 90% of public 2-year colleges in the United States provided distance education courses over the Internet (NCES, 2001).

Vocational education, by the nature of its instructional format, was among the last of the educational institutions to participate in distance education. Because of the kinesthetic nature of instruction, vocational education leaders began investigating distance education opportunities in the 1990s, relying on the method to provide only the lecture portion of instruction. By 2004, only 31% of students enrolled in vocational schools had participated in some form of distance education during their program of study (NCES, 2005). In 2008, hands-on instruction in programs such as automobile mechanics and welding, and the clinical portion of health occupations programs, continued to be taught in the traditional classroom setting (NCES, 2008).

Analysis of data reported by the NCES indicated that distance education had become a staple for higher education institutions. At both the 4-year and 2-year university level, over 65% of institutions offered more than 12 million courses in 2006-2007 by distance education. While vocational education had traditionally been more hands-on, distance education had become more prevalent in providing opportunities for students to participate in components of the system over the Internet (NCES, 2008).

Distance education became the prevalent strategy for higher education institutions to expand their services to new and returning students, without the financial implications of capital expansion. Higher education utilized the strategy to market to students outside their traditional geographic reach by utilizing the power of the Internet. The increasing demand from students of all ages for online opportunities provided new ground for the expansion of higher education opportunities.

#### Grades as an Indicator of Quality of Student Learning

The grading system in the United States educational system has served as an indicator of knowledge for over 100 years. Educators have utilized high school grades as a sorting mechanism in American schools to determine postsecondary opportunities. Modern society has accepted honors attainment, graduation honors, and course grades as an indicator of knowledge acquisition in postsecondary education. Stray (2001) reported that the use of grading in schools can be traced to the industrial revolution and the development of factories.

William Farish of Cambridge University developed the first grading system in higher education in 1792 (Stray, 2001). Farish mimicked the system established by factories of the time: grade A being the best. The thought was that Farish employed the grading system in order to teach more students, an aberration at that time when instructors rarely had more than a few. The demand for more higher education opportunities prompted Farish to open his class to more students, and as such, led to his use of a sorting system. This was the first known record of grading utilized in classrooms to measure student achievement (Stray, 2001).

Smallwood (1935) reported the first grading in higher education at Yale University in 1792. Stiles, President of Yale University, directed the use of the scale in the late 18<sup>th</sup> century. However, Smallwood noted it was not until 1813 that any record of grades or marking appeared.

Using a scale of 100, philosophy and mathematic professors instituted the first use of a marking instrument in the 1800s at Harvard. Smallwood noted early systems were experimental, utilizing different numerical scales, with no standardized system in place between higher education institutions. It was not until the late 1800s that faculty began using descriptors, such as A and B, to rank students according to a predetermined numerical scale (Smallwood, 1935).

Experimentation with evaluation of achievement continued into the early 20<sup>th</sup> century, when educational psychologists, including Dewey and Thorndike, attempted to compare grading scales with intelligence testing. Thorndike's philosophy of standardized testing and grading survived the 20<sup>th</sup> century, and his quote, "Whatever exists at all exists in some amount" (Thorndike, 1916, as cited in Ebel & Frisbie, p. 26) has been utilized in educational measurement textbooks as a validation of the use of standards of measurement to measure achievement (Ebel & Frisbie, 1991).

The use of grades expanded to community colleges, high schools, and elementary schools in the early 1900s (Pressey, 1920). The use of grades throughout the educational system is fairly standardized today with the 4.0 scale. It is this standardization that allows comparison of grades as achievement between educational levels and institutions (Ebel & Frisbie, 1991) and allows grades to be utilized as a measure for comparison of educational achievement.

Researchers analyzing the success of community college transfer students have traditionally studied the grades of the traditional transfer student with an AA or AS degree. Keeley and House's 1993 study of sophomore and junior transfer students at Northern Illinois University analyzed "transfer shock" (p. 2) for students matriculating from community colleges. The researchers found students who transferred from a community college obtained a grade point average significantly lower in their first semester than did students who began their college career at a 4-year institution. However, the results of the longitudinal studies showed that transfer students who persisted to graduation showed an equivalent GPA at baccalaureate completion (Keeley & House, 1993).

Students who transferred from occupationally oriented degree programs typically were not included in traditional studies of transfer students. While the research in general does not include AAS students in traditional transfer data, limited conclusions were available comparing AAS students to traditional 4-year college attendees. Townsend's study at the University of Missouri-Columbia (2002) showed no difference in grades at baccalaureate graduation between students with an AA/AS degree and students with an AAS degree.

The use of grades as an indicator of the level of student achievement has been relied upon by studies comparing traditional classroom instruction and distance instruction. Research analyzing the effectiveness of student learning in distance education began with the first correspondence courses offered utilizing the mail service (Russell, 1999). The study of effectiveness of correspondence courses expanded to include new technologies, such as television and video courses, and increased with the proliferation of

online educational offerings. Researchers continued to challenge the effectiveness of learning methods not delivered in traditional higher education settings.

In 1991, Russell reviewed over 355 studies, dating from the 1930s and continuing through the late 1980s, and found no significant difference in student learning using any form of distance education, as compared with students in classroom-based instruction (Russell, 1999). Russell's conclusion formed the basis for a series of works collectively known as "No Significant Difference." Russell's conclusion from his studies follows:

The fact is the findings of comparative studies are absolutely conclusive; one can bank on them. No matter how it is produced, how it is delivered, whether or not it is interactive, low tech or high tech, students learn equally well with each technology and learn as well as their on-campus, face-to-face counterparts even though students would rather be on campus with the instructor if that were a real choice. (p. xviii)

Overwhelmingly, studies have supported Russell's conclusions, including Neuhauser's (2002) study of traditional face-to-face education and online education in a business communications class at a large urban university in North Carolina. Neuhauser concluded there was no significant difference in pre- and post-test scores of students enrolled in online and traditional communications classes. In addition, Neuhauser found no significant difference in final grades, homework grades, and grades on research papers, even though learners in the online course were significantly older than were learners in the traditional face-to-face section.

The Summers et al. (2005) research included a comparison of student achievement and satisfaction in an online versus a traditional face-to-face statistics class.

The study, conducted at the University of Missouri-Columbia, included undergraduate nursing students who were tested on both their pre- and post-course knowledge of statistics. Their results indicated that utilizing grades as an indicator of knowledge showed no significant difference between the online and traditional classroom students. In their meta-analysis, Machtmes and Asher (2002) reviewed 30 studies and concluded there did not appear to be a difference in achievement, as measured by grades, between distance and traditional learners.

As technology use continued to evolve in online education, various studies were conducted to determine whether different delivery methods created a difference in the grades of online students compared to their face-to-face counterparts. A study conducted by Carmel and Gold (2007) supported Russell's original conclusion by analyzing specific types of online platforms and delivery models. Carmel and Gold's study included hybrid and traditional classroom-based instruction. They analyzed results from 164 students in 110 courses and found no significant difference in student achievement based on grades between students enrolled in either delivery method.

Additional studies supporting Russell's theory have crossed multiple content areas and delivery models. Brown and Liedholm's (2002) study at Michigan State University included microeconomics students in virtual, hybrid, and traditional classroom-based instruction. The study included 389 students in the traditional setting, 258 in the hybrid delivery section and 89 students enrolled in online education. No significant difference in student learning as measured by end of course grades was found.

