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Student Outcomes in Traditional, Hybrid, and Online Courses in Community College Career and Technical Education Programs

Thomas R. Sewell
East Tennessee State University

Student Outcomes in Traditional, Hybrid, and Online Courses in Community College Career and

Technical Education Programs

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by

Thomas Ray Sewell

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Dr. Hal Knight, Chair
Dr. Don Good
Dr. Keith Johnson
Dr. James Lampley

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ABSTRACT

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The purpose of this quantitative study was to examine whether differences in student course

outcomes as defined by final course grades existed between three content delivery methods in

career and technical education courses: Traditional (face to face), hybrid, and online. Final

course grades in career and technical education courses at one community college for the Fall

2011 through the Fall 2015 semesters were used in this study to compare the success of students

in courses employing the three content delivery methods. The outcomes for male and female

students and the outcomes for traditional and nontraditional students in career and technical

education programs were compared as well.

The method of delivery was found to have an impact. Withdrawal rates for career and technical

education courses were also impacted by course delivery method. Seven research questions were

included in this study, and the data was analyzed using one-sample chi-square tests for the seven

research questions in the study.

Results indicated that students had significantly higher student learning outcomes in traditional

courses in career and technical education programs than in either hybrid or online courses.

Withdrawal rates were higher for hybrid and online courses than traditional courses. Student

gender and age were related to student final course outcomes with both male and female students

more likely to earn transferable final course grades in traditional courses than in hybrid or online courses. Traditional age and nontraditional age students were also more likely to earn transferable final course grades in traditional courses than in hybrid or online courses. Nontraditional age students were significantly more likely than traditional age students to earn a transferable final course grade regardless of delivery method. Overall findings suggest that delivery method may impact student outcomes in career and technical education courses. The study is significant in that it provides insight into specific differences in student outcomes by the three different delivery methods currently used in higher education and may be used for comparison with other institutions' student outcomes.

DEDICATION

This study is dedicated to my family. To my wife Shelley, thank you for the patience, the understanding, and the willingness to allow me to read, research, rant, and sometimes rest throughout the long road from the initial class to the final document. To my children Amber, Hayley, Matthew, and Jeremy, thank you for your patience and your ability to ignore me when I wondered out loud why I was doing this. I love you all and appreciate all of the support, the time, and the help you have given me. Words offer but a feeble attempt to express what you mean to me.

To my parents, Jerry and Dana, thank you for your guidance, your support, your encouragement, and your willingness to allow me to learn throughout my life. You guided me while allowing me to learn from my mistakes, made sure I was provided with opportunities even when it meant hardship for you, and never allowed me to give up when faced with adversity. You are greatly missed.

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For all of the students who have had to endure my class lectures, labs, and discussions, I would like to thank you for being sounding boards when I needed to talk through an idea; for being test subjects when I had ideas and wanted to see the possibilities and probabilities; and for

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CHAPTER 1

INTRODUCTION

Recent trends in higher education indicate an increased emphasis on alternative content delivery methods that may be used to either enhance or replace the traditional lecture-based pedagogy found in many college classrooms. As classrooms change to provide course content, homework, and assessment anywhere at any time, the perception of online learning varies by audience; the public at large has a less optimistic view of online courses than college presidents do (Taylor, Parker, Lenhart, & Patten, 2011). This perception exists with the knowledge that technology now provides students and instructors with tools to manipulate data into information and then into knowledge more quickly and from more diverse sources than ever before (Mundie & Hooper, 2014). Integration of technology into existing pedagogy requires careful thought as to the redesign of classroom instruction, however. Advocates of technology use note that technology tools should "serve as intellectual partners during activities requiring problem-solving or critical thinking" (Ertmer & Ottenbreit-Leftwich, 2013, p. 176). As online learning requires the use of technology to access and interact with instructors and materials, the design and implementation of online instruction brings new and more complex issues to light.

Researchers have found that in the past 10 years, online education has had a dramatic impact on institutions of higher education in terms of access, effectiveness, and commitment. In the fall 2002 semester approximately 800,000 students were enrolled in online courses; by the fall of 2006 that number had reached over 1.9 million students (Cejda, 2010). As of 2012, 6.7 million students, or 32% of all students enrolled in higher education, completed at least one online course in their previous semester of enrollment (Allen & Seaman, 2013). By 2014 the

number of students taking at least one distance course had fallen to 5.8 million; this was 28% of overall college enrollment, and reflected a decline in online enrollment greater than the decline in overall enrollment (Allen, Seaman, Poulin, & Straut, 2016). While Sener (2010) predicted that "a large majority of higher education students (70%-80%) will take at least one online course during their college career" within the next 10 years, the most recent trends indicate consistent online enrollment at approximately 30%. Miller et al. (2014) found that the "perceived presence of the instructor and peers" (p. 86) was the strongest predictor of student success in any online course, and that online courses will impact one-third of college students for the foreseeable future. The shift towards online instruction impacts the instructor as well as the students; as more institutions include online instructional components or courses, more faculty are required to teach in an online format with various levels of professional development in the mode of instruction (Comas-Quinn, 2011). Technical courses traditionally require demonstration of skills and completion of hands-on components, and the U.S. Department of Education's Office of Vocational and Adult Education "calls for states to use technical skills assessments aligned with industry standards" (Staklis & Klein, 2010, p. 4). Technical skill assessments that are classified as occupation-specific assessments "test students' mastery of technical skills associated with a particular job or narrow career area and often focus on assessing individuals' knowledge and ability to apply advanced content" (Staklis & Klein, 2010, p. 4), and may require an in-person demonstration of these skills.

Colleges have transitioned courses from traditional delivery methods to hybrid and online delivery methods with varying levels of involvement and commitment from faculty teaching these courses. Allen, Seaman, Lederman, and Jaschik (2012) found that 58% of the faculty surveyed were more fearful than excited about the growth of online education, and 66% of these

faculty felt that "the learning outcomes for an online course are inferior or somewhat inferior to those for a comparable face-to-face course" (p. 9). A study conducted four years later by the same company indicated little change in these attitudes; 52% of faculty were not accepting of online education; however, there was no report on faculty opinions of learning outcomes (Allen et al., 2016). Otter et al. (2013) determined that professors at Middle Tennessee State University with online teaching experience felt that they were more available to students and spent more time teaching online courses than traditional courses. Windes and Lesht (2014) reported that faculty felt that the two main challenges to teaching online were "lost interaction with students" and "time commitment" (p. 6). There is a dramatic difference between faculty and administrator opinions when asked if there are quality tools in place to assess online instruction; while 50% of administrators feel there are good tools available and in place, fewer than 25% of faculty share that opinion (Allen et al., 2012).

Other researchers have shown that online delivery methods impact factors that affect student learning and student success in postsecondary education. Verhoeven and Wakeling (2011) found a statistically significant lower success rate for online students in an upper-division business course, while Crawford and Persaud (2013) found that "students enrolled in online courses were significantly less likely to complete courses than students enrolled in face-to-face courses" (p. 75). Wolff, Wood-Kustanowitz, and Ashkenazi (2014) examined 11 factors that potentially impact student performance in community college, including "age; gender; course load; caregiver status; mode of delivery; grade point average (GPA); credits previously completed; employment (average hours per employed per week for pay); and math, reading, and writing proficiency" (p. 167). This research found that full-time employment and low math placement scores were the most significant indicators of poor student performance. Jaggars,

Edgecombe, and Stacey (2013b) have also found that failure and withdrawal rates are higher for online courses than for face-to-face courses by approximately 10%; that those students who do complete an online course performed more poorly than students in a face-to-face course; and that in two specific state systems, "students who took one or more online courses in their first semester were 4 to 5 percentage points less likely to return for the subsequent semester" (p. 4); these studies demonstrate that online coursework impacts retention and completion, two key factors in the evaluation of college programs.

The choice of course delivery methods also determines the materials that may be used in the classroom; while traditional face-to-face delivery methods rely heavily on synchronous interaction between instructor and student, hybrid and online courses must make use of asynchronous communication for significant segments of the course. The increased use of technology in the asynchronous format has led to many studies focused on student satisfaction (Castle & McGuire, 2010; Draus, Curran, & Trempus, 2014: Dziuban & Moskal, 2011), but fewer studies that outline the differences in final outcomes such as grades and completion in different formats of the same course. Jaggars (2014) found that undergraduate students took easy courses online and hard courses on campus, and "for many students it seemed that the words *easy* and *difficult* were code words for *humanities* versus *math and science*" (p. 16). Lee and Choi (2011) classified 44 dropout factors, but only addressed three larger categories: student factors, course-program factors, and environmental factors rather than investigate the dropout factors separately.

Course delivery method definitions are also open to interpretation; there is no standard agreement on percentages of content that define the difference between hybrid and online courses, or even on-ground courses; the largest variation occurred when defining a hybrid or

blended course. McGhee and Reis (2012) reported studies that noted hybrid courses ranged from 30% to 79% online or face-to-face to either a 90%-10% to 10%-90% combination of online and face-to-face content. A proposed definition for K-12 education that is applicable to any level of hybrid learning offers "a formal education program in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path, and/or pace and at least in part at a supervised brick-and-mortar location away from home" (Staker & Horn, 2012, p. 3). Sharma (2010) provided three different definitions of blended learning based on delivery method, technologies used, and methodologies used but did not delineate specific percentage ranges. Ashby, Sadera, and McNary (2011) defined a blended class as a 50/50 split between online and face-to-face work. While these definitions vary from system to system and from institution to institution, face-to-face classes in these studies always met in person regardless of the technologies used, while online classes did not physically meet.

While convenience is often a factor in a student's selection of online courses, this convenience may come with a cost. A study of an introductory sociology course offered in online and face-to-face formats found the possibility of a selection effect, with "academically stronger students… gravitating toward the F2F (face-to-face) sections of a course and performing better on the exam" (Driscoll, Jicha, Hunt, Tichavsky, & Thompson, 2012, p. 320). More current research defines the importance of matching the course content and learning outcomes with the delivery method, and that provides updated processes for course development that take into account the differences in delivery methods (Brinthaupt, Clayton, Draude, & Calahan, 2014; Robinson & Stubberud, 2012). Sussman and Dutter (2010) found "no difference… for face-to-face versus fully online course delivery" (p. 6) when comparing scores for an issue paper assignment and for final course grades. Dell, Low, and Wilker (2010) compared online and face-

to-face sections of the same human development and learning course and of an educational psychology course and determined "that the platform or medium (online vs. face-to-face) is not as important as the instructional strategies employed" (p. 35).

Online course delivery has come under great scrutiny since its inception; journals and research have been generated to both support and oppose its use in education at all levels. This study will provide support to a much smaller set of research studies that focus on career and technical education courses (Burns, Duncan, Sweeney, North, & Ellegood, 2013; Moriba & Edwards, 2013). As research on career and technical education courses and programs tends to focus on the secondary level, this study will serve to meet a need for research on students enrolled in postsecondary career and technical education courses and programs.

Statement of the Problem

A review of literature indicates that while research has been completed on online courses at the postsecondary level, little research focuses on the relationship between online delivery, student demographics, and career and technical courses and programs. The purpose of this study was to determine if there are significant differences in student success in traditional, hybrid, and online courses in selected career and technical education programs as measured by final course grades, by transferable grade completion, and by withdrawal rates; the relationship between gender, transferable course grades, and course delivery method; and the relationship between age and transferable course grades. This study served to determine if students in online career and technical education courses complete these courses as successfully as students in face-to-face and hybrid career and technical education courses. The study was focused on courses offered in

career and technical education programs over a 4-year period at one community college, and included courses and programs offered through more than one delivery method.

Research Questions

The study used a nonexperimental quantitative methodology with a comparative design to address the following questions:

1. Is there a significant difference in the proportion of students earning a final grade of A, B, C, D, or F among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

2. Is there a significant difference in the proportion of students earning a final course grade of W (withdrawing from the course) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

3. Is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

4. For females, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

5. For males, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

6. For traditional age students, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

7. For nontraditional age students, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

Significance of the Study

This research study compared student outcomes such as final grades, withdrawal rates, and transferable course grade completion for differing content delivery methods; it also used courses that are specific to career and technical education programs at the community college level. The findings of this research study may be of benefit to those community college programs and instructional designers who are either converting or designing courses and programs that make use of nontraditional delivery methods, particularly in career and technical education areas of study. The findings provide specific examples of course delivery methods and outcomes in a rural community college setting, which may provide insight into the changes in online and hybrid class pedagogy over time.

Further study of course delivery methods may also assist course designers in the appropriate selection of delivery methods. Online and hybrid courses often make use of digital content, including e-texts, learning objects, open source materials, apps and games, and online assessments, that are not included in the development of traditional face-to-face classroom curricula (Halpin & Collier, 2014). Curriculum designers must take these and other new elements into consideration when choosing the correct delivery method for a selected course, and

the examples of courses reviewed in this study offer some context for specific career and technical education courses that may serve as guides.

The majority of research in online and hybrid course offerings and student outcomes has been completed on coursework and programs outside of the scope of career and technical education and tends to focus on humanities programs such as history and cultural studies and social science programs such as geography, economics, psychology, philosophy, and sociology (Ashby et al., 2011; Driscoll et al., 2012; Jones & Long, 2013; Shukla, Hassani, & Casleton, 2014; Verhoeven & Rudchenko, 2013; Xu & Jaggars, 2013, 2014). The results of the study may not be applicable to other courses of study, particularly those programs that are designed as pathways to further education in four-year institutions.

The results of this study are directly applicable to the college and to the career and technical education programs included in the data process; however, a conscious effort must be made to not view the research as a critique of individual instructors or of groups of instructors. The selection of subject material and data collection was limited to a subset of faculty, many of whom may be identified as the only instructors of on-ground or online courses. Another study may focus on the differences in delivery or evaluation within these courses, but that was not the purpose of this study.

The study may provide impetus for research on a local, regional, or national scale based on the focus of career and technical education. One of the main purposes of career and technical education is to prepare graduates for entry into the workforce, and most career and technical education courses include an experiential component through a mechanism such as laboratory activities, work-based learning, or some means of hands-on work (Clark, Threeton, & Ewing, 2010). While an on-ground course provides opportunity for the student to demonstrate a skill

associated with the content of the course, this opportunity may not be available to a student enrolled in either a hybrid or an online course. Some research has been completed in this area (Karp & Bork, 2012; Xu & Jaggars, 2013), but further investigation will be needed concerning the integration of skills demonstrations into alternative delivery methods.

Definitions of Terms

Asynchronous learning: learning that allows students to participate in the learning process at any time through the use of technology such as message boards or discussion boards (Hrastinski, 2008).

Blended courses: courses that combine elements of face-to-face and online courses; also known as hybrid courses (McGhee & Reis, 2012).

Blended Learning: "the combination of traditional face-to-face and technology-mediated instruction" (Graham, Woodfield, & Harrison, 2013, p. 3). Percentages for each methodology will vary by institution and program.

Career and Technical Education: CTE, defined as coursework in degree programs that prepare students for jobs requiring less than a baccalaureate degree (Fletcher, Lasonen, & Hernandez-Gantes, 2013). For the purpose of this study, career and technical education programs are listed in Appendix 1; programs that are not included in the study based on lack of coursework in traditional, hybrid, and online delivery formats are denoted.

Course completion rate: "the percentage of students who do not withdraw from class and who receive a valid grade" (RP Group, 2011, p. 1), defined as a letter grade of A, B, C, D, F, I, P, or NP. For the purpose of this study course completion was based on the student receiving a grade of A, B, C, D, or F for the course.

Course delivery method: the modality by which course materials, instruction, assessment, and other interactions are presented to students by an instructor (Euzent, Martin, Moskal, & Moskal, 2011).

Digital literacy: "an ability to understand and to use information from a variety of digital sources," including Internet search and navigation, knowledge construction, and assessment (Koltay, 2011, p. 216).

Hybrid courses: courses that combine online and face-to-face instruction; also known as blended courses (Hill, 2012).

Hybrid delivery method: a method of delivering course content that "incorporates characteristics of both the traditional and online classroom settings" (Simon, Jackson, & Maxwell, 2013, p. 109), where "students receive the benefit of face-to-face interaction with faculty and students while being exposed to web-based learning paradigms simultaneously" (Simon et al., 2013, p. 110). For the purpose of this study hybrid delivery will be any class that replaces any part of traditional face-to-face delivery with online delivery.

Learning management system: "computer software and hardware to facilitate learning online"; also known as a virtual learning environment (McHaney, 2011, p. 70).

Learning outcomes: statements of what a student will be able to do upon successful completion of a unit of instruction, that include "active and measurable verbs and are realistic, specific, clearly stated, and student-centered (Brinthaupt et al., 2014, p. 328).

Nontraditional age students: students over the age of 24 who meets one or more of the following criteria: delayed enrollment past the year he or she finished high school; is a part-time student; works full-time; is financially independent; has dependents; is a single parent; or does not have a

high school diploma (Choy, 2002). For the purpose of this study nontraditional students were defined as students age 25 and over.

Online delivery method: a delivery model where all content and interaction are delivered via the Internet without meeting in person (Staker & Horn, 2012).

Online instruction: "any form of learning and/or teaching that takes place via a computer network" (Lim, Morris, & Kupritz, 2006, p. 28).

Persistence: "the ability to complete a[n]… course despite obstacles or adverse circumstances" (Hart, 2012, p. 30)

Program completion rate: "the percentage of individuals who complete a certificate or degree" (Reyna, 2010, p. 7).

Synchronous learning: learning that takes place in real time, either through face-to-face meetings or through technology such as videoconferencing or chat (Hrastinski, 2008).

Traditional delivery method: an instruction method where "participants generally attend training in a centralized location with other learners and interact face-to-face with the trainer" (Klein, Noe, & Wang, 2006, p. 669).

Traditional age students: students between the ages of 18 and 24 who are attending college for the first time and are enrolled full-time (Mann & Henneberry, 2012; Deil-Amen, 2011).

Withdrawal rate: the percentage of students who "paid full tuition for a course but ultimately earned no credit for it… because they… dropped out of the course" (Jaggars et al., 2013b, p. 2). For the purpose of this study the withdrawal rate was based on the number of students who receive a W in place of a grade, based on withdrawal from the course after the drop deadline but prior to the withdrawal deadline for each semester included in the study.

Delimitations and Limitations

For the purpose of this study delimitations were defined by the focus on career and technical education courses, programs, and students. The study is based on data from one 2-year institution and includes programs that lead to Associate of Applied Science degrees; these degrees are designed to prepare students for the workforce, and are not intended to transfer to 4-year institutions. The data also include only those programs that include courses offered in an online or hybrid format; programs that do not offer courses in these delivery formats were not included in the study. Programs of study excluded from the research based on a lack of courses available in the traditional, hybrid, and online formats are denoted in Appendix 1. Programs in the Allied Health, Early Childhood Education, and Public Safety divisions were not included in the study.

The study was limited by the number of students enrolled in each course and in each format. There were not adequate numbers of students in certain programs, courses, or formats to provide data that allow for definitive comparisons. The number of subjects in the study was also limited by gender, age, and/or program of study based on enrollment in the courses. This also affected the applicability of the findings.

Another limitation of this study is that the outcomes may not be applicable to courses or programs that do not offer courses in all three formats. The study was not designed to investigate the impact of different delivery methods on one another.

Overview of Study

Chapter 1 includes a description of the issue that the study addresses and the relevance of the study, along with the statement of the problem, the research questions, the significance of the

study, definition of terms, and delimitations and limitations. Chapter 2 presents a review of literature including topics such as a history of course delivery methods, course delivery method design, the development and maturation of hybrid and online courses, student outcomes, and student demographics. Chapter 3 describes the research methodology used and includes the research design, population, data collection, and data analysis. Chapter 4 provides the data analysis, defines the demographics, and addresses each of the research questions. Chapter 5 summarizes the study and offers conclusions and recommendations for practice and further research.

CHAPTER 2

REVIEW OF THE LITERATURE

Throughout the history of formal education there has always been debate about how to best provide course content to students. As students progressed through the educational system, pedagogy focused on the teacher as the keeper of knowledge and the students as recipients of this knowledge through lecture, drill and practice, and recitation. As early as ancient Greece students were taught in elementary, secondary, and postsecondary institutions that focused on the Trivium of grammar, logic, and rhetoric and the Quadrivium of arithmetic, geometry, music, and cosmology (Martineau, 2011). While content has progressed with time, the pedagogy has remained much the same until the 20th century, when technological advances impacted both the design and delivery of courses.

Career and Technical Education

Career and technical education, or CTE, in 2-year college degree programs is most often defined as educational programs that "prepare students for work that required a pre-baccalaureate education" (Fletcher et al., 2013, p. 1). Career and technical education programs are focused on either 2-year degrees or on short-term certificates; these certificates are suited to incumbent workers, while they hold less value for first-generation students who do not hold a degree or to nontraditional students who wish to train in a new career area (Moore, Jez, Chisholm, & Shulock, 2012).

Career and technical education programs are more likely to include experiential learning as a major component of the education process. Programs in this area combine basic skills in

thinking and problem-solving with workplace skills that are specific to an occupational focus

(Clark et al., 2010). Because these programs are designed to meet workplace needs, it is

important that career and technical education instructors and programs "be aware of the current

trends in business and industry as well as future trends" (Viviano, 2012, p. 54).

History of Career and Technical Education

Career and technical education is a recent development in the larger landscape of higher

education in America. Prior to the Industrial Revolution in the mid-1800s, training for careers

focused on apprenticeships as "the basic method of obtaining occupational competence"

(Gordon, 2014, p. 6). Apprenticeships functioned to meet the needs of training a workforce that

required learned skills; this was accomplished when "a master provide[d] direct instruction of

mastering a skill to a student, or apprentice" (Brewer, 2010, p. 2). This model of instruction was

based on the European model of manual training, particularly the apprenticeship programs found

in Germany. Through the middle of the 1800s, trade guilds held power in Germany. By

combining manual learning with "elementary learning (that) was both free and compulsory"

(Gordon, 2014, p. 2), Germany implemented a vocational training model that worked for the

time and location.

However, needs in vocational training in the late 18th century would be drastically

changed by the Industrial Revolution. In the early 19th century, "schools began to include

'practical arts' in addition to the traditional education curriculum" (Brewer, 2010, p. 6). The shift

to an industrial base for many occupations led to the rise of private trade schools and business

schools as well; these private schools provided vocational preparation and in some cases added

general education to the curriculum (Gordon, 2014). In the middle of the 19th century the federal

government began to enact legislation that would set the direction for vocational education in America.

In 1862 Congress passed the Morrill Act that defined the process for creating land grant colleges. The Morrill Act "apportioned to each state endowments of land to be sold and used for the 'support, and maintenance of at least one college' that – without excluding classical studies – would focus mainly on agricultural and mechanical arts, as well as military studies" (Benson & Boyd, 2015, p. 73). These land-grant colleges would become many of the larger universities in existence today. Kansas State University is the first institution established under the land-grant movement in 1863 (Gordon, 2014, p. 59). Cornell University was established in 1865 and admitted students in 1867; Andrew D. White, the university's first president, outlined "fully developed programs of a vocational nature" at Cornell, and formalized occupational training in "agriculture, mechanic arts, civil engineering, commerce and trade, mining, medicine and surgery, law, education, and… public service" (Rudolph, 1977, p. 118). These programs of study at Cornell expanded on the land-grant focus on agricultural and mechanical areas to include other vocational program areas. The Morrill Act was followed by the Hatch Act in 1887 that "provided funding for states to develop agricultural experiment stations (Brewer, 2010, p. 6). Other public school systems in the latter part of the 19th century and the beginning of the 20th century added manual training to their curricula, which was later relabeled vocational education (Gordon, 2014).

With the beginning of the 20th century came new interest in and support for vocational education. The Smith-Hughes Act, signed in 1917, was designed "to promote vocational education; to cooperate with the states in promotion of such education in agriculture, trades, and industries and in the preparation of teachers of vocational subjects; and to appropriate money and

regulate its expenditure" (Gordon, 2014, p. 103). At this time Charles Prosser, referred to as the father of U.S. vocational education, published 16 theories of vocational education that "provided a comprehensive foundation for vocational education" (Wonacott, 2003, p. 9). This was followed by a series of legislative acts cosponsored by Walter F. George between 1929 to 1956 that authorized funding in vocational education; the George-Baden Act of 1946 particularly focused on vocational training for returning veterans, an adult population that needed "to acquire employable skills in a rapidly expanding economy" (Gordon, 2014, p. 108). These acts were followed by the Manpower Development and Training Act of 1962, the Vocational Education Act of 1963, the Economic Opportunity Act of 1964, and the Vocational Education Amendments of 1968, all addressing vocational training, work-study programs, and workforce needs (Brewer, 2010, p. 11-13). The most significant legislation since that time is the Carl D. Perkins Vocational Education and Applied Technology Act of 1984. Now commonly referred to as Perkins IV, it was last renewed in 2006 and is currently under review by the federal government (Stipanovic, Lewis, & Stringfield, 2012). Current Perkins IV funding supports both secondary and postsecondary career and technical education efforts; at the postsecondary level it is focused on programs of study, which are defined as "coherent educational and career pathways" (Stipanovic et al., 2012, p. 80).

At the postsecondary level there are now many options for students to enter and complete career and technical programs. These providers may include "vocational schools; technical colleges; community colleges and private two-year colleges; public and private four-year universities; employers, labor organizations, and industry groups through preapprenticeships, apprenticeships, and other training programs; regional training centers…; adult workforce education centers…; and detention centers and correctional facilities" (Dortch, 2014, p. 10).

These providers also provide transition opportunities within and between themselves. Two-year colleges, which began as junior colleges with Joliet Junior College in Chicago in 1901, underwent a gradual "vocationalization" process that Leonard Koos defined as semiprofessions: higher than trades, for which secondary school prepared graduates, yet below professions, which required 4 years of postsecondary work (Brint & Karabel, 1989). These semiprofessions became the vocational programs that are today known as career and technical programs. As of 2006 the community colleges, technical colleges, and vocational schools noted by Dortch (2014) as public 2-year institutions, awarded over 58% of the total career and technical education credentials of all credentials awarded by less-than-4 year postsecondary institutions (Clery, 2008).

Career and Technical Education and Student Retention

Most research on the impact of career and technical education programs of study has been conducted at the secondary level. However, the research that has been conducted on postsecondary CTE programs provide similar data on factors such as withdrawal rates, course completion rates, and program completion rates. Neild and Byrnes (2014) reported that students in secondary CTE programs in Philadelphia, Pennsylvania, had postsecondary completion rates "between 18 percent and 28 percent" (p. 40) for a combination of 2-year and 4-year institution enrollments over the period from 2003 through 2005. This compares to an overall graduation rate of 43.2% for 2-year and 4-year institutions in 2005 regardless of program or background (Knapp, Kelly-Reid, & Ginder, 2010).