Research also showed type of course discipline is not affected by the online delivery model. Schulman and Simms (1999) compared pretest and posttest scores of



students enrolled in an online course and a traditional course at Nova Southeastern University. The researchers compared 40 undergraduate students enrolled in online courses and 59 undergraduate students enrolled in the classroom setting of the same course. Results indicated that the students who select online courses scored higher than traditional students scored on the pretest results. However, posttest results showed no significant difference for the online students versus the in-class students. Schulman and Simms concluded that online students were learning equally as well as their classroom-based counterparts. Reigle's (2007) analysis across disciplines at the University of San Francisco and the University of California found no significant difference between online and face-to-face student grade attainment.

Shachar and Neumann (2003) conducted a meta-analysis that estimated and compared the differences between the academic performance of students enrolled in distance education compared to those enrolled in traditional settings over the period from 1990-2002. Eighty-six studies containing data from over 15,000 participating students were included in their analysis. The results of the meta-analysis showed that in two-thirds of the cases, students taking courses by distance education outperformed their student counterparts enrolled in traditionally instructed courses.

Lynch, during the use of the "Tegrity" system, a brand-specific online platform at Louisiana State University, found that students' grades were slightly better after utilizing the technology than when the traditional approach was used (Lynch, 2002). Initial results of a University of Wisconsin-Milwaukee study of 5000 students over 2 years indicated that the U-Pace online students performed 12% better than their traditional Psychology 101 counterparts on the same cumulative test (Perez, 2009). Arle's (2002) study found

students enrolled in online human anatomy courses at Rio Salado College scored an average of 6.3% higher on assessments than the national achievement average. Students were assessed using a national standardized test generated by the Human Anatomy and Physiology Society, whose norming sample is based entirely on traditional classroom delivery (Arle, 2002).

In a study conducted by Stephenson, Brown, and Griffin (2008), comparing three different delivery styles (traditional, asynchronous electronic courseware, and synchronous e-lectures), results indicated no increased effectiveness of any delivery style when all question types were taken into account. However, when results were analyzed, students receiving traditional lectures showed the lowest levels on questions designed to assess comprehension.

Research found supporters in higher education academic leaders. In a 2006 survey of Midwestern postsecondary institutions concerning their online offerings, 56 % of academic leaders in the 11 states rated the learning outcomes in online education as the same or superior to those in face-to-face instructional settings. The proportion of higher education institutions believing that online learning outcomes were superior to those for face-to-face outcomes was still relatively small, but had grown by 34% since 2003, from 10.2 to 13.7 % (Allen & Seaman, 2007b). This belief added merit to the conclusions supported by Russell and others.

Russell's (1999) "no significant difference" conclusion had its detractors. The most commonly cited is Phipps and Merisotis (1999), who reviewed Russell's original meta-analysis (1999) and reported a much different conclusion. They concluded that the overall quality of the original research was questionable, that much of the research did

not control for extraneous variables, and therefore it could not show cause and effect.

They included in their findings evidence that the studies utilized by Russell (2000) in the meta-analysis did not use randomly selected subjects, did not take into effect the differences among students, and did not include tests of validity and reliability.

The Phipps and Merisotis (1999) analysis included the conclusion that research has focused too much on individual courses rather than on academic programs, and has not taken into account differences among students. They postulated that based on these conclusions, there is a significant difference in the learning results, as evidenced by grades, of students participating in distance education as compared to their classroom-based peers. Their analysis of Russell's original work questioned both the quality and effectiveness of research comparing distance and traditional education delivery.

While there has been ongoing conjecture that online education students are not receiving an equivalent learning experience compared to their traditional classroom counterparts, studies utilizing grades as an indicator of student learning have produced little evidence of the disparity. The incidence of studies showing significant negative differences in grades of online learners is small. Higher education institutions have indicated their support for online education, and its continued growth has allowed studies such as the present research to contribute to ongoing dialogue.

### Student Retention in Postsecondary Education

Persistence and retention in higher education is an issue that has intrigued researchers for over 50 years. Quantitative studies conducted in the mid-20<sup>th</sup> century produced data that caused researchers to look at low retention rates in higher education

and search for answers. This question has continued to consume researchers and higher education institutions.

In 1987, Tinto attempted to summarize studies of individual student retention in higher education by proposing a theory to allow higher education administrators to predict success and support students (Tinto, 1987). Tinto's model of student engagement has been in use for over 20 years as higher education administrators and faculty attempt to explain student retention issues at universities and colleges. Tinto's model primarily focused on factors of student engagement: How students respond to instructors, the higher education community itself, and students' own engagement in learning are the primary factors Tinto theorized as determining the student's retention. In the concluding remarks to his 1987 treatise on retention, Tinto acknowledged that persistence in higher education is but one facet of human growth and development, and one that cannot necessarily be attributed to a single factor or strategy.

Tinto's (1987) original study of student retention included the observation that student retention is a complicated web of events that shape student leaving and persistence. He observed that the view of student retention had changed since the 1950s, when students were thought to leave due to lack of motivation, persistence, and skills, hence the name *dropout*. In the 1970s, research began to focus on the role of the environment in student decisions to stay or leave. In the 1990s, Tinto proposed that the actions of the faculty were the key to institutional efforts to enhance student retention (Tinto, 2007). This was a significant addition to his theory, placing the cause on the instructor instead of the student, and it has done much to influence retention strategies

utilized in higher education institutions (Tinto, 2007). Tinto's studies have driven research in both traditional retention studies and those involving distance education.

Studies of the persistence of the postsecondary student routinely focus on 4-year postsecondary education. It is only within the last 20 years that persistence studies have included community college students and occupational students, acknowledging that their reasons for entering the postsecondary community are different from the traditional 4-year higher education participant (Cohen & Brawer, 1996). With different avenues to a baccalaureate degree more prevalent, the research into college persistence has expanded to include other types of programs and students.

Postsecondary student retention rates routinely utilize data from longitudinal studies of students entering in a Fall semester and completing a bachelor's program no more than 6 years later (NCES, 2003). The National Center for Education Statistics reported that 55% of those seeking a baccalaureate degree would complete in 6 years (NCES, 2003). The report acknowledged institutions are unable to follow students who transfer to other institutions; they are able to report only the absence of enrollment in their own institution.

Research has also found a large gap between community college entrants and 4-year college entrants in rates of attaining a bachelor's degree. Dougherty (1992) reported that students entering community college receive 11 to 19% fewer bachelor's degrees than students beginning at a 4-year university. Dougherty postulated that the lower baccalaureate attainment rate of community college entrants was attributable to both their individual traits and the institution they entered (Dougherty, 1992).

Studies of student retention of community college also vary based on the types of students. Community college retention rates are routinely reported as lower than traditional 4-year institutions (NCES, 2007). Cohen and Brawer (1996) attributed the differences in retention to the difference in the mission. In many instances, students did not enroll in a community college in order to attain a degree (Cohen & Brawer, 1996). The most recent longitudinal study in 1993 showed a retention rate of 55.4% of students after 3 years (NCES, 2001).