A study of career and technical programs at four community colleges found that student retention from Fall 2009 to Winter 2010 averaged 76.9% (Bremer et al., 2011). Jenkins and Cho (2014) found that one-third of the students entering a community college program of study in

one state in the 2005-2006 academic year enrolled in career-technical programs. Of these students, "over one-third earned a certificate or associate degree, but only about 5% transferred to a four-year institution without a two-year credential, and only 2% earned a bachelor's degree from an outside institution" (p. 7). Of a total of 20,220 students enrolled in career-technical programs, 54% were female, and 31% required at least one developmental course (Jenkins & Cho, 2014). A study of California community colleges found that of 142 career-technical programs across the state, over one-half of the completers came from only eight programs of study (Moore et al., 2012). In the California study nursing alone produced 13% of the total career-technical program completers in the state from 2007 through 2010 (Moore et al., 2012).

Nontraditional students are a significant portion of the current undergraduate student body. Ross-Gordon (2011) found that 38% of the undergraduate population in 2007 was 25 years old or older. However, no research was found that directly evaluates the relationships between age, gender, career and technical programs of study, and course delivery methods.

History of Course Delivery Methods

Traditional methods of course delivery, also known as face-to-face instruction, have a long history in Western civilization. With roots in ancient Greece, traditional instructional methods have a foundation in perennialism, which seeks "permanence, order, certainty, rationality, and logic" (Webb, Metha, & Jordan, 2003, p. 88). Adler (1983), as a proponent of perennialism, posited that there are three modes of teaching that should be the basis for traditional methods of instruction: "(1) the didactic, which is teaching by telling or lecturing, aided by textbooks, manuals, recitations, demonstrations, quizzes, and examinations; (2) coaching, which is teaching by supervising performances to attain skills…; (3) Socratic or

'maieutic' teaching, which is teaching by asking or questioning" (p. 17). This is the foundation for most lecture courses offered at the postsecondary level today.

Online learning has its foundations in distance education and relies on technology for educational transactions. In the 19th century correspondence courses were offered as a means to provide education outside of the traditional classroom model; these courses serves as "the original distance education" (Maeroff, 2003). These courses began at the University of Chicago where President William Harper started "learning by correspondence" courses in 1892 that allowed "students to complete a maximum of 30% of coursework through mail" (Gaytan, 2007, p. 2). In the middle of the 20th century television and radio became the most common methods of distance education; these were replaced by videotapes in the last 2 decades of the 20th century (Valentine, 2002). From the 1970s through approximately 1990 educational use of technology evolved from computer-assisted learning to the use of computer multimedia for training purposes (Keengwe & Kidd, 2010). This use of technology was limited to content that was built into the media and was only updated through a new release of media such as new software on floppy disks.

The rise of networking, local area networks, personal computers, and protocols such as TCP/IP that allowed computers and users to communicate through these networks led to the appearance of web-based education and training by the early 1990s (Leiner et al., 2012). The first postsecondary online course that made use of the World Wide Web was in place by 1994; however, these "online" courses were far different from those offered by today's institutions of higher learning in terms of content, interaction, depth, and quality (Hill, 2012). From 1995 to the present, online learning developed into what is now known as eLearning, combining multimedia

with Internet connectivity through learning management systems to deliver courses in an online environment (Keengwe & Kidd, 2010).

Within a decade of the first online courses, the University of Maryland University College (UMUC) transitioned from single online courses to complete online degree programs serving both full-time and part-time students (Maeroff, 2003). This shift correlated with the changes in Internet technology taking place at the same time, with the increased use of pervasive networking, personal computers, e-mail, and audio and video technology (Leiner et al., 2012). As technology changes came to education enrollment in online courses increased rapidly as well. In the Fall 2002 semester, the first semester for which data are available, there were approximately 1.6 million students who were taking at least one online course (Allen & Seaman, 2013). This was less than 10% of overall enrollment for that semester; according to the same study, by the Fall 2011 semester 32% of students were taking at least one online course. Christensen, Horn, Caldera, and Soares (2011) note that based on data from North Carolina community colleges, the state can expect that whereas only 2.4% of courses were offered in an online mode in 1999, 90% of courses in the system will be delivered online by 2018.

Blended or hybrid learning is a combination of the traditional methods of instruction with online components. Thorne (2003) suggests that blended learning "is the most logical and natural evolution of our learning agenda" (p. 2). It integrates technology into the traditional learning process but does not have a set way of combining the two methods. Moskal, Dziuban, and Hartman (2012) found that there are multiple ways to combine traditional and online components of classes, and that "there is no singular best model" (p. 16). Blended learning became more prominent in research and implementation beginning in the early 2000s and is seen as "a shift from lecture-centered to student-centered instruction where students become active and

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interactive learners" (Poon, 2013, p. 274). Garrison and Vaughan (2012) stated that in blended learning, "the face-to-face and online means of communication are fused in a way that capitalizes on the strengths of each" (p. 24) but that further restrictions on what defines blended learning are not defined. Ocak (2011) reviews many possible definitions and chose to focus on the faculty's "ability to integrate web-based and class-based activities in a planned and organized way in which some portion of in-class activities is replaced by online activities" (p. 690). This definition allows for the use of any web-based activity, from e-mail to synchronous meetings as determined appropriate for the situation.

Blended learning is now commonly used in higher education. Current estimates note that "'blended' or 'hybrid' course offerings are estimated to be used by 79% of public institutions of higher education in the U.S." (McGee & Reis, 2012, p. 7). At the undergraduate level, fewer courses are offered in a blended mode of delivery (45.9%) than either face-to-face (88.5%) or online (55.3%) modes of delivery (Allen, Seaman, & Garrett, 2007).

Classification of Course Delivery Methods

New technologies and methodologies have impacted educational processes and changed pedagogy in the process. This also leads to differences in the classification of courses. Allen and Seaman (2013) define traditional courses as having no online content; web-facilitated courses as containing 1% to 29% online content; blended or hybrid courses as having 30% to 79% online content; and online courses as 80% or more online. A comparative study at Columbus State University involved face-to-face or traditional courses with no online content at all, hybrid courses as 67% face-to-face and 33% online, and online courses as completely online (Shukla et al., 2014). A closely related definition is found in a study by Kelly and Rebman, Jr. (2014),

where traditional courses contained either no online technology or 1% to 29% of content through a learning management system, hybrid courses were 30% to 79% online, and online courses were 80% or more online. Jaggars et al. (2013b) at Columbia University define an online course as "a course held entirely online, as opposed to a 'hybrid' course which consists of both online and face-to-face instruction" (p. 1), with no percentages noted.

Regardless of the classification system used, today's students expect that institutions will make use of technology, and that the credits for each course will transfer seamlessly into a unified program of study. As delivery method definitions vary from system to system and from institution to institution, classification for comparison purposes must be done on a case-by-case basis.

Blended Learning

Blended learning is defined as a combination of traditional and online learning. While percentages may vary by institution and program, the vagueness of defined percentages is intentional (Staker & Horn, 2012). The intent is to determine a connection between the traditional and the online formats, and to allow variations in the pace of learning. These courses initially began as traditional courses that used online components to supplement the traditional classroom and now include courses that may be only partially or almost completely online (McHaney, 2011). Blended learning classes will vary the amount of material and work between the two formats based on factors such as the learner, the instructor, the goals and objectives of the course, the materials, and the desired outcomes (Poon, 2013). Course designers consider blended learning to be an opportunity to combine the best components of traditional courses with the best components of online learning in an attempt to create a high-quality course with

flexibility in delivery and evaluation (Vaughan, 2010). Verhoeven and Rudchenko noted that blended learning offered better accommodation of student time, improved use of classroom space, and provided opportunities for face-to-face interaction with faculty and other students (2013). While there has been much research indicating positive reactions and positive outcomes from a blended learning approach, students and faculty tend to have different opinions on the implementation of blended learning approaches.

Studies conducted on student satisfaction ratings indicate that students for the most part find blended learning to be as effective as traditional course delivery methods in relation to effectiveness components such as completion, graduation, grades, and withdrawals (Nowell, 2011). Faculty have a different view of blended learning and have seen it as complex, requiring more planning, lacking communication, and taking more time to complete (Ocak, 2011). Whereas students focus on the outcomes of blended courses, the faculty's negative perceptions are based on design and implementation factors. Research on faculty opinions of blended learning focus on factors other than student outcomes to determine faculty acceptance of blended learning approaches to instruction.

Online Learning

Online courses, or web-based courses, are by most definitions presented in a completely online format. All content, discussion, and assessment is completed online, most often through the use of a learning management system (LMS) such as WebCT or Blackboard. Online learning was used by over 6.7 million students in the United States in 2012 and reached 32% of the total student population in higher education during that same year (Allen & Seaman, 2013). Online courses are also seen as "more affordable, more focused on the needs of the student" and "better

able to make a value-added contribution to their students' pursuit of purposeful careers" (Zemsky, 2013, p. 96).

As online learning involves the use of technology as the communication medium, it requires a new way of approaching the process of teaching from both the instructor's and the student's point of view. As an element of distance learning online learning follows the legacy of correspondence courses, television, and videostreaming in making use of currently available technology to deliver content to students in a remote location (Means, Toyama, Murphy, Bakia, & Jones, 2010). While the term "currently available technology" lacks definition, it is one component that most research has agreed upon as a unifying concept for online learning (Moore, Dickson-Deane, & Galyen, 2010). Online learning is defined by the Sloan Consortium as work in which at least 80% of the content is online and typically lacks face-to-face meetings (Cejda, 2010).

Online learning has gained legitimacy through the support of those smaller institutions that have used it to reach out to students who do not come to a traditional campus as well as through the support of presidents at MIT, Harvard, and Stanford (Hill, 2012). Within the community college setting online education has seen much higher enrollment increases than the growth in the overall student population (Xu & Jaggars, 2011). A meta-analysis of 50 studies showed a small increase in student performance using an online course format as opposed to a traditional course format and better outcomes using a combination of online and traditional course elements (Means et al., 2010).

Online courses also impact faculty and student perceptions and interactions as well. Instructor-student interaction is direct and immediate in a traditional classroom and may be evaluated and reinforced in real time. The online medium is mainly an asynchronous mode, and

so there is not a real-time component to the interaction. Studies have shown that the student-to-student interactive component of an online course is important to push students to move beyond simple memorization strategies (Nandi, Hamilton, & Harland, 2012). A lack of interaction, or of understanding of the importance of this interaction, on the part of either the faculty or the student may result in failure to communicate or to complete the requirements of the online course. Other factors associated with student perceptions have been found to remain the same regardless of delivery method. Butz, Stupnisky, Peterson, and Majerus (2014) compared hybrid courses in a graduate business program in which 60% of the students attended online and 40% of the students attended on campus and found "few significant differences between online and on-campus students in terms of need satisfaction, motivation, and perceived success" (p. 220).

The perception that online courses will make education available to low-income students or students who have dropped out of college previously has not been supported by research. Surveys of low-income students have shown that a lack of high-speed Internet connection at home may have a negative impact on enrollment in online courses, while studies of college dropouts indicate that cost, financial aid, and family issues have a greater impact than the availability of online courses (Jaggars & Bailey, 2010). Similar issues were found in an earlier study by Aragon and Johnson (2008); students noted personal issues, technology issues, and advisement as important factors in their failure to complete online courses.

Issues arise from the faculty side of online education as well. Online courses have been accepted by faculty as a common part of faculty workload; the faculty have become more concerned with the technology component of the online course design and look for technologies that will work, can be learned quickly, and are manageable (Carlson et al., 2012). Faculty also focus on evaluation and look for methods that provide effective measurement of student learning.

A majority of the online courses in recent studies included the use of online discussion, quizzes and tests, and written assignments (Kearns, 2012). The grading of online discussions is in opposition to the traditional classroom situation, where participation may be a minor component of the overall class grade if it is included in grading at all. The online course shifts the responsibility for learning from the instructor to the student and becomes more focused on student centered learning (Revere & Kovach, 2011).

Online Course Design and Instruction

Many models have been proposed for the best way to design courses to obtain specific learning outcomes. Most of these models have focused solely on the traditional classroom format and have made extensive use of face-to-face interaction between instructor and student. Removing this element through the use of technology requires course designers and faculty members to rethink how a course is presented, its content and flow, and how assessment occurs.

In the initial shift from traditional classroom instruction to online instruction a primary focus is on moving from a content-based approach to a student-focused approach. The online classroom makes much greater use of tasks, discussion, and reflection and requires greater reading and writing skills than a traditional classroom (Soto, 2013). A student focus in the online classroom also involves teaching higher-order cognitive skills rather than simply providing students with content and then testing retention (Boling, Hough, Krinsky, Saleem, & Stevens, 2012).

Another aspect of online learning that has not been used in the traditional classroom is the inclusion of social media. The use of blogs, discussion boards, wikis, and chats in online courses is focused on ways to introduce new methods of communication to what is essentially a

static process that does not invite conversation (Shin & Lee, 2009). The social aspect of online courses, which is seen as a strength in traditional classrooms, is seen as a weakness in online courses, and this weakness may negatively impact student interest, motivation, and completion (Kim, Kwon, & Cho, 2011).

The social aspect points to communication as one of the driving forces behind student success in online learning. The instructor is tasked with creating relationships, assessing student work, delivering content, and communicating with students in ways that are markedly different from traditional courses; the use of technology requires changes that lack the depth of research that traditional course pedagogy has (Young & Duncan, 2014).

Despite the use of asynchronous communication, students also expect immediate feedback in online classes. This is contrary to the anytime component of online courses, which allows students and faculty to interact in a time-independent fashion. One of the most important factors for students in selecting online courses is the ability to attend class at any time and to communicate through postings rather than through conversation (Hrastinski, 2008). However, students expect feedback in the online classroom to be immediate, and it directly impacts student course satisfaction (Ladyshewsky, 2013).

Student Demographics

A focus of recent research has been the defining characteristics of online students. Determining the impact of traits such as age, socioeconomic status (SES), subject area, gender, or other factors on whether a student will be more likely to enroll in online courses and whether that student will also be successful in the online format is the goal of much of this research.

Age

College students are typically placed into one of two large age groups: traditional age students or nontraditional age students. Traditional age college students are between the ages of 18 and 24, and most enter college before the age of 21 (Adelman, 2005). Studies note that the average age of online students fall within this age range (Amro, Mundy, & Kupczynski, 2015; Jenkins & Cho, 2012; Platt, Raile, & Yu, 2014; Wolff et al., 2014), and Crosta (2013) found that students who were most likely to complete community college programs of study averaged 22 years old at enrollment. Other studies provide a range of ages, often focusing on the age group defined as traditional postsecondary students (Driscoll et al., 2012; Helsper & Eynon, 2010). Other characteristics attributed to traditional age college students include "one who earns a high school diploma, enrolls full time immediately after finishing high school, depends on parents for financial support, and either does not work during the school year or works part time" (Choy, 2002, p. 1). This research contrasts with findings for nontraditional age students. Chung, Turnbull, and Chur-Hansen (2014) reviewed 45 studies and found that the most common factor used to define nontraditional age students was an age over 24. Definitions of nontraditional age students also include "being independent for financial aid purposes, having one or more dependents, being a single caregiver, not having a traditional high school diploma, delaying postsecondary enrollment, attending school part time, and being employed full time" (Radford, Cominole, & Skomsvold, 2015, p. 1).

Fetzner (2013) found that online students who were older than 25 and classified as nontraditional age students performed better in online classes than those students who met the traditional age student definition. Wright (2013) also found that "younger students are significantly correlated with lower online course grades" (p. 67). Platt et al. (2014) noted that "older participants saw online courses as being less equivalent to face-to-face courses in general,

and more challenging" (p. 497), while Taylor et al. (2011) found that 67% of students younger than 30 and 58% of students older than 30 said that online classes were of lesser value than the same class taken in person. Wolff et al. (2014) determined that online students met several criteria for nontraditional age students, including "significantly older and more likely to ne employed" and "more likely to describe themselves as the primary caregiver to a dependent child or adult" (p. 171). Kelly and Rebman, Jr. (2014) noted online student demographics in line with other findings: "students are generally older, have a dependent and/or spouse, or have full-time employment" (p. 50). While Ashby et al. (2011) found that there was no significant difference in the number of passing grades achieved by students in comparable face-to-face, blended, and online classes, there was a significantly higher number of older students enrolled in the online courses studied. These studies indicate that online students tend to be older students who fulfill at least some of the characteristics of nontraditional age students.

Gender

For the purposes of this study gender was defined as either male or female. Gender enrollment in online courses mirrors gender enrollment in postsecondary institutions to a degree. In 2013, there were approximately 9.8 million females and 7.7 million males enrolled in degree-granting postsecondary institutions (Kena et al., 2015). Of these enrolled students women have a greater chance of completing a postsecondary degree than men do regardless of the age at which either gender enters postsecondary education (DiPrete & Buchmann, 2014). Wolff et al. (2014) found that female students enrolled at a greater rate than male students in an online biology course at the community college level, while other studies show that females tend to have higher enrollment than males in online courses (Amro et al., 2015; Shea & Bidjerano, 2014; Wladis,

Conway, & Hachey, 2015; Xu & Jaggars, 2013). Females have also been found to have higher

grades and to outperform males in an online environment (Aragon & Johnson, 2008; Gibson,

2008; Wladis, Hachey, & Conway, 2015). Yang, Cho, and Watson (2015) found that "female

students felt a stronger sense of classroom community in online courses than male students" (p.

10); this reinforces earlier work by Anderson and Haddad (2005) that found "in online courses

with required participation in discussion, female students appear less hesitant to engage in

dialogue" (p. 4). Peslak, Kovacs, Davis, and Scarpino (2014) found that gender did not affect the

perceived effectiveness of either face-to-face or online courses; however, they did note that

"female students see hybrid as more effective" (p. 6) than the on-ground or online methods of

course delivery.

Student Learning Outcomes

One of the major components of every course, regardless of mode of delivery, subject

area, or institution, is that each has a set of learning outcomes that define what a student should

be able to do upon successful completion of the course. Moriba and Edwards (2013) refer to

these learning outcomes as "the knowledge, skills, and attitudes a student acquires and can

demonstrate after completing learning experiences in a given course or in other learning venues"

(p. 234). A much simpler definition, that of final scores for courses, has been proffered by other

studies as an appropriate definition, with little explanation as to the scope of the term

(Carmichael, Carmichael, & Leber-Gottberg, 2014; Lee, Srinivasan, Trail, Lewis, & Lopez,

2011; Smith, Lange, & Huston, 2012).

Learning outcomes define what the student will be able to do when they complete a

course and "include active and measurable verbs and are realistic, specific, clearly stated, and

student-centered" (Brinthaupt et al., 2014, p. 328). Key to this definition is measurability; this requires a direct relationship between the student learning outcome and the means for measurement, such as quizzes, exams, homework, or other means of assessment and should be defined during the course design process.

Course Outcomes

Unlike learning outcomes, which are defined as what students will learn in a class, course outcomes are the grades or the completion status that a student obtains at the end of the course. Grades will follow the A-F format of most colleges, while the student may withdraw and fail to complete the course. Students will most often express feelings related to the outcomes in course or instructor ratings, but many studies will conduct student surveys to collect this information rather than using qualitative study methods. These surveys often note that discussions were good, reading was interesting, participation was encouraged, interactions were helpful, and the instructor responded appropriately (Paechter, Maier, & Macher, 2010; Ting & Gonzalez, 2013; Yao, 2012).

Jaggars et al. (2013b) found that in two state systems failure and withdrawal rates for students enrolled in online courses averaged 11% higher than the same rates for students enrolled in face-to-face courses. Xu and Jaggars (2013) , however, found that "taking a particular course in an online rather than face-to-face format would decrease his or her likelihood of course persistence by 7 percentage points…, and if the student persisted to the end of the course, would lower his or her final grade by more than 0.3 points" (p. 55). Harmon, Alpert, and Lambrinos (2014) found that "the advantages of online learning at least offset its disadvantages" (p. 119) and so concluded that further study was needed.

As online and blended course implementations increase, methods to improve course outcomes are vital to improving student completion rates. Jaggars, Edgecombe, and Stacey (2013a) note that the use of Adobe Connect for lectures, homework using software tutorials and ungraded textbook problems, discussion boards, live chat sessions, and lab assignments improved student performance and persistence in an online chemistry course. Lim et al. (2006) found that "group and individual projects, discussion activities, and class assignments were noted as the most effective learning activities for the learners' learning as a whole" (p. 35) in a study comparing online, blended, and traditional course offerings. A focus on interaction and discussion is common to all course delivery modes and is noted as strengthening the learning process regardless of delivery method.

Digital Curriculum

Formal education has followed a narrow path for transmission of information and communication. The process moved from oral to written in the 1400s and is now on the verge of moving from written to digital. The written textbook is being replaced with e-texts, learning objects, programs, apps, and games (Halprin & Collier, 2014). Technology has shifted the creation, dissemination, and assessment of learning from traditional classrooms to the Internet. However, the processes for design, development, implementation, and evaluation of student learning differ between the traditional face-to-face instructional method and the online method.

Online courses are inherently different from face-to-face courses in terms of communication, design, operation, and evaluation. These differences mean that course developers must understand the shift to a digital curriculum and must design courses in a way that takes advantage of the opportunities afforded by the digital medium. Behnke and Greenan

(2011) note that "when designed and applied appropriately, [computer-based delivery] offers a consistent, asynchronous, adaptive, flexible, and economic form of delivery" (p. 66-65). The media used in online course design include "multimedia, educational programming, simulations, games, and the use of new media on fixed and mobile platforms" (Keengwe & Kidd, 2010). While these media are not restricted solely to the online format, they are only now being used in traditional curriculum design.

The medium impacts the delivery of content in a course. Puzziferro and Shelton (2014) recommend that quality online courses should be "well-organized into learning units; have clear learning goals and objectives; include materials and activities that directly support the learning goals and objectives; engage the learner through interaction with content, other students, and the instructor; and offer rich and relevant resources for students" (p. 122). At the same time, designers of digital curriculum must integrate "multimedia tools, animation and graphic design software, game engine, virtual reality, scene and digital studios" (Huang, Hsiao, Chang, & Hu, 2012, p. 94) into the process within a larger learning management system that dictates the look and feel of the course. At the same time, course designers must take into account the digital skills of both the faculty teaching the course and the students taking part in the course; factors such as text materials, handouts, subject-specific symbols and content, and evaluation methods impact the experiences of all participants in the digital classroom (Lewis, Lee, Noble, & Garrett, 2013). The process of teacher-student communication must change to a digital format as well; blended and online classes make use of "email, threaded discussion, and other electronic venues, in a more consistent and frequent manner" (Vitulli, Martin, Byrd, Kinniburgh, & Dodge, 2013). Preston et al. (2014) found that the use of Twitter as a means of social media communication

within a course increased the students' comfort level with technology and "launch[ed] the student's digital identity" (p. 10).

Future Directions

Traditional face-to-face delivery of content has always had limitations that exclude certain populations from obtaining training. These include but are not limited to the fixed time required for attendance, the inflexibility of content to meet student needs, and the lack of student control of pace (Ghosh, Nath, Agarwal, & Nath, 2012, p. 56). Online courses offered in an asynchronous format answer each of these challenges, but questions have arisen as to the quality of online instruction.

Online courses allow the curriculum to adapt more quickly than traditional courses. Whereas traditional textbooks provide static learning material that is only updated by new printed versions of the text, online material can adapt to changes in both the environment and the student (Rose & Gravel, 2012). Tools available in blended learning classrooms include virtual laboratories, flipped classrooms, and massive open online courses (Johnson et al., 2016). Future changes in technology hardware and software offer new tools and opportunities that have not been available in the past.

Social networking through sites such as Facebook, Twitter, and LinkedIn has become a very popular method of communication for all demographics. However, the use of these sites has been very limited in an educational setting. A study reviewing the possible use of Facebook for classwork indicated that neither students nor faculty greatly approved of its use for this purpose (Roblyer, McDaniel, Webb, Herman, & Witty, 2010, p. 138). While there are limited

applications for communication, Facebook is not seen as an appropriate delivery vehicle for content.

Other technology-enabled possibilities will be created in the near future as newer technologies extend the reach and scope of online activities. Virtual reality, the Internet of things, and mobile tools will add options to the current technology field that will require further research.

CHAPTER 3

RESEARCH METHODOLOGY

This quantitative study compares outcomes of specific community college career and technical education courses as they relate to one of three content delivery methods: traditional on-ground delivery, hybrid delivery, and online delivery. This chapter describes the methodology used to gather and analyze the data as they relate to the research questions in the study.

The study is quantitative in design and uses a nonexperimental quantitative methodology with a comparative design. The data for the study were based on 4 years of student outcomes (2011-2015) at a rural community college in Tennessee. The college serves approximately 6,000 students across a 10-county service area. Quantitative data were available based on courses offered over the time from 2011 to 2015, as student, course, and program outcomes "can be measured across a scale, their numeric values have meaning, and they can be subjected to arithmetic operations" (Belli, 2008, p. 61). The research was nonexperimental in that it examined existing data and relationships between this data without manipulation of the existing variables (Ary, Jacobs, Sorensen, & Walker, 2013). The researcher collected data for student grades for selected classes from the college for the academic terms from Fall 2011 through Fall 2015. In the Fall 2011 semester, the college began a mobile technology initiative that was designed to incorporate mobile devices into a larger eLearning approach to all classes. This initiative provided a time in which online components were incorporated into all classes and offers an appropriate beginning point for this study. These data include course, delivery method, student gender, student age, student program of study, and student final grade. The data did not contain any personally identifiable information, so student confidentiality was maintained.

Research Questions and Null Hypotheses

The following research questions and corresponding null hypotheses were used to guide this study:

Research Question 1: Is there a significant difference in the proportion of students earning a final grade of A, B, C, D, or F among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

> $H_0 1$: There is no significant difference in the proportion of students earning a final grade of A, B, C, D, or F among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

Research Question 2: Is there a significant difference in the proportion of students earning a final course grade of W (withdrawing from the course) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

> $H_0 2$: There is no significant difference in the proportion of students earning a final course grade of W (withdrawing from the course) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

Research Question 3: Is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

> $H_0 3$: There is no significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

Research Question 4: For females, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

> H_04: For females, there is no significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

Research Question 5: For males, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

> H_05: For males, there is no significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

Research Question 6: For traditional age students, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

> H_06_1: For traditional age students, there is no significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

Research Question 7: For nontraditional age students, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

$H_0 7$: For nontraditional age students, there is no significant difference in the proportion of

students earning a transferable final course grade (A, B, or C) among the three

delivery methods (traditional, hybrid, or online) for career and technical education

courses.