Of community college students, only 60.9% indicated a desire to transfer later to a baccalaureate degree completion program (NCES, 2003). While retention data collected by the federal government (NCES, 2003) did not include students with an AAS degree, Townsend's studies of the transfer rates and baccalaureate attainment rates of students in Missouri who had completed an Associate of Arts and students who had completed an Associate of Applied Science degree was 61% compared to 54% (Townsend, 2001).

Vocational or occupational programs have reported retention rates as "program completion," a definition involving completion of specific tasks and competencies instead of grades and tied to a limited program length. This state and federal requirement indicates program quality and ensures continued federal funding. In 2001, the U.S. Department of Education reported a 60.1% completion rate of postsecondary students enrolled in occupational education (NCES, 2007). Until 1995, the reasons for students leaving was neither delineated nor reported; it was not until federal reporting requirements under the Carl Perkins Act of 1994 that institutions were required to explore why students were not retained in vocational programs (P.L. 105-332).

Distance education provided a new arena for the study of student persistence. Theorists and researchers have attempted to utilize Tinto's model of student persistence to explain retention issues involved with distance education. However, Rovai (2003) analyzed the differing student characteristics of distance learners as compared to the traditional students targeted by Tinto's original models and concluded that student retention theories proposed from that population were no longer applicable to distance education learners. Rovai proposed that distance educators could address retention in ways that traditional higher education has not. He suggested that distance educators utilize strategies such as capitalizing on students' expectations of technology, addressing economic benefits and specific educational needs to increase student retention in courses (Rovai, 2003).

The expanded use of technology created a distinct subset of research into student retention issues. In 2004, Berge and Huang developed an overview of models of student retention, with special emphasis on models developed to explain the retention rates in distance education. Their studies primarily focused on the variables in student demographics and external factors, such as age and gender, which influence persistence and retention in online learning. Berge and Huang found that traditional models of student retention such as Tinto's did not acknowledge the differences in student expectations and goals that are ingrained in the student's selection of the online learning option.

Other researchers have attempted to study retention issues specifically for online education. In a meta-analysis, Nora and Snyder (2009) found the majority of studies of online education focused on students' individual characteristics and individual

perceptions of technology. Nora and Snyder concluded that researchers attempt to utilize traditional models of student engagement to explain student retention issues in distance or online learning courses, with little or no success. This supported Berge and Huard's conclusions. Nora and Snyder (2009) also noted a dearth of quantitative research.

Few quantitative studies exist that support higher or equal retention in online students compared to their classroom-based counterparts. One example is the Carmel and Gold (2007) study. They found no significant difference in student retention rates between students in distance education courses and their traditional classroom-based counterparts. The study utilized data from 164 students, 95 enrolled in classroom-based courses and 69 enrolled in a hybrid online format. Participants randomly self-selected and were not all enrolled in the same course, introducing variables not attributed in the study.

The majority of quantitative studies instead concluded there is a higher retention rate in traditional classrooms than in distance education. In the Phipps and Merisotis (1999) review of Russell's original research, which included online education, results indicated that research has shown even lower retention rates in online students than in students attending classes in the traditional college setting. The high dropout rate among distance education students was not addressed in Russell's meta-analysis, and Phipps and Merisotis found no suitable explanation in the research. They postulated that the decreased retention rate documented within distance education studies skews achievement data by excluding the dropouts.

Diaz (2002) found a high drop rate for online students compared to traditional classroom-based students in an online health education course at Nova Southeastern. Other studies have supported the theory that retention of online students is far below that



of the traditional campus students. In 2002, Carr, reporting for *The Chronicle of Higher Education*, noted that online courses routinely lose 50 % of students who originally enrolled, as compared to a retention rate of 70-75% of traditional face-to-face students. Carr reported dropout rates of up to 75% in online courses as a likely indicator of the difficulty faced in retaining distance education students who do not routinely meet with faculty. The data have not been refuted.

As community colleges began utilizing distance education, retention rates were reported as higher than traditional students (Nash, 1984). However, the California Community College System report for Fall 2008 courses showed inconsistent retention results for distance education learners, varying by the type of course. Results indicated equivalent retention rates for online instruction compared to traditional coursework in the majority of courses. Lower retention rates were indicated in online engineering, social sciences, and mathematics courses as compared to traditional classroom instructional models (California Community Colleges Chancellor's Office, 2009).

Due to the limited number of vocational/technical or occupational courses taught in the online mode, there was little data on student retention. In 1997, Hogan studied technical course and program completion of students in distance and traditional vocational education and found that course completion rates were higher for distance education students. However, program completion rates were higher for traditional students than for students enrolled in distance education (Hogan, 1997).

In summary, studies of retention have focused primarily on student characteristics while acknowledging that postsecondary retention rates vary according to a variety of factors. Research showed mixed results concerning the retention rate of online students,

though quantitative data leans heavily toward a lower course retention rate in online students. Data from 4-year universities have shown lower retention rates for online students than for traditional face-to-face students, while community colleges have shown inconsistent results. Data from vocational-technical education has been limited, but course retention rates are higher for online students, while program retention rates are lower. No significant research factor affecting retention has been isolated between students in online baccalaureate completion programs and students participating in traditional classroom-based settings.

### Summary

Research studies have been conducted analyzing student retention in higher education, transfer and retention of students from community colleges to universities, the impact of distance education, and student achievement and retention factors related to distance education. However, no comparative research was identified that compared the achievement and retention of students participating in an occupationally oriented transfer program utilizing both online education and traditional classroom-based instruction.

Chapter Three addresses the topics of research design, hypotheses, and research questions. Additionally, population and sample, data collection, and data analysis are discussed.

## CHAPTER THREE

### METHODOLOGY

The purpose of this study was to determine if there is a significant difference between course grades of students enrolled in online Technology Administration courses and their traditional classroom-based counterparts. The study also examined if there is a significant difference between course retention and program retention of students enrolled in online Technology Administration courses and their traditional classroom-based counterparts. The methodology employed to test the research hypotheses is presented in this chapter. The chapter is organized into the following sections: research design, hypotheses and research questions, population and sample, data collection, data analysis, and summary.

#### Research Design

A quantitative, quasi-experimental research design was selected to study grades, course retention, and program retention in students enrolled in the Technology Administration program. The design was chosen as a means to determine if significant differences occur between online and face-to-face students by examining numerical scores from all participants enrolled, and retention rates in both courses and programs in the Technology Administration program.

#### Hypotheses and Research Questions

This study focused on three research questions with accompanying hypotheses. The research questions and hypotheses guiding the study follow.

Research Question 1: Is there is a statistically significant difference between students' grades in online classes and traditional face-to-face classes?

*H1:* There is a statistically significant difference in course grades of students participating in online courses and students enrolled in a traditional classroom setting at the 0.05 level of significance.

Research Question 2: Is there a statistically significant difference between course retention rate of students in online classes and traditional face-to-face classes?

*H2:* There is a statistically significant difference in student course retention between students participating in online courses and students enrolled in face-to-face courses at the 0.05 level of significance.

Research Question 3: Is there a statistically significant difference in program retention between students who entered the program in online classes and students who entered the program in traditional face-to-face classes?

*H3:* There is a statistically significant difference in program retention between students who begin the Technology Administration program in online courses and students who begin in face-to-face courses at the 0.05 level of significance.

#### Population and Sample

The two populations selected were students enrolled in online and face-to-face courses. The sample included students enrolled in Technology Administration courses. Student enrollment was analyzed for all Technology Administration courses in the program sequence to determine the number of samples available in online and face-to-face classes. The course enrollment data for the sample are outlined in Table E1. The subsample of the data utilized for the study is presented in Table 1.

Table 1

*Technology Administration Enrollment Data*

Year	Instructor	TA 300		TA310	
		FTF	OL	FTF	OL
Spring 02	A			14	25
Fall 02	A	11	20	9	26
Spring 03	A			29	38
Fall 03	A	20	29	13	34
Spring 04	B			32	25
Fall 04	B	18	32	10	28
Spring 05	B			23	31
Fall 05	B	15	28	11	28
Spring 06	B			13	30
Fall 06	B	14	24	24	32
Spring 07	B			15	33
Fall 07	B	16	23	27	30
Spring 08	B			22	3529
TOTAL		94	156	242	395

*Note:* TA 300 Evolution and Development of Technology, TA 310 Technology and Society

The subsample for hypothesis 1 and hypothesis 2 included all students enrolled in two entry-level courses required for completion of the Technology Administration program: TA 300 Evolution and Development of Technology, and TA 310 Society and

Technology. The university offered the courses in online and face-to-face formats during the period of the study. Two instructors, identified as A and B, were involved with teaching the online and face-to-face courses. Two courses were selected that met the following criteria: (a) the same faculty member taught both courses, (b) the courses were offered over the period of the study consistently in online and face-to-face instruction, and (c) the syllabi for simultaneous online and face-to-face sections were identical.

For hypothesis 3, data included records of all students enrolled in TA 300 Evolution and Development of Technology for the Fall semesters of 2002, 2003, 2004, 2005, and 2006. The course was selected for inclusion in the study based on the following criteria: (a) student enrollment in the course was the result of declaration of the Technology Administration program major and (b) parameters of the study allowed students 2 or more years to complete the program requirements. For the purpose of the study, all student names were removed.

#### Data Collection

An Institutional Review Board (IRB) form was prepared for Washburn University approval prior to data collection. The study was designated as an exempt study. The Washburn University IRB form is provided in Appendix A. Approval of the IRB was transmitted by e-mail. A copy is located in Appendix B. In addition, an IRB was submitted to Baker University. The form is located in Appendix C. The Baker IRB approval letter is located in Appendix D.

Washburn University had two types of data collection systems in place during the period identified for the study, Spring 2002 through Spring 2008. The AS 400 data collection system generated paper reports for 2002 and 2003. The researcher was allowed

access to paper records for 2002 and 2003. Enrollment results for all technology administration sections for 2002-2003 were entered manually into an Excel spreadsheet.

In 2004, the University transferred to the Banner electronic student data management system. All records since 2004 were archived electronically and were retrieved utilizing the following filters for data specific to students enrolled in the identified Technology Administration courses: TA course designation and specific coding for year and semester to be analyzed (01 = Spring semester, 03 = Fall semester, 200X for specified year). Results retrieved under the Banner system were saved as an Excel spreadsheet by the researcher. The course enrollment data for the sample are presented in Tables E1 and E2.

Student transcripts and records were analyzed to determine program completion or continued enrollment in the program for program retention analysis. Documents examined included paper student advising files located within the Technology Administration department and specific student records housed within the Banner reporting system. Technology Administration course TA 300 was selected based on the following: (a) It is a required entry course only for Technology Administration majors, and (b) TA 310 is a dual enrollment course for business department majors.

#### Data Analysis

Data analysis for all hypothesis testing was conducted utilizing SPSS software version 16.0. The software system provided automated analysis of the statistical measures.

To address Research Question 1, a two-factor analysis of variance was used to analyze for a potential difference in delivery method (online and face-to-face), potential

difference in instructor (instructors A and B), and potential interaction between the two factors. When the analysis of variance reveals a difference between the levels of any factor, Salkind (2008) referred to this as the main effect. This analysis produces three *F* statistics: to determine if a difference in grades of online students as compared to their classroom based counterparts was affected by a main effect for delivery, a main effect for instructor, and for interaction between instructor and delivery.

Chi-square testing was selected to address research questions 2 and 3. The rationale for selecting chi-square testing was to observe whether a specific distribution of frequencies is the same as if it were to occur by chance (Salkind, 2008). If the obtained chi-square value is greater than the critical value, it indicates there is sufficient evidence to believe the research hypothesis is true. For research question 2, a chi-square test for differences between proportions analyzed course retention of online and face-to-face students at the end of semester. For Research Question 3, a chi-square test for differences between proportions analyzed program retention comparing students who began the program in the online section of TA 300 to the students who began in the face-to-face section.

#### Limitations of the Study

Roberts (2004) defined the limitations of the study as those features of the study that may affect the results of the study or the ability to generalize the results. The limitations of this study included (a) potential for data entry error, (b) curriculum modifications not reflected in the syllabi made by instructors over the period of the study, (c) behavior of the instructors during delivery in the two different formats, and (d)



rationale of students for selecting one course delivery method over another. These may affect the generalizability of this study to other populations.

### Summary

This chapter described the research design, population and sample, hypotheses, data collection, and analysis used in this research study. Statistical analysis using two-way analysis of variance and chi-square were used to determine if there are significant statistical differences in the course grades, course retention, and program retention of students enrolled in online classes as compared to their face-to face counterparts. The results of this study are presented in Chapter Four.

## CHAPTER FOUR

### RESULTS

The study had three main purposes. The first purpose was to determine if there was a difference in grades between students in online classes and students in traditional face-to-face classes in the Technology Administration program. In addition, the study was designed to examine the difference in course retention rates of students in the online classes as compared to the face-to-face classes. The third part of the study was designed to examine program retention rates of students who began the program in online classes and students who began the program in traditional face-to-face classes.

This chapter begins with the descriptive statistics for the sample: gender, age, grades by gender, and course selection of students in online or face-to-face courses by gender. From the three research questions, research hypotheses were developed, and the results of statistical analyses used to test each hypothesis are presented.

#### Descriptive Statistics

Demographic data for the sample was collected from the student data system for 2002 through 2009. The descriptive statistics presented below include gender ( $n = 884$ ), age ( $n = 880$ ), grades by gender ( $n = 884$ ) and course selection online or face-to-face by gender ( $n = 884$ ).

Table 2 describes the cross-tabulation of the frequencies for gender and of the sample selected for the study. The mean age for the sample tested was 31.06 years, with a standard deviation of 9.46 years. The age range of the sample was from 18 to 66 years. One participant did not report gender. Age was not available for three participants.

Table 2

*Participant Age Group by Gender (n=880)*

	Age Range By Years					
	< 20	20-29	30-39	40-49	50-59	60-69
Female	0	198	121	62	29	3
Male	5	281	104	53	19	5

*Note:* Gender not reported for one participant; Age not reported for four participants  
 Females = 413 Males = 467

Table 3 presents the frequency of course grades by gender and total number of students receiving each grade. Grades were distributed across the continuum, with slightly more females than males receiving A's, more males than females receiving B's, C's and F's, and an equal distribution of students receiving D's. More males withdrew from classes than did females.