Instrumentation

All students who enroll in courses at the college receive a reported outcome, either

through a final course grade, an incomplete grade, or a withdrawal. Course completion rates are

based on the number of students who receive a letter grade other than W (withdrawal) or F

(failure). Program completion is determined by the awarding of an appropriate degree or

certificate upon the completion of all requirements as outlined for each program. All data were

collected from the college's database and the data were finalized and approved by the college.

The college database is a student information system produced by Ellucian and used by

all colleges in the Tennessee Board of Regents system. Banner provides a means to "collect,

store, manage, and apply real-time operational data" for students across registration, enrollment,

advising, financial aid, and record keeping areas for the college, and is the main repository for

student grades and transcripts as well (Ellucian, 2016, p. 8). Collection of data from Banner uses

database commands to provide reports based on specified data components, and can be

configured to provide information based on set parameters.

Population

The population for this study includes all students enrolled in a career and technical

education course that was offered in more than one delivery method format during the 2011-

2015 academic years at the community college under study. These courses were defined as being specific to Associate of Applied Science degrees and the programs included are listed in Appendix 1. A review of courses from the Fall 2011 semester to the Fall 2015 semester indicated a course enrollment range from 1 student to 49 students and program enrollment ranges each semester between 3 and 50 students. The study included approximately 762 traditional course sections, 73 hybrid course sections, and 272 online course sections with a total student population of 20,045 reported individual student outcomes (e.g. grades).

Data Collection

Data collection was carried out through a request to the Office of Planning, Research, and Assessment at the community college under study. This request was for reports for courses by delivery method within career and technical education programs, grades for students for each course with age, gender, course, and program completion data. Because this information is confidential, any information that may identify students was removed from all reports by the Office of Planning, Research, and Assessment prior to data collection. The Office of Student Records is responsible for maintaining all data related to student enrollment, grades, and program completion at the community college in this study.

Data for this study were collected from Banner, which has been in use by the college since the Spring 2009 semester and houses all institutional data related to student enrollment, student grades, degree advising, financial aid, and academic administration. The appropriate data were extracted from the Banner system by the college's Office of Planning, Research, and Assessment, and provided in an Excel file for analysis through IBM SPSS software. All

identifying data for individual students were removed from the Excel file prior to its receipt by the researcher.

Validity of these outcomes is based on the interpretation of final grades and the awarding of degrees and certificates as indicators of student attainment; the college has historically followed a standard translation of number grades into an appropriate grade point average as a means of determining success in meeting student learning outcomes. Reliability was established through the consistency of the grade process across the institution and over time and the publication of all data to students each semester.

Data Analysis

Version 23 of IBM SPSS Statistics software was used to analyze the statistical data in this study. Data for each course section offered over the 13 semesters included in this study were organized into appropriate data files. Comparisons of final grades, withdrawal rates, transferable final course grades, transferable final course grades by gender, and transferable course grades by traditional or nontraditional student classification were completed via a series of chi square tests. All data were analyzed at the .05 level of significance.

CHAPTER 4

FINDINGS

In recent years, online learning has become a rallying cry for many people who seek alternative methods to increase access and lower costs in higher education. Christensen and Eyring (2011) saw online learning as a disruptive technology that allows "for-profit and traditional not-for-profit institutions to rethink the entire traditional higher education model" (p. 18). Online learning, when used in combination with traditional face-to-face classrooms and with hybrid models that combine elements of both online and traditional classes, offers alternative delivery methods that provide flexibility in time and location for students who are faced with increased demands of work and home life. Many students now expect "delivery methods that make sense in the context of a global, interconnected, technologically enabled world" (McHaney, 2011, p. 156). However, research has shown mixed results in student outcomes when traditional, hybrid, and online course outcomes have been compared (Jaggars et al., 2013b). Corter et al. (2011) have shown that hands-on lab activities directly relate to higher mean course scores than do remote labs or simulations. As laboratory activities are often a major component in career and technical education courses, these findings should be taken into account when choosing a course delivery method for career and technical education courses.

The purpose of this study was to determine if there are significant differences in student success in traditional, hybrid, and online courses in selected career and technical education programs as measured by final course grades, by transferable grade completion, and by withdrawal rates; the relationship between gender, transferable course grades, and course delivery method; and the relationship between age and transferable course grades. These

outcomes were analyzed to determine if there were significant differences in student outcomes for these three delivery methods in career and technical education courses that made use of at least two of these delivery methods for courses. The researcher also examined relationships between the following factors and the delivery method: (a) withdrawals (student withdraws from the course before a final grade is assigned); (b) transferable grades (grade of A, B, or C); (c) gender; and (d) age.

The researcher in the present study evaluated the outcomes of each content delivery method based on the final student grades that were achieved in the classes included in the study over a period from August 2011 through December 2015. Academic performance often uses final course grades as an indicator of student success (Colorado & Eberle, 2010; Romero, Lopez, Luna, & Ventura, 2013; Suskie, 2009). The final course grades available for students in the present study were A, B, C, D, F, or W and were assigned by instructors at the college.

The present study was based on secondary data analysis of quantitative data extracted from the Banner student information system by the Office of Planning, Research, and Assessment at a public 2-year community college in East Tennessee. The student population in the study was drawn from students enrolled in traditional, hybrid, and online sections of career and technical education programs at the college each semester. The programs of study included in this study were accounting, agriculture business, culinary arts, hotel and restaurant management, management, paralegal studies, clean energy technology, computer science, information technology, networking, biomedical equipment technology, drafting and design, electrical and electronics, electromechanical technology, manufacturing, general technology, golf course and turfgrass management, and greenhouse management, as outlined in Appendix 1. A total of 20,045 final student grades were included in the analysis.

The study focused on seven research questions, and seven hypotheses were tested. The research questions were analyzed using chi-square (χ^2) tests of independence.

The variables examined in this study included final course outcomes, gender, age, and course delivery method. Variables for the student population in the study, including the total cases included in the study, the number of student course outcomes by gender, the number of student course outcomes by course delivery method, and the associated percentages, are presented in Table 1. The average age of students included in the study was 27.18 years, with a range of 16 to 74. The total of 20,045 total cases were analyzed using IBM SPSS version 23.

Table 1

Study Variables

Variable		N	%
Male		10,247	51.12
Female		9,798	48.88
	Total	20,045	100.0
Traditional Delivery		15,002	74.84
Hybrid Delivery		1,234	6.16
Online Delivery		3,809	19.00
	Total	20,045	100.0
Traditional Students		11,761	58.67
Nontraditional Students		8,284	41.33
	Total	20,045	100.0

Research Question 1

Is there a significant difference in the proportion of students earning a final grade of A, B, C, D, or F among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

$H_0 1$: There is no significant difference in the proportion of students earning a final grade of A, B, C, D or F among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

A two-way contingency table analysis was conducted to determine if the proportion of final grades of A, B, C, D, or F varied depending on the delivery method. The two variables for the study were the final grade (A, B, C, D, or F) and the delivery method (traditional, hybrid, or online). Final course grades and course delivery method were found to be significantly related, Pearson χ^2 (8, $N = 19,056$) = 88.34, $p < .001$, Cramer's $V = .05$. Therefore, the null hypothesis was rejected. Follow-up analysis was conducted.

The percentage of final course grades by course delivery method is shown in Table 2. The total number of final course letter grades by the content delivery method is shown in Figure 1.

Follow-up pairwise comparisons were conducted to evaluate the differences in grade distributions among the three different delivery methods. The results of these analyses are illustrated in Table 3. The Holm's sequential Bonferroni method was used to control for Type I error at the .05 level across the 15 comparisons that were conducted. There were three significant pairwise comparisons, between a grade of F in traditional versus online classes, a grade of C in traditional versus online classes, and a grade of F in traditional versus hybrid classes. Based on the analysis students who take career and technical education classes in either a hybrid or an

online delivery method are significantly more likely to earn a grade of F than those taking career and technical education classes in a traditional delivery method. Students who take career and technical education classes in a traditional format are also significantly more likely to earn a grade of C than students taking career and technical education classes in an online format.

Table 2

Final Course Letter Grades by Course Delivery Method

Course Delivery Method	Final Course Letter Grade					Total
	A	B	C	D	F	
Traditional	44.99	24.31	13.26	5.63	11.81	100.0
Hybrid	43.94	21.12	12.83	5.53	16.58	100.0
Online	43.01	25.86	10.31	4.73	16.08	100.0
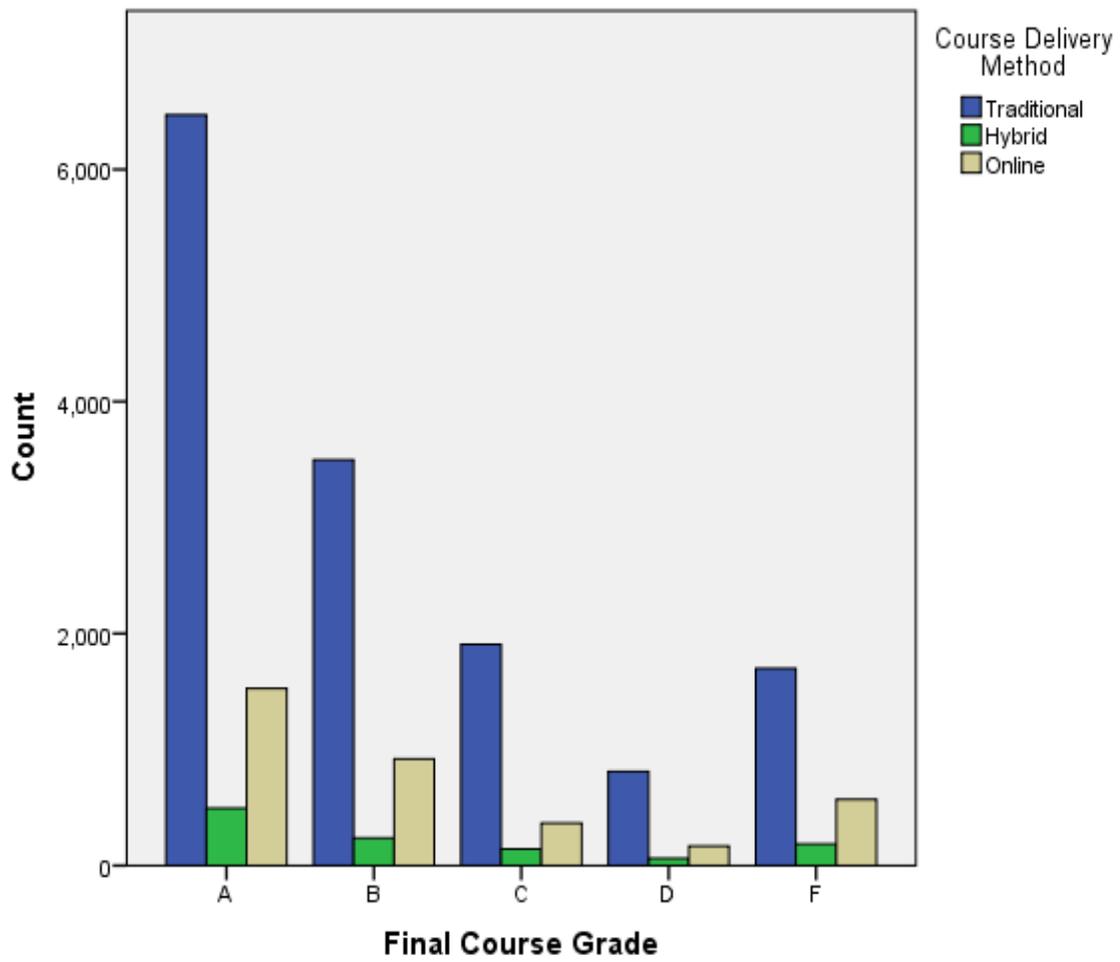
Figure 1. Final course grades by course delivery method.

Table 3

Pairwise Comparisons Using the Holm's Sequential Bonferroni Method

Comparison	χ^2	p	Cramer's V
F (Traditional – Online[#])	47.06*	<.001 (.003)	.19
C (Traditional[#] – Online)	22.37*	<.001 (.004)	.14
F (Traditional – Hybrid[#])	22.18*	<.001 (.004)	.14
B (Hybrid – Online)	10.30	.035 (.004)	.09
B (Traditional – Hybrid)	5.81	.214 (.005)	.07
C (Hybrid – Online)	5.57	.238 (.005)	.05
A (Traditional – Online)	4.49	.343 (.006)	.25
D (Traditional – Online)	4.45	.348 (.006)	.12
B (Traditional – Hybrid)	3.69	.450 (.007)	.05
D (Hybrid – Online)	1.14	.887 (.008)	.08
A (Traditional – Online)	.46	.977 (.010)	.04
A (Hybrid – Online)	.30	.990 (.013)	.06
C (Traditional – Online)	.16	.997 (.017)	.02
F (Hybrid – Online)	.15	.997 (.025)	.01
D (Traditional – Hybrid)	.02	.999 (.050)	<.01

*p value ≤ alpha   [#] higher value

Research Question 2

Is there a significant difference in the proportion of students earning a final course grade of W (withdrawing from the course) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

$H_0 2$: There is no significant difference in the proportion of students earning a final course grade of W (withdrawing from the course) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

A two-way contingency table analysis was conducted to evaluate whether students were more likely to earn a final course grade of W (withdrawal from the course) based on the delivery method of the course (traditional, hybrid, or online). The two variables were course completion (completed or withdrawn) and course delivery method (traditional, hybrid, or online). Course withdrawal rates and course delivery methods were found to be significantly related, Pearson χ^2 (2, $N = 20,045$) = 94.63, $p < .001$, Cramer's $V = .07$. Therefore, the null hypothesis was rejected.