Table 3

*Average Grades by Gender (n=884)*

Grades	Female	Male	Total
A	245	208	453
B	53	79	132
C	32	70	102
D	17	16	33
F	37	55	92
No Credit	1	0	1
Passing	0	1	1
Withdraw	25	42	67
Withdraw Failing	3	0	3
Total	413	471	884

*Note:* Gender not reported for one participant

Table 4 presents the course selection patterns of male and female students.

Overall, more students selected online courses than face-to-face courses. Females and males enrolled in online courses in equal numbers; however, proportionally more females (68.7%) chose the online instructional format instead of face-to-face compared with males (60.1%).

Table 4

*Course Selection by Gender (n=884)*

Course Type	Female	Male	Total
Face-to-face	129	184	313
Online	284	287	571
Total	413	471	884

*Note:* Gender not reported for one participant

### Hypothesis Testing

*H1:* There is a statistically significant difference in the course grades of students enrolled in online classes and students enrolled in a traditional classroom setting at the 0.05 level of significance. The sample consisted of 815 students enrolled in online and face-to-face Technology Administration courses at Washburn University. A two-factor analysis of variance was used to analyze for the potential difference in course grades due to delivery method (online and face-to-face), the potential difference due to instructor (instructors A and B), and the potential interaction between the two independent variables.

Mean and standard deviation for grades were calculated by delivery type and instructor. Table 5 presents the descriptive statistics. The mean of grades by delivery showed no significant difference between online and face-to-face instruction. Additionally, no significant difference in mean grade was evident when analyzed by instructor.

Table 5

*Means and Standard Deviations by Course Type and Instructor*

Course type	Instructor	Mean	Standard Deviation	n
Face-to-face	A	3.0690	1.41247	29
	B	2.9586	1.39073	266
	Total	2.9695	1.39084	295
Online	A	2.9024	1.52979	41
	B	3.0271	1.35579	479
	Total	3.0271	1.36911	520
Total	A	2.9714	1.47414	70
	B	3.0027	1.36783	745
	Total	3.000	1.37635	815

The results of the two-factor ANOVA, presented in Table 6, indicated there was no statistically significant difference in grades due to delivery method ( $F = 0.078$ ,  $p = 0.780$ ,  $df = 1, 811$ ). This test was specific for hypothesis 1. In addition, there was no statistically significant difference in grades due to instructor ( $F = 0.002$ ,  $p = .967$ ,  $df = 1, 811$ ), and no significant interaction between the two factors ( $F = 0.449$ ,  $p = 0.503$ ,  $df = 1, 811$ ). The research hypothesis was not supported.

Table 6

*Two-Factor Analysis of Variance (ANOVA) of Delivery by Instructor*

	<i>df</i>	F	p
Delivery	1	0.148	0.780
Instructor	1	0.003	0.967
Delivery*Instructor	1	0.449	0.503
Error	811		
Total	815		

*H2*: There is a statistically significant difference in student course retention between students enrolled in online courses and students enrolled in face-to-face courses at the 0.05 level of significance. The sample consisted of 885 students enrolled in TA 300 and TA 320 online and face-to-face courses. The hypothesis testing began with the analysis of the contingency data presented in Table 7. The data are organized with course selection (online or face-to-face) as the row variable and retention in the course as the column variable. Data were included in the retained column if a final grade was reported for participant. Participants who were coded as withdraw or withdraw failing were labeled as not retained. Chi-square analysis was selected to observe whether a specific distribution of frequencies is the same as if it were to occur by chance (Roberts, 2004).

The result of the chi square testing ( $X^2 = 2.524$ ,  $p = .112$ ,  $df = 1$ , 884) indicated there was no statistically significant difference between retention of students enrolled in online courses compared to students enrolled in face-to-face courses in the TA program. Additional results indicated that 93.92% (294/313) of the online students were retained,

compared to 90.89% (519/571) of the face-to-face students. The research hypothesis was not supported.

Table 7

*Course retention of online and face-to-face TA students*

	Retained	Not retained	Total
Face-to-face students	294	19	313
Online students	519	52	571
Total	813	71	884

*H3*: There is a statistically significant difference in program retention between students who begin the Technology Administration program in online courses and students who begin in face-to-face courses at the 0.05 level of significance. The sample consisted of 249 students enrolled in TA 300 in the online and face-to-face courses from Fall 2002 through Fall 2008. The hypothesis testing began with the analysis of the contingency data located in Table 8. The table is organized with course selection (online or face-to-face) as the row variable and program retention as the column variable. Data were included in the retention column if students had successfully met requirements for a Bachelors of Applied Science in Technology Administration or if they were enrolled in the program in Spring 2009. Data were included in the non-retained column if students had not fulfilled degree requirements and they were not enrolled in Spring 2009. Chi-square analysis was selected to observe whether a specific distribution of frequencies is the same as if it were to occur by chance (Roberts, 2004).



The result of the chi-square testing ( $X^2 = .132, p = .717, df = 1, 249$ ) indicated there was no statistically significant difference between the program retention rate of students who began the TA program in the online courses compared to the students who began the program in the face-to-face courses. Additional results showed that 91.57% (163/178) of students who began in online courses were retained compared to 92.96% (66/71) of students who began the TA program in face-to-face courses. The research hypothesis was not supported.

Table 8

*Program retention of online and face-to-face TA students*

	Retained	Not retained	Total
Face-to-face	66	5	71
Online	163	15	178
Total	229	20	249

### Summary

In this chapter, an introduction provided a summary of the analysis and statistical testing and in the order in which it was presented. This was followed by descriptive statistics of the sample, including age range of participants, grades by gender, and course selection by gender.

Results from testing of *H1* revealed no significant difference between course grades of online students and students enrolled in traditional face-to-face classes. Chi-square testing was utilized for testing of *H2*. Results indicated there was no significant

difference in course retention of students enrolled in online courses and students enrolled in traditional face-to-face courses. *H3* was also tested utilizing chi-square testing. The results indicated no significant difference in program retention of students who began the TA program in online courses and students who began in traditional face-to-face courses. Chapter Five provides a summary of the study, discussion of the findings in relationship to the literature, implications for practice, recommendations for further research, and conclusions.

## CHAPTER FIVE

### INTERPRETATION AND RECOMMENDATIONS

#### Introduction

In the preceding chapter, the results of the analysis were reported. Chapter Five consists of the summary of the study, an overview of the problem, purpose statement and research questions, review of the methodology, major findings, and findings related to the literature. Chapter Five also contains implications for further action and recommendations for further research. The purpose of the latter sections is to expand on the research into distance education, including implications for expansion of course and program delivery and future research. Finally, a summary is offered to capture the scope and substance of what has been offered in the research.

#### Study Summary

The online delivery of course content in higher education has increased dramatically in the past decade. Allen and Seaman (2007a) reported that almost 3.5 million students participated in at least one online course during the Fall 2006 term, a nearly 10% increase over the number reported in the previous year. They also reported a 9.7% increase in online enrollment compared to the 1.5% growth in overall higher education. As online delivery has grown, so has criticism of its efficacy.