Table 4 indicates the percentage of students who completed or withdrew from career and technical education courses for each course delivery method. Figure 2 shows the number of students who completed or withdrew from career and technical education courses for each course delivery method.

Follow-up pairwise comparisons were conducted to evaluate differences in withdrawal rates between the three course delivery methods in career and technical education courses. Table 5 shows the results of these analyses. The Holm's sequential Bonferroni method was used to control for Type I error at the .05 level across the three comparisons conducted. There were two pairwise comparisons found to be statistically significant; students were more likely to withdraw

from hybrid and online career and technical education courses than from traditional career and technical education courses.

Table 4

Students Who Completed or Withdrew from Courses by Course Delivery Method

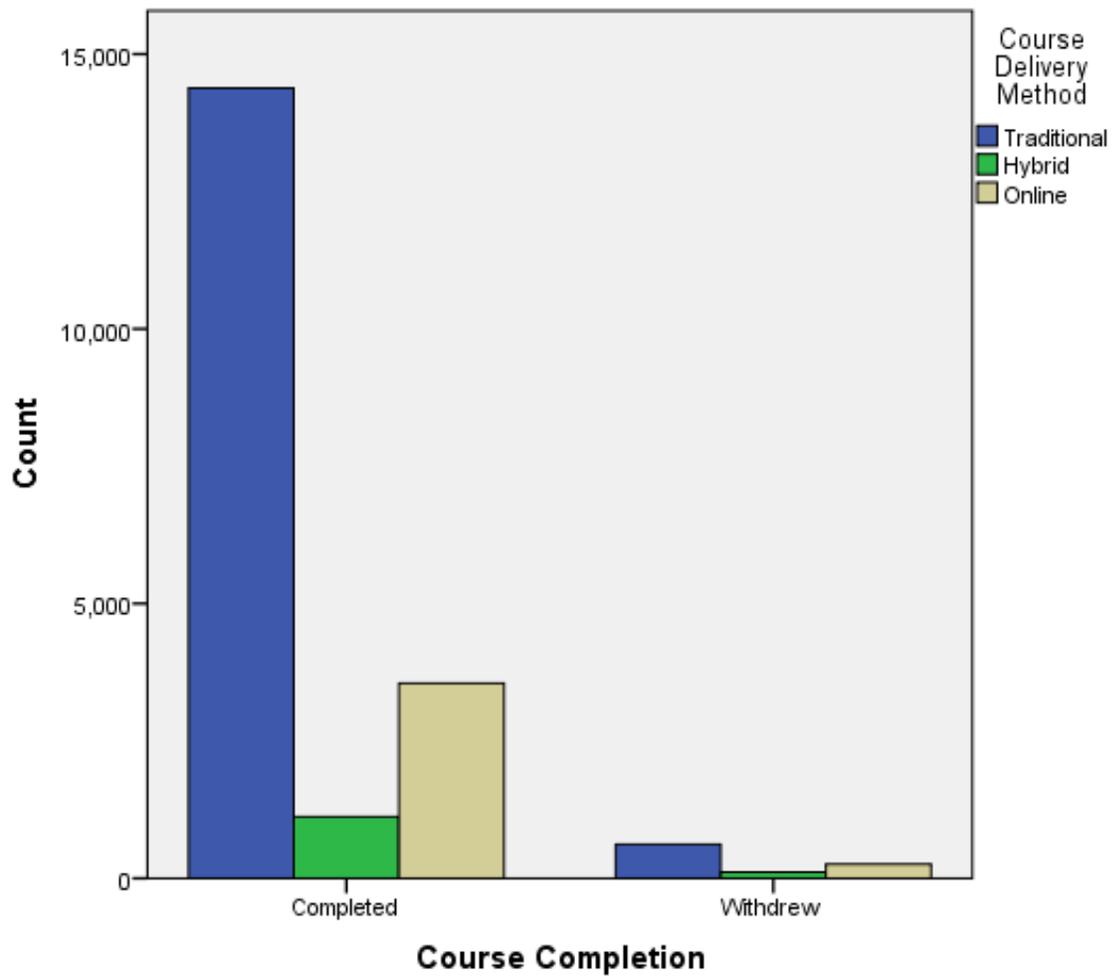| Course Delivery Method	Final Course Status		Total
	Completed	Withdrew	
Traditional	95.88	4.12	100.0
Hybrid	90.92	9.08	100.0
Online	93.20	6.80	100.0

Figure 2. Students completing or withdrawing by delivery method.

Table 5

Pairwise Comparisons of Students Who Completed or Withdrew from Courses by Course Delivery Method

Comparison	χ^2	p	Cramer's V
Withdrew – Traditional vs. Hybrid[#]	67.24*	<.001 (.017)	.30
Withdrew – Traditional vs. Online[#]	49.14*	<.001 (.025)	.24
Withdrew – Hybrid vs. Online	7.08	.132 (.050)	.14

*p value ≤ alpha   [#] higher value

Research Question 3

Is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

H_03: There is no significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

A two-way contingency table analysis was conducted to evaluate whether students were more likely to earn a transferable final course grade (A, B, or C) based on the delivery method of the course (traditional, hybrid, or online). The two variables were the final course letter grade (A, B, C, D, F, or W) and course delivery method (traditional, hybrid, or online). Transferable course grades and course delivery methods were found to be significantly related, Pearson χ^2 (2, N = 20,045) = 85.19, p <.001, Cramer's V = .07. Therefore, the null hypothesis was rejected. Table 6 indicates the percentages of transferable final course grades that were earned for each course

delivery method. Figure 3 shows the number of students earning a transferable final course grade of A, B, or C by course delivery method versus the number of students earning a nontransferable grade of D, F, or W by course delivery method.

Follow-up pairwise comparisons were conducted to evaluate specific differences between the proportions of students earning transferable final course grades by each delivery method. Table 7 shows the results of these analyses. The Holm's sequential Bonferroni method was used to control for Type I error at the .05 level across the three comparisons conducted. There were two significant pairwise differences, Traditional versus Hybrid and Traditional versus Online. Overall, students were more likely to earn a transferable grade of A, B, or C in a traditional class than they were in either a hybrid or in an online course offering.

Table 6

Transferable Final Course Grades by Course Delivery Method

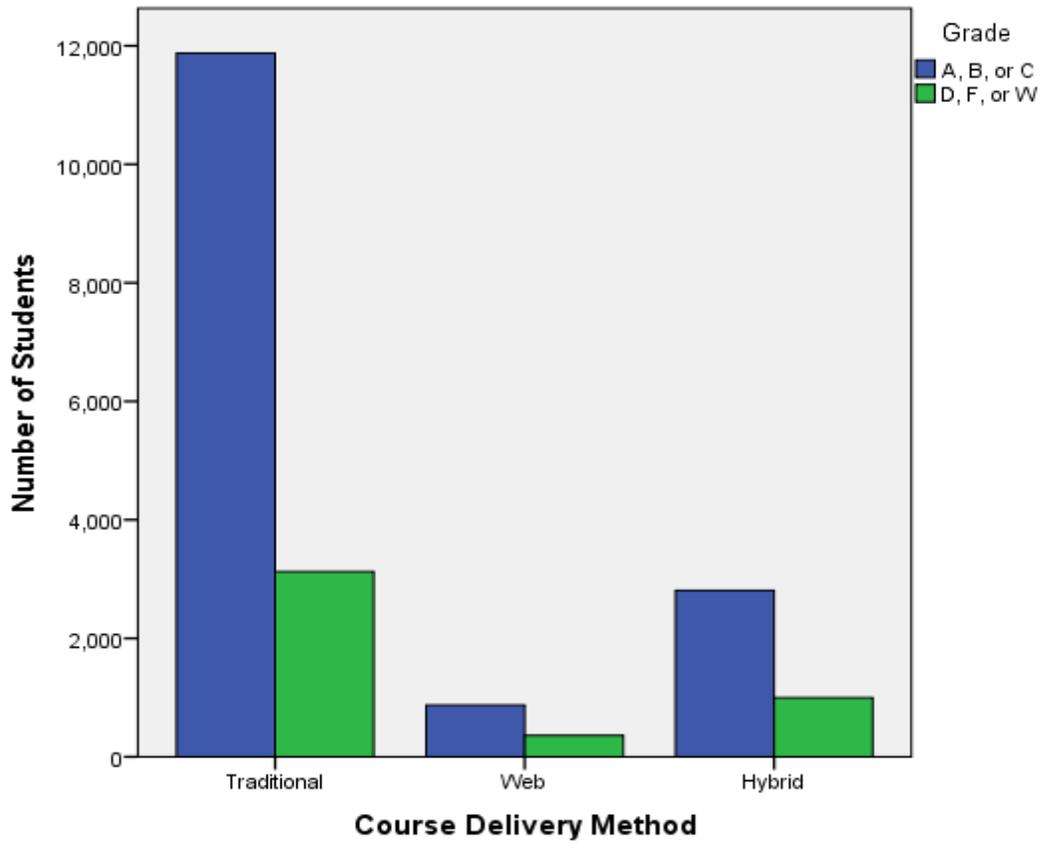|	Final Course Letter Grade		
Course Delivery Method	A, B, or C	D, F, or W	Total
Traditional	79.16	20.84	100.0
Hybrid	70.83	29.17	100.0
Online	73.80	26.20	100.0

Figure 3. Students earning a transferable final course grade by delivery method.

Table 7

Pairwise Comparisons of Transferable Final Course Grades by Course Delivery Method

Comparison	χ^2	p	Cramer's V
Traditional[#] vs. Online	46.91*	<.001 (.017)	.05
Traditional[#] vs. Hybrid	29.32*	<.001 (.025)	.04
Hybrid vs. Online	4.19	.123 (.050)	.03

*p value ≤ alpha   [#] higher value

Research Question 4

For females, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

H_04: For females, there is no significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

A two-way contingency table analysis was conducted to evaluate whether there was a significant difference in female students earning a transferable letter grade of A, B, or C and those earning a nontransferable grade of D, F, or W between the three different course delivery methods. The variables were final course grade (A, B, C, D, F, or W) and course delivery method (traditional, hybrid, or online), and the population for this analysis was limited to female students enrolled in career and technical education courses. Transferable final course grades and

course delivery methods were found to be significantly related for female students, Pearson χ^2 (2,

$N = 9{,}798) = 41.69$, $p < .001$, Cramer's $V = .07$. Therefore, the null hypothesis was rejected.

Table 8 indicates the percentage of female students earning a transferable final course grade of A, B, or C versus the percentage of female students earning a nontransferable letter grade of D, F, or W for each of the three delivery methods (traditional, hybrid, or online). Figure 4 shows the count of the number of female students earning each final course grade by course delivery method.

Follow-up pairwise comparisons were conducted to evaluate specific differences among the proportions of female students earning transferable final course grades between the three different course delivery methods. Table 9 shows the results of these analyses. The Holm's sequential Bonferroni method was used to control for Type I error at the .05 level across the three comparisons conducted. Female students were statistically more likely to earn a transferable course grade in a career and technical education course offered in a traditional format than they were in either a hybrid or an online career and technical education course. There was no statistically significant difference between the hybrid and the online course final grades.

Table 8

Female Students Earning Transferable Final Course Grades by Course Delivery Method

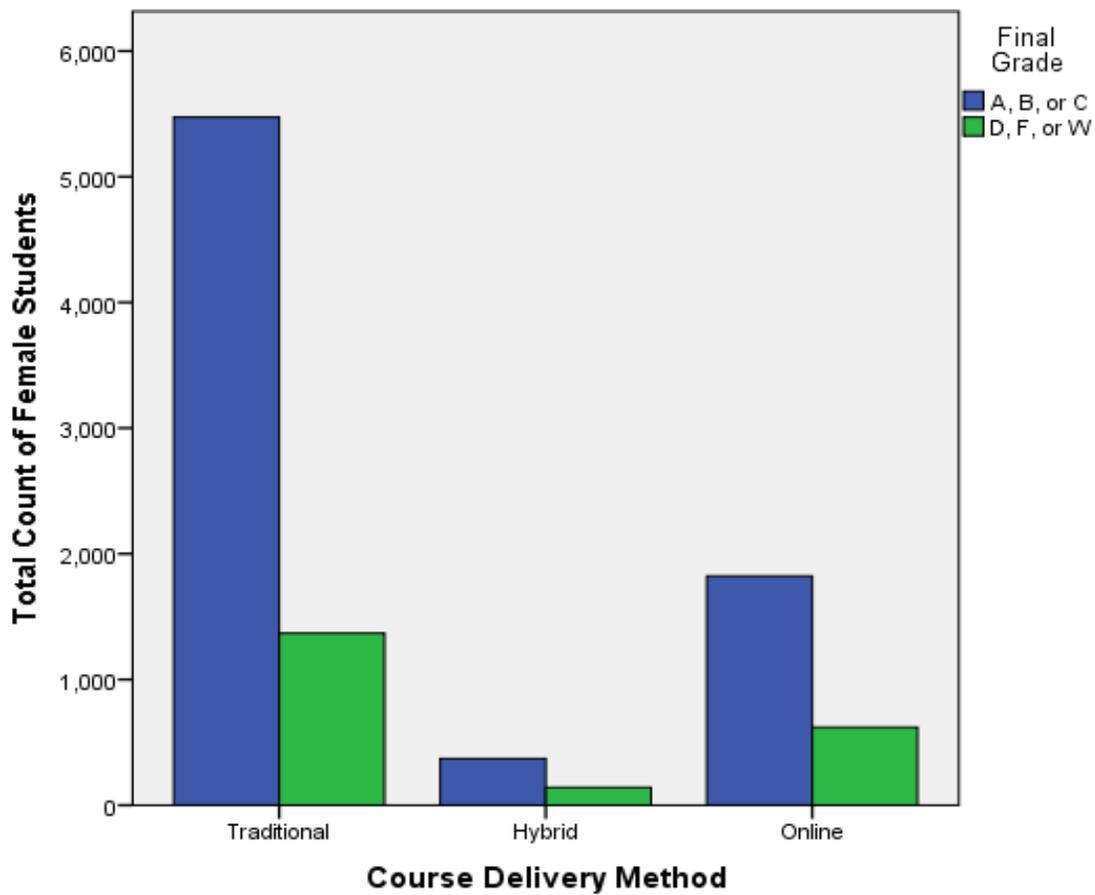| | Final Course Letter Grade | | |
Course Delivery Method	A, B, or C	D, F, or W	Total
Traditional	79.99	20.01	100.0
Hybrid	72.32	27.68	100.0
Online	74.62	25.38	100.0

Figure 4. Female students earning transferable final course grades by delivery method.