Online delivery of education has become an important strategy for the institution that is the setting of this study. The purpose of this study was three-fold. The first purpose of the study was to determine if there was a significant difference between the course grades of students participating in TA online courses and their traditional classroom-based counterparts. The second purpose of the study was to determine if there was a

significant difference between course retention of students participating in TA online courses and their traditional classroom-based counterparts. A third purpose of the study was to determine if there was a significant difference between program retention of students who began the TA program in online courses and those who began the program enrolled in traditional face-to-face courses. The study was designed to expand the knowledge base concerning online education and its efficacy in providing baccalaureate degree completion opportunities.

The research design was a quantitative study to compare course grades, course retention, and program retention of students enrolled in the online and traditional face-to-face TA program at Washburn University. Archival data from the student system at Washburn University was utilized to compare online and traditional face-to-face students. In order to answer Research Question 1, a sample of students enrolled in TA 300 and TA 310 online and traditional face-to-face courses was analyzed. The sample included students entering the program in the Fall semesters of 2002, 2003, 2004, 2005, and 2006. Two instructors were responsible for concurrent instruction of both the online and face-to-face classes for the period analyzed. A two-factor analysis of variance was used to analyze for a potential difference in the dependent variable, course grades, due to delivery method (online and face-to-face), the instructor (instructors A and B), and the potential interaction between the two independent variables (Research Question 1).

A chi-square test for differences among proportions was used to analyze both course and program retention (Research Questions 2 and 3). For Research Question 2, archived data from the Washburn University student system was analyzed for students enrolled in TA 300 and TA 310. Additional variables identified for this sample included

course selection and instructor (A or B). For Research Question 3, archived data from the Washburn University system was used, which identified students with declared Technology Administration majors who began the TA program enrolled in online and face-to-face courses. A single gatekeeper course (TA 300) was identified for testing. Two instructors (A and B) were responsible for instruction during the testing period.

A two-factor ANOVA was utilized to test *H1*: There is a statistically significant difference in course grades of students participating in online courses and students enrolled in a traditional classroom setting at the 0.05 level of significance. ANOVA testing was utilized to account for the two delivery methods and two instructors involved for the period of the study. The results of the test indicated there was no statistically significant difference in grades due to delivery method. The results of the testing also indicated no statistically significant difference in grades due to instructor and no interaction between the two independent variables. The research hypothesis was not supported.

To test the next hypothesis, chi-square testing was utilized. *H2*: There is a statistically significant difference in student course retention between students participating in online courses and students enrolled in face-to-face courses at the 0.05 level of significance. The result of the chi-square testing indicated there was no statistically significant difference in course retention of students enrolled in online courses and students enrolled in face-to-face courses in the TA program. The research hypothesis was not supported.

To test the final hypothesis, chi-square testing was also used. *H3*: There is a statistically significant difference in program retention between students who begin the

Technology Administration program in online courses and students who begin in face-to-face courses at the 0.05 level of significance. The result of the chi-square testing indicated there was no statistically significant difference in the program retention rate of students who began the TA program in the online courses and students who began the program in the face-to-face courses. The research hypothesis was not supported. Testing found that course retention was high in both formats, leading to interpretation that higher results may be due to the age of participants or prior degree completion.

The results found no significant difference in grades, course, or program retention for students in online TA courses and students enrolled in traditional face-to-face instruction. The implication of these results compared to current literature is discussed in the next section.

#### Findings Related to the Literature

Online education has become a strategy for higher education to provide instruction to students limited by distance or time, or who, for other reasons, do not wish to attend traditional classroom-based university classes. Additionally, online education allows higher education institutions to expand their geographic base. Institutions have utilized distance education for over a century to provide instruction, but it was only within the last two decades that instruction over the Internet had replaced correspondence, television, and video courses as the method of choice for delivery (Russell, 1999).

Utilizing grades as a measure of achievement, meta-analyses conducted by Russell (1999), Shachar and Neumann (2003), and Machtmes and Asher (2002) found no significant difference in grades of online students and traditional classroom-based

students. These analyses utilized multiple studies of course information, comparing grades of online students and traditional face-to-face students, primarily utilizing  $t$  tests as the preferred methodology. The results of previous research were supported by the present study. Additionally, this study went further, analyzing data over more than one semester, controlling for the effect of different instructors. These results were contrary to the conclusion reached by Phipps and Merisotis (1999).

The second purpose of the study was to determine if a significant difference existed between the course retention of students enrolled in online TA courses and students enrolled in face-to-face courses. Meta-analyses conducted by Phipps and Merisotis (1999) and Nora and Snyder (2009) concluded a much lower course retention rate in online students as compared to their face-to-face counterparts. The previous meta-analyses examined retention of online students and traditional face-to-face students in distinct courses, utilizing  $t$  tests as the primary methodology. The chosen method of  $t$  tests was used instead of the chi square testing due to the limitations of the studies to one course taught by one instructor, limited to one semester or cycle. Carr (2002) reported in *The Chronicle of Higher Education* that retention of online students was 50% less than that of traditional face-to-face students. Carr's results were based on the examination of longitudinal retention data from universities as reported to the United States Department of Education.

The results of the present study found no significant difference in the course retention rates. These results are supported by the findings of Carmel and Gold (2007) in which they reported no significant difference in course retention rates of online students compared to traditional face-to-face students in their analysis of students in multiple

courses in disciplines across a 4-year university. The present study expanded those results, examining course data in the same discipline over a 6-year period and controlling for delivery by two separate instructors.

Research into program completion rates of AAS students has been conducted primarily in traditional university settings, including Townsend's (2002) studies at the University of Missouri-Columbia. Townsend's results showed a lower baccalaureate completion rate for students entering with an AAS than students who transferred to 4-year universities with an AA degree. Studies by Hogan (1997) of vocational-education programs also found a lower program completion rate for online students compared to students in traditional delivery vocational education programs. Analysis of the data in the current study showed no significant difference in program completion rate of students who began in online TA courses as compared to students who began the program in face-to-face courses.

### Conclusions

The use of distance education for postsecondary instruction, primarily in the form of the Internet, has both changed and challenged the views of traditional university-based instruction. Multiple studies have been designed in an effort to examine whether online students have the same level of academic achievement as their traditional higher education peers. The present study agrees with the research indicating there is no statistically significant difference in the grades of online students and their face-to-face counterparts. In addition, with student retention an issue for all postsecondary institutions, the data from previous studies indicated a lower retention rate for online students than for their traditional face-to-face classmates. The current study contradicted



those arguments. In the following sections, implications for action, recommendations for research, and concluding remarks are addressed.

### *Implications for Action*

As postsecondary institutions move into the 21<sup>st</sup> century, many have examined issues of student recruitment and retention in an effort to meet the demands of both their students and their communities. The majority of postsecondary institutions have initiated online education as a strategy to recruit students from beyond their traditional geographic areas. This study supported existing research utilizing grades as a measure of achievement and should alleviate doubt that online students are shortchanged in their education. The transition of existing face-to-face to courses to an online delivery model can be accomplished without sacrificing achievement of course and program goals.

The study also examined course and program retention data, finding no significant differences between online and traditional students in the TA program. The findings of this study support the expansion of additional online courses and programs within the School of Applied Studies.

Finally, this study can provide the basis for further action, including analyzing other programs and courses offered in the online format by the University. The analysis of other programs offered in an online delivery model would enhance further development of online courses and programs.