Table 9

Pairwise Comparisons of Female Students Earning Transferable Final Course Grades by Course Delivery Method

Comparison	χ^2	p	Cramer's V
Traditional[#] vs. Online	30.84*	<.001 (.017)	.06
Traditional[#] vs. Hybrid	17.21*	<.001 (.025)	.05
Hybrid vs. Online	1.17	.556 (.050)	.02

*p value ≤ alpha   [#] higher value

Research Question 5

For males, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

H_05: For males, there is no significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

A two-way contingency table analysis was conducted to evaluate whether there was a significant difference in male students earning a letter grade of A, B, or C and those male students earning a letter grade of D, F, or W between the three different course delivery methods. The two variables were final course grade (A, B, C, D, F, or W) and course delivery method (traditional, hybrid, or online), and the population for this analysis was limited to male students enrolled in career and technical education courses. Transferable final course grades and course

delivery methods were found to be significantly related for male students, Pearson χ^2 (2, $N =$ 10,247) = 47.95, $p < .001$, Cramer's $V = .07$. Therefore, the null hypothesis was rejected.

Table 10 indicates the number of male students earning a transferable final course grade of A, B, or C for each of the three delivery methods (traditional, hybrid, or online). Figure 5 shows the count of the number of male students earning each final course grade by course delivery method.

Follow-up pairwise comparisons were conducted to evaluate specific differences among the proportions of male students earning transferable final course grades between the three different course delivery methods. Table 11 shows the results of these analyses. The Holm's sequential Bonferroni method was used to control for Type I error at the .05 level across the three comparisons conducted. Male students were statistically more likely to earn a transferable final course grade of A, B, or C in a course offered in a traditional format than in a course offered in a hybrid or an online format.

Table 10

Male Students Earning Transferable Final Course Grades by Course Delivery Method

	Final Course Letter Grade		
Course Delivery Method	A, B, or C	D, F, or W	Total
Traditional	78.46	21.54	100.0
Hybrid	69.76	30.24	100.0
Online	72.33	27.67	100.0
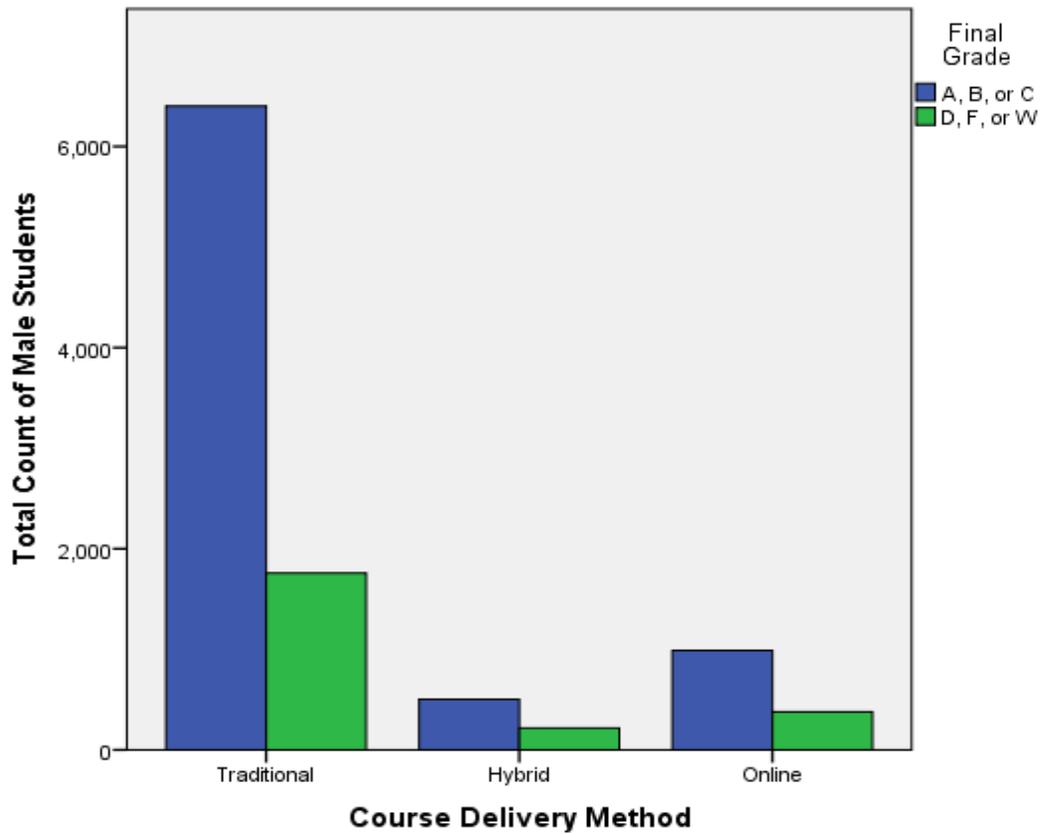
Figure 5. Male students earning transferable final course grades by delivery method.

Table 11

Pairwise Comparisons of Male Students Earning Transferable Final Course Grades by Course Delivery Method

Comparison	χ^2	p	Cramer's V
Traditional[#] vs. Hybrid	28.93*	<.001 (.017)	.06
Traditional[#] vs. Online	25.26*	<.001 (.025)	.05
Hybrid vs. Online	1.52	.468 (.050)	.03

*p value ≤ alpha   [#] higher value

Research Question 6

For traditional age students, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

$H_0$6: For traditional age students, there is no significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

A two-way contingency table analysis was conducted to evaluate whether there was a significant difference in traditional age students earning a letter grade of A, B, or C and those traditional age students earning a letter grade of D, F, or W between the three different course delivery methods. The two variables were final course grade (A, B, C, D, F, or W) and course delivery method (traditional, hybrid, or online), and the population for this analysis was limited to traditional age students age 24 and under enrolled in career and technical education courses. Transferable final course grades and course delivery methods were found to be significantly related for traditional age students, Pearson χ^2 (2, $N = 11,781$) = 72.77, $p < .001$, Cramer's $V =$ .08. Therefore, the null hypothesis was rejected.

Table 12 indicates the percentage of traditional age students earning a transferable final course grade of A, B, or C versus the percentage of traditional age students earning a nontransferable grade of D, F, or W for each of the three delivery methods (traditional, hybrid, or online). Figure 6 shows the count of the number of traditional age students earning each final course grade by course delivery method.

Follow-up pairwise comparisons were conducted to evaluate specific differences among the proportion of traditional age students earning transferable final course grades between the

three different delivery methods. Table 13 shows the results of these analyses. The Holm's

sequential Bonferroni method was used to control for Type I error at the .05 level across the

three comparisons conducted. Traditional age students were statistically more likely to earn a

transferable course grade in a career and technical education course offered in a traditional

format than they were in either a hybrid or an online format. There was no statistically

significant difference between the hybrid and online course final grades.

Table 12

Traditional Age Students Earning Transferable Final Course Grades by Course Delivery Method

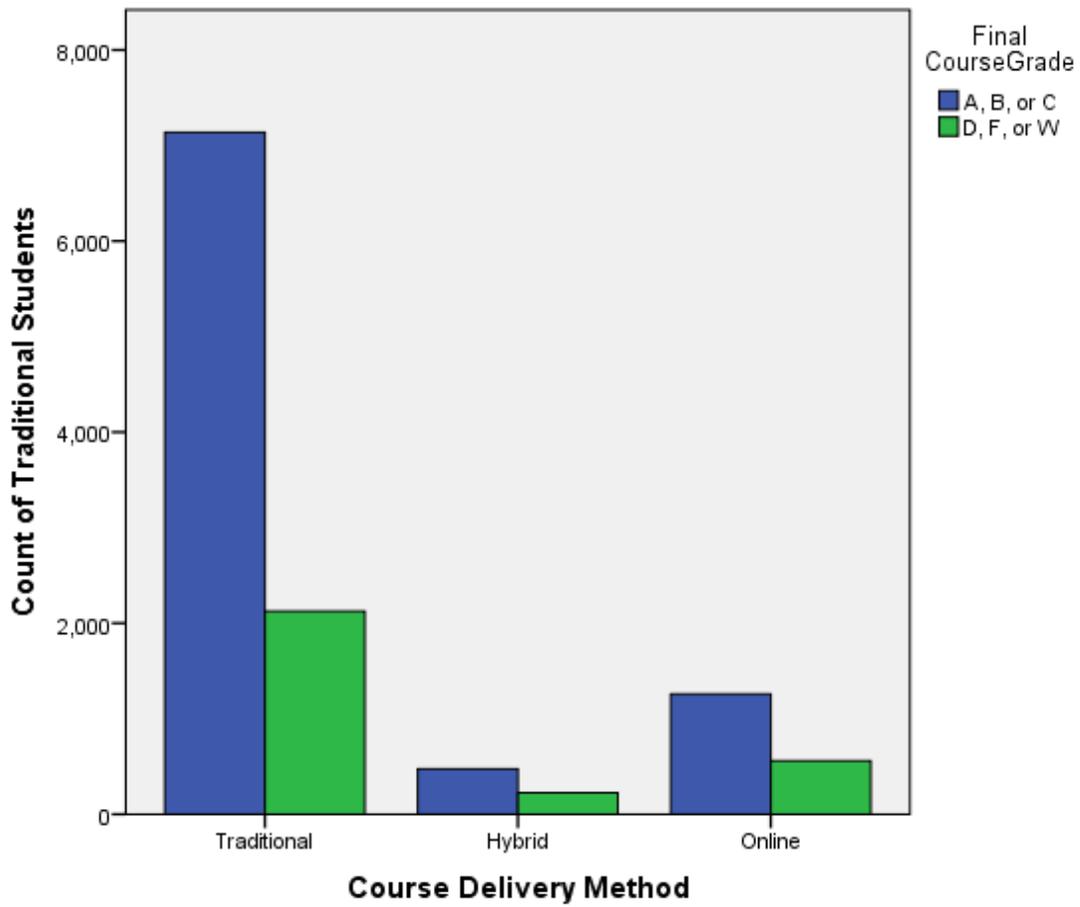|	Final Course Letter Grade		
Course Delivery Method	A, B, or C	D, F, or W	Total
Traditional	77.06	22.94	100.0
Hybrid	67.76	32.24	100.0
Online	69.24	30.76	100.0

Figure 6. Traditional age students earning transferable final course grades by delivery method.

Table 13

Pairwise Comparisons of Traditional Age Students Earning Transferable Final Course Grades by Course Delivery Method

Comparison	χ^2	p	Cramer's V
Traditional[#] vs. Online	50.67*	<.001 (.017)	.07
Traditional[#] vs. Hybrid	31.26*	<.001 (.025)	.06
Hybrid vs. Online	.51	.774 (.050)	.01

*p value $\leq$ alpha   [#] higher value

Research Question 7

For nontraditional age students, is there a significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses?

$H_0$7: For nontraditional age students, there is no significant difference in the proportion of students earning a transferable final course grade (A, B, or C) among the three delivery methods (traditional, hybrid, or online) for career and technical education courses.

A two-way contingency table analysis was conducted to evaluate whether there was a significant difference in nontraditional age students earning a letter grade of A, B, or C and those nontraditional age students earning a letter grade of D, F, or W between the three different course delivery methods. The two variables were final course grade (A, B, C, D, F, or W) and course delivery method (traditional, hybrid, or online), and the population for this analysis was limited to nontraditional age students age 25 and over enrolled in career and technical education courses. Transferable final course grades and course delivery methods were found to be significantly

related for nontraditional age students, Pearson χ^2 (2, $N = 8,355$) = 36.17, $p <.001$, Cramer's $V =$ .07. Therefore, the null hypothesis was rejected.

Table 14 indicates the percentage of nontraditional age students earning a transferable final course grade of A, B, or C versus the percentage of nontraditional age students earning a nontransferable grade of D, F, or W for each of the three delivery methods (traditional, hybrid, or online). Figure 7 shows the count of the number of nontraditional age students earning each final course grade by course delivery method.