### *Recommendations for Future Research*

Distance education delivery has expanded dramatically with the use of the Internet for online instruction. The present study could be continued in future years to measure the effects of specific curriculum delivery models and changes made to online

delivery platforms. In addition, the study could be expanded to include specific characteristics of student retention named in the literature, such as examining whether the age and entering GPA of students provides any insight into course and program retention. The study could also be expanded to include other universities with similar baccalaureate-degree completion programs and other disciplines. Because the body of research is limited concerning the baccalaureate-degree completion of students who begin their postsecondary education in career-oriented instruction, there is value in continuing to study baccalaureate completion rates, both in an online format and in more traditionally based settings.

### *Concluding Remarks*

The current study examined a Technology Administration program that has been offered in both online and face-to-face format, utilizing data from Fall 2002 through Spring 2008. The TA program was developed to allow students who had completed an occupationally oriented AAS degree to complete a bachelor's degree program. Three hypotheses were tested in this study, examining course grades, course retention, and program retention of students enrolled in online and face-to-face courses in Technology Administration. No significant difference was found for the three hypotheses.

These results form a strong foundation for expanding online courses and programs at Washburn University. By addressing two of the major concerns of educators, achievement and retention, the study results allow expansion of online courses and programs to benefit from data-driven decision-making. Other institutions can and should utilize data to examine existing online course and program data.

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## APPENDIX A: WASHBURN UNIVERSITY IRB APPLICATION

## INSTITUTIONAL REVIEW BOARD (IRB)

### Application for Project Approval

#### PLEASE COMPLETE THIS FORM IN ITS ENTIRETY

*NOTE: Click on Text Boxes (<http://www.washburn.edu/main/academics/academic-catalog/index.html>) and begin typing to provide written information.*

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1. Name of Principal Investigator: Vickie A. Kelly
2. Name of Additional Investigators:
3. Departmental Affiliation and Location: Office, Legal & Technology Benton 312C
4. Phone Number: (a) Campus, 2280 (b) Home/Cell, 215-1748
5. Name of Faculty Member(s) Responsible for Project:
6. Title of Project: A Quantitative Study of Course Grades and Retention Comparing Online and Face-to-Face Clases
7. Funding Agency (if applicable): N/A
8. Project Purpose(s) and Benefits: As part of a comprehensive program review, course grades and retention in Technology Administration online and face-to-face courses will be analyzed. Results may be published.
9. Describe the proposed subjects:
  - a. Number – 346
  - b. Age –
  - c. Sex –
  - d. Race –
  - e. Other characteristics –
10. Which of the following groups will you be using in your study? **Check ALL that apply.**
  - ☐ Children (individuals under the age of 18)
  - ☐ Prisoners
  - ☐ Individuals with developmental disabilities
  - ☐ Pregnant women, fetuses, and/or neonates
  - ☒ None of the above will be used in the proposed study
11. Describe how subjects are to be selected/recruited.  
 Historical program data available in the Banner system will be utilized for the study.
12. Describe the proposed procedure in the project. Any proposed experimental activities that are included in evaluation, research, development, demonstration, instruction, study, treatments, debriefing, questionnaires, and similar projects must be described.  
*Use simple language; avoid jargon.*

Data will be collected from Banner including student data from Fall 2002 through Spring 2008 from students enrolled in online and face-to-face Technology administration courses. Data will be analyzed utilizing two factor ANOVA for comparison of course grades and Chi-square analysis to determine the difference in course and program retention. No individual student identifiable will be used in the study.

13. If questionnaires, tests, or related research instruments are to be used, attach a copy of the instrument(s). If other agencies, institutions, etc. are used, a scanned letter of approval written on the agency letterhead **must** accompany the proposal. An email of approval is also acceptable.
14. The data will be analyzed in:
  - ☐ Individual form
  - ☒ Aggregate form
  - ☐ Both individual and aggregate forms
15. Attach the informed consent statement. If participants are under 18 years of age, a consent form **must** be created for parental signature. If information other than that provided on the informed consent form is provided, attach a copy of such information. Explain how the identifying data (research findings) are to be either anonymous or confidential. The consent statement **cannot** include exculpatory (absolving from fault) language through which the subject is made to waive, or appear to waive, any legal rights, or to release the institutions or agent from liability for negligence.
 

Have you attached a copy of the informed consent statement?

  - ☐ Yes
  - ☒ No
16. Will electrical or mechanical devices be applied to subjects?
  - ☐ Yes – If “Yes,” use the box that follows to provide a detailed description of the steps that will be taken to safeguard the rights, safety, and welfare of subjects.
  - ☒ No
17. Participants in the proposed study will be:
  - ☐ Audio recorded
  - ☐ Video recorded
  - ☐ Both audio and video recorded
  - ☒ None of the above apply to the proposed study
18. Does this research entail more than “minimal risk” (the risk of harm anticipated in the proposed research is not greater, considering probability and magnitude, than

that ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.)?

☐ Yes

☒ No

*If the primary investigator is a student, then (1) type your name below and (2) forward this application to your faculty supervisor so that the next item can be completed. ONLY faculty can submit an IRB application.*

TO BE COMPLETED BY FACULTY SUPERVISING STUDENT RESEARCH: "I have reviewed this IRB application and deem it acceptable for IRB review."

☐ Yes

☐ No

☒ Not a student project.

***I agree to conduct this project in accordance with Washburn University's policies and requirements involving research.***

Vickie A. Kelly

*Name(s) of Principal Investigator(s) (type your full name above)*

**APPENDIX B: WASHBURN UNIVERSITY APPROVAL E-MAIL**

----- Original Message -----

**From** Michael Russell <mike.russell@washburn.edu>

**Date** Fri, 13 Mar 2009 11:29:39 -0500

**To** Vickie Kelly <vickie.kelly@washburn.edu>

**Subject** Re: Question Concerning IRB Approval

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Vickie,

Thank you for the additional information. Your IRB application entitled, "A Quantitative Study of Course Grades and Retention Comparing Online and Face-to-Face Classes" [*sic*] (09-29) has been approved. You may bring [*sic*] at your leisure. If you have any questions, please feel free to let me know. Good luck with your project!!!

Dr. Mike Russell  
IRB Chair

## APPENDIX C: BAKER UNIVERSITY IRB PROPOSAL



Date: April 6, 2009

School of education  
Graduate department

IRB PROTOCOL NUMBER \_\_\_\_\_  
(irb USE ONLY)

**IRB Request  
Proposal for Research  
Submitted to the Baker University Institutional Review Board**

**I. Research Investigator(s)** (Students must list faculty sponsor first)

**Department(s)**      **School of Education Graduate Department**

Name	Signature	
1. <u>Dr. Susan Rogers</u>	_____	X Major Advisor
2. <u>Dr. Carolyn Doolittle</u>	_____	Check if faculty sponsor
3. _____	_____	Check if faculty sponsor
4. _____	_____	Check if faculty sponsor

Principal investigator or faculty sponsor contact information:

Name: Vickie A. Kelly \_\_\_\_\_

Mailing address of Principal Investigator

8620 SW 85<sup>th</sup> Street

Auburn, KS 66402

Phone: 785-256-2161

Email: vakelly@spgsmail.bakeru.edu

Expected Category of Review: X Exempt    \_\_\_ Expedited    \_\_\_ Full

**II: Protocol Title**

A QUANTITATIVE STUDY OF COURSE GRADES AND RETENTION  
COMPARING ONLINE AND FACE-TO-FACE CLASSES

**Summary**

The following summary must accompany the proposal. Be specific about exactly what participants will experience, and about the protections that have been included to safeguard participants from harm. Careful attention to the following may help facilitate the review process:

**In a sentence or two, please describe the background and purpose of the research.**

Washburn University has been involved in online education delivery for nine years.

Online courses were reviewed at the end of year one of implementation, but have not been analyzed in depth for student retention and achievement factors. The Technology Administration program was the first fully online degree offered by Washburn

University. The purpose of the study is to examine the difference in GPA and course retention of students enrolled in online Technology Administration courses and program versus their traditional classroom based counterparts for a period of 6 years, 2002-2008.

**Briefly describe each condition or manipulation to be included within the study.**

There are no manipulations in the study. The delivery method is the independent variable in the study.

**What measures or observations will be taken in the study? If any questionnaire or other instruments are used, provide a brief description and attach a copy.**

Historical student data will be analyzed for grades, course retention and program retention for Technology Administration students enrolled in TA 300 and TA 310 for the period from Fall 2002 through Spring 2008. The data will be retrieved from the Banner Data Management System utilized by Washburn University. Student data prior to 2004 is stored in paper archives.

**Will the subjects encounter the risk of psychological, social, physical or legal risk? If so, please describe the nature of the risk and any measures designed to mitigate that risk.**

There is no risk to subjects. Subjects will not be identified in the study or contacted.

**Will any stress to subjects be involved? If so, please describe.**

There is no stress to the subjects involved. All data is historical and subjects of the study will not be identified or contacted.

**Will the subjects be deceived or misled in any way? If so, include an outline or script of the debriefing.**

Subjects will not be deceived or misled. All data will be historical and subjects will not be identified or contacted during the study.

**Will there be a request for information that subjects might consider to be personal or sensitive? If so, please include a description.**

No personal or sensitive information will be requested.

**Will the subjects be presented with materials that might be considered to be offensive, threatening, or degrading? If so, please describe.**

Subjects will not be contacted during the course of the study.

**Approximately how much time will be demanded of each subject?**

No time will be required of any subject. All data is historical and currently available from Washburn University.

**Who will be the subjects in this study? How will they be solicited or contacted?**

**Provide an outline or script of the information which will be provided to subjects prior to their volunteering to participate. Include a copy of any written solicitation as well as an outline of any oral solicitation.**

The subjects of the study are students who enrolled in online and face-to-face Technology Administration courses from Fall 2002 through Spring 2008. All data is historical and contained in university records at Washburn University.

**What steps will be taken to ensure that each subject's participation is voluntary?**

**What if any inducements will be offered to the subjects for their participation?**

Not applicable.

**How will you ensure that the subjects give their consent prior to participating? Will a written consent form be used? If so, include the form. If not, explain why not.**

All data collected is currently in Washburn University records.

**Will any aspect of the data be made a part of any permanent record that can be identified with the subject? If so, please explain the necessity.**

No individual identification will occur as part of the study.

**Will the fact that a subject did or did not participate in a specific experiment or study be made part of any permanent record available to a supervisor, teacher or employer? If so, explain.**

Not applicable.

**What steps will be taken to ensure the confidentiality of the data?**

All data collected will be aggregated by the principal researcher. No individual identification will occur in any final reports. Any published reports resulting from this study will utilize aggregate data. All paperwork and preliminary reports containing student identification will only be handled by the principal investigator and will be destroyed at the completion of the study.

**If there are any risks involved in the study, are there any offsetting benefits that might accrue to either the subjects or society?**

There are no risks involved with the study.

**Will any data from files or archival data be used? If so, please describe.**

Aggregate data will be retrieved from the Banner data management system at Washburn University utilizing university protocol for data retrieval. Only data from students enrolled from Fall 2002 to Spring 2008 in Technology Administration courses will be analyzed. Student files will be utilized to examine program retention, but will not be identified with individual data.

## APPENDIX D: BAKER UNIVERSITY IRB APPROVAL LETTER

21 April 2009

Vickie Kelly  
8620 SW 85<sup>th</sup> Street  
Auburn, KS 66402



BAKER  
UNIVERSITY

Dear Ms Kelly:

The Baker University IRB has reviewed your research project application (M-0067-0409-0421-G) and approved this project under Exempt Review. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

The Baker University IRB requires that your consent form must include the date of approval and expiration date (one year from today). Please be aware of the following:

1. At designated intervals (usually annually) until the project is completed, a Project Status Report must be returned to the IRB.
2. Any significant change in the research protocol as described should be reviewed by this Committee prior to altering the project.
3. Notify the OIR about any new investigators not named in original application.
4. Any injury to a subject because of the research procedure must be reported to the IRB Chair or representative immediately.
5. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity. If you use a signed consent form, provide a copy of the consent form to subjects at the time of consent.
6. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.

Please inform Office of Institutional Research (OIR) or myself when this project is terminated. As noted above, you must also provide OIR with an annual status report and receive approval for maintaining your status. If your project receives funding which requests an annual update approval, you must request this from the IRB one month prior to the annual update. Thanks for your cooperation. If you have any questions, please contact me.

Sincerely,

Marc L. Carter, PhD  
Chair, Baker University IRB  
Cc: Susan Rogers

## APPENDIX E: TECHNOLOGY COURSE ENROLLMENTS 2002-2008

Table E1

*Technology Enrollments 2002-2008 for TA 300, TA 310, TA 320 & TA 330*

Semester	TA 300		TA 310		TA 320		TA 330	
	FTF	OL	FTF	OL	FTF	OL	FTF	OL
S02			14	25	9	19		
F02	11	20	9	26			8	15
S03			29	38	15	20		
F03	20	29	13	34			10	26
S04			32	25	9	26		
F04	18	32	10	28			10	24
S05			23	31		28		
F05	15	28	11	28	9			25
S06			13	30		20	10	
F06	14	24	24	32	9			21
S07			15	33		15	9	
F07	16	23	27	30		7		18
S08			22	35		10	9	
TOTAL	94	156	242	395	51	145	56	129

*Note:* S = Spring    F = Fall

TA 300 – Evolution and Development of Technology

TA 310 – Technology and Society

TA 320 – System Design, Assessment &amp; Evaluation

TA 330 – Safety Analysis and Quality Assurance

Table E2

*Technology Course Enrollments 2002-2008 for TA 390, TA 400, & TA 420*

Semester	TA 390		TA 400		TA 420	
	FTF	OL	FTF	OL	FTF	OL
S02			7	9	3	11
F02	6	16				
S03			7	14	4	13
F03						
S04						
F04		26				1
S05				23		22
F05		23	1		1	
S06				24		21
F06		23				
S07		23		19		20
F07		27				2
S08		16		12		12
TOTAL	6	154	15	101	8	202

*Note:* S = Spring      F = Fall

TA 390 – Technology and Ecology

TA 400 – Technology Planning

TA 420 – Technology Project