Follow-up pairwise comparisons were conducted to evaluate specific differences among the proportion of nontraditional age students earning transferable final course grades between the three different delivery methods. Table 15 shows the results of these analyses. The Holm's sequential Bonferroni method was used to control for Type I error at the .05 level across the three comparisons conducted. Nontraditional age students were statistically more likely to earn a transferable course grade in a career and technical education course offered in a traditional format than they were in either a hybrid or an online format. There was no statistically significant difference between the hybrid and online course final grades.

Table 14

Nontraditional Age Students Earning Transferable Final Course Grades by Course Delivery Method

| Course Delivery Method | Final Course Letter Grade | | Total |
	A, B, or C	D, F, or W	
Traditional	82.76	17.24	100.0
Hybrid	74.81	25.19	100.0
Online	78.07	21.93	100.0
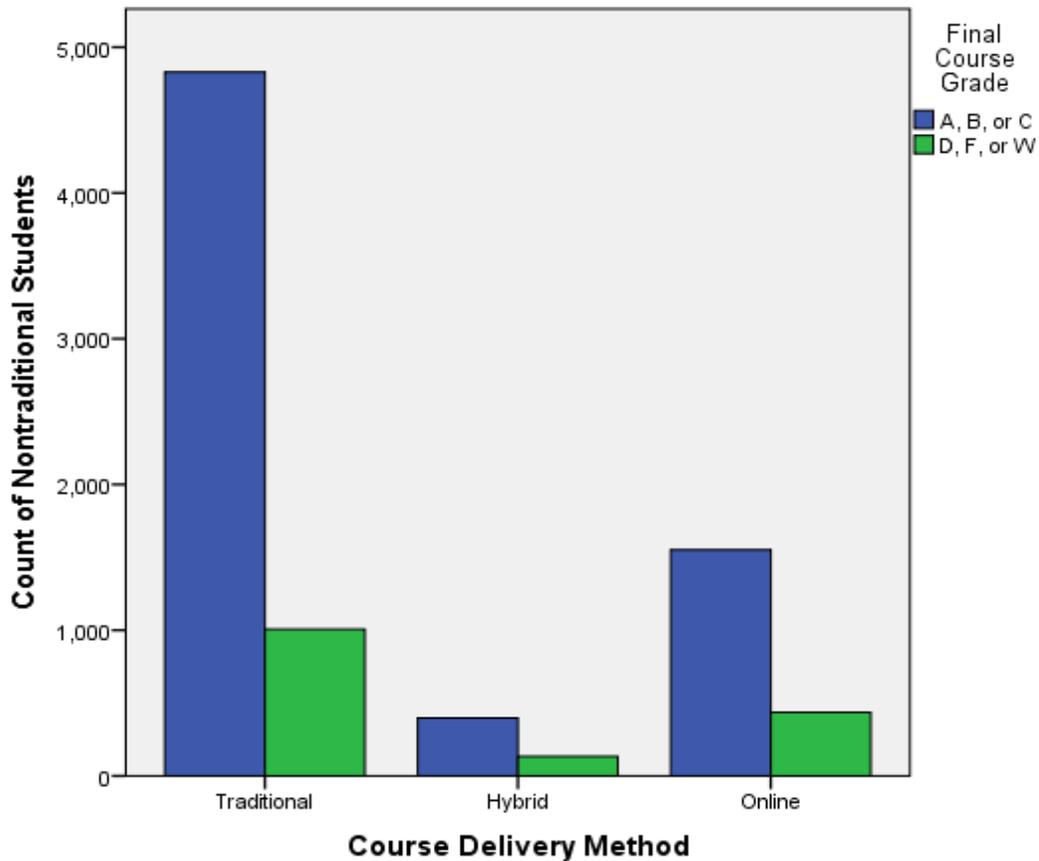
Figure 7. Nontraditional age students earning transferable final course grades by delivery method.

Table 15

Pairwise Comparisons of Nontraditional Age Students Earning Transferable Final Course Grades by Course Delivery Method

Comparison	χ^2	p	Cramer's V
Traditional[#] vs. Online	21.70*	<.001 (.017)	.05
Traditional[#] vs. Hybrid	20.95*	<.001 (.025)	.06
Hybrid vs. Online	2.54	.280 (.050)	.03

*p value ≤ alpha   [#] higher value

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to determine if there are significant differences in student success in traditional, hybrid, and online courses in selected career and technical education programs as measured by final course grades, by transferable grade completion, and by withdrawal rates; the relationship between gender, transferable course grades, and course delivery method; and the relationship between age and transferable course grades. The study also examined gender and age differences in transferable course grades within course delivery methods (traditional, hybrid, or online courses). The focus of the study was on comparing student success across three delivery methods. A summary, findings, conclusions, and recommendations are reviewed in this chapter.

Summary

Previous studies have shown that the implementation of online courses at the postsecondary level has increased dramatically over the past decade, and that student enrollment in these courses has likewise increased (Allen & Seaman, 2013; Allen et al., 2016; Christensen & Eyring, 2011; Euzent et al., 2011; Jaggars, 2014; Taylor et al., 2011). While "[t]here are virtually no public institutions … with no online offerings" (Allen & Seaman, 2014, p. 13), few studies have been completed that address the appropriateness of course content for online delivery. Those studies that do address this have often focused on academic subject areas that lie outside of career and technical education programs or courses (Xu & Jaggars, 2013, 2014). A study of

student learning outcomes by course delivery method in career and technical education courses was necessary to promote discussion of future directions for these courses.

The present study's findings supported earlier studies concerning student outcomes in online and hybrid course delivery methods (Lim et al., 2006; Moriba & Edwards, 2013). The results of this study demonstrated that there were significant differences in final course grades for different course delivery methods for a subset of career and technical education courses at one institution. There were a statistically significant higher percentage of failures for students in career and technical education courses offered in a hybrid or online format than for those offered in a traditional format. Additionally, there were significantly more withdrawals from career and technical education courses offered in online or hybrid formats than from those courses offered in a traditional format. The percentage of students earning transferable final course grades (A, B, or C) was found to be significantly different when comparing traditional courses to both hybrid and online courses. Female and male students were both more likely to earn transferable final course grades in a course delivered in a traditional format than either hybrid or online formats. Both traditional students, those age 24 and under, and nontraditional students, those 25 and older, were statistically more likely to earn a transferable final course grade in a traditional course than in either a hybrid or an online course.

Conclusions

For this study, final course grades in career and technical education courses offered at a single community college were gathered for 13 semesters. The population consisted of 20,045 total final course grades over these 13 semesters. These grades were disaggregated by delivery method (15,002 traditional course grades, 1,234 hybrid course grades, and 3,809 online course

grades). These grades were further separated into two categories: transferable course grades, which are grades of A, B, or C for purposes of transfer to a 4-year institution, and nontransferable grades, which were grades of D, F, or W. Overall demographics indicated a relatively equal percentage of students by gender and slightly larger number of traditional students than nontraditional students in the career and technical education courses included in the present study.

Research questions 1 and 2 used grouping variables of (1) final course grade and (2) course delivery method. The grouping variables for research question 3 were (1) transferable final course grades and (2) course delivery method, and research questions 4 and 5 used grouping variables of (1) gender, (2) transferable final course grade, and (3) course delivery method. Research questions 6 and 7 used grouping variables of (1) transferable final course grade, (2) course delivery method, and (3) student age. The seven research questions were addressed using chi-square tests, and the problem of multiple comparisons was corrected in the chi square tests through the use of the Holm's sequential Bonferroni method. An overview of the results of each research question is provided in the following sections.

Research Question 1

Research question 1 focused on the differences in final course grades for each of the three delivery methods included in the study: traditional, hybrid, and online. As the chi square test indicated a significant relationship between the final course grades and the course delivery method, the follow-up pairwise comparisons showed the grade of F to be significant for traditional versus online and traditional versus hybrid classes, while a grade of C in traditional versus online classes was found to be significant. Students were more likely to earn a grade of F

in online and hybrid classes than they were to earn the same grade in a traditional class. The relationship between delivery method and final grade was strong for these three comparisons, and the strength of other relationships drops dramatically after these pairwise comparisons. The distribution of grade percentages indicated similar grades across delivery methods with the exception of those noted as statistically significant.

It is possible that students who took online and hybrid courses were unprepared for the work outside of class that was required to be successful in these class delivery formats. Napier, Dekhane, and Smith (2011) found that students in online and hybrid courses required more discipline, better time management, and a knowledge of technology that many students did not possess. Without a closer investigation of other factors, such as the courses, the programs, or the characteristics of the individual students, it is not accurate to say that any one factor is responsible for the difference in student outcomes. However, further research may determine specific indicators that explain this variation.

Research Question 2

Research question 2 was focused on the number of student withdrawals from courses within each course delivery method. Students were found to be more likely to withdraw from hybrid and online courses than from traditional courses. The withdrawal rates between hybrid and online courses was not found to be statistically significant. Students were twice as likely to withdraw from a hybrid course than from a traditional course, and more than two thirds as likely to withdraw from an online course than from a traditional course. However, increasing the percentage of students who earn transferable final course grades to the 95.88% rate that was

achieved in traditional course offerings would result in an increase of 13 students per semester who earned transferable final course grades.

Two factors that could contribute to this elevated withdrawal rate is the contact with the instructor and experience with the online format. Hybrid and online courses have significantly less personal interaction with the instructor, and this may contribute to a lack of connectedness with the instructor, the course, or other students. Also, because these courses are first- and second-year courses at a community college, the student experience with different course delivery formats may be lacking. Xu and Jaggars (2011) note that "the gap in online course completion narrows significantly as students gain more experience with online courses" (p. 14). A lack of experience at an early stage in postsecondary education may impact the student's perception of online courses overall.

Research Questions 3, 4, and 5

Research question 3 addressed a subset of grades, those that were transferable to a 4-year postsecondary institution for credit towards a degree versus those grades that were not transferable. As in research question 1, a significant relationship was found between the final course grade and the course delivery method. The pairwise comparisons indicated a significant relationship between traditional and hybrid courses and between traditional and online courses. Students were more likely to earn a transferable grade in a traditional course than in either a hybrid or an online course. There was little difference in final course grades between hybrid and online courses, however. Research questions 4 and 5 disaggregated this larger group into two subgroups: female students and male students who earned transferable final course grades in career and technical education courses versus those same gender differentiated groups who

earned nontransferable final course grades in those same courses. Both female and male students were more likely to earn a transferable final course grade in a traditional course than in either a hybrid or an online course. Both female and male students were slightly more likely to earn a transferable final course grade in an online course than in a hybrid course, but there was no statistically significant difference between these two course delivery methods for either group.

There are multiple factors that could contribute to this disparity between traditional and online grades. While traditional classes focus on synchronous learning, online courses are asynchronous by nature; student participation does not take place in real time, and so interaction does not occur in the same manner. Wilson and Allen (2011) found that "more personal contact with the instructor" may be a factor that is critical to student success (p. 5). This study did not research the amount of time students spent in each class format nor the number of online courses each student had taken. These may both be factors that could impact student success in an online classroom and provide areas for further research. The disaggregation by gender showed statistically significant differences between traditional courses and both hybrid and online courses regardless of gender, and that female students were dramatically more likely to earn a transferable final course grade in hybrid courses than male students. Overall, gender did not show a significant variation from the overall population findings on student completion of courses with transferable final course grades.

Research Questions 6 and 7

Research questions 6 and 7 focused on transferable final course grades for traditional students, defined as those students age 24 and under, and nontraditional students, defined as students age 25 and older. The questions analyzed students in each group earning a transferable

final course grade (A, B, or C) or a nontransferable final course grade (D, F, or W) in each of the three course delivery methods. A chi square test found a significant relationship between course delivery method and final course grade for both traditional and nontraditional students. Both groups were significantly more likely to earn a transferable final course grade in a traditional course than they were to earn a transferable final course grade in either a hybrid or an online course.

These findings align with the outcomes reported in research questions 3, 4, and 5, which found that final course grades were better in traditional courses than in either hybrid or online courses, and that hybrid and online course outcomes were similar. Regardless of age, students may benefit from elements such as instructor contact and synchronous learning activities associated with traditional courses that are not present in hybrid or online courses (Ashby et al., 2011). The student population consisted of 58.7% traditional students and 41.3% nontraditional students; Xu and Jaggars (2013a) found that "older college students tend to have poorer academic outcomes overall" (p. 3). This study was limited to a student population in career and technical education courses that used different course delivery methods, and did not compare final course outcomes in other academic subjects to the career and technical education course outcomes.

Recommendations for Practice

Because career and technical education courses and programs provide pathways to both further education and to the workforce, it is important that colleges afford them the same attention and provide students with the same access as they do to traditional transfer programs. These programs are often targeted to local business and industry needs and alliances with 4-year

institutions that provide pathways to continued education enhance the opportunities for students in career and technical fields, as well as improve the skill level of the workforce. It is with these goals in mind that the following recommendations for practice are made.

Because there remain large numbers of students who do not complete postsecondary programs of study, it is important to address the number of lower grades achieved by students regardless of course delivery method. For courses offered through more than one delivery method, course designers and faculty should review course learning outcomes, evaluation methods, and student outcomes on a regular basis to ensure that the learning experiences are similar regardless of delivery method. Allen et al. (2013) noted that learning outcomes for online learning "show a substantial improvement in the opinion of academic leaders on the relative quality of the learning outcomes for online education" (p. 24). However, each institution that implements hybrid and online course offerings should develop or implement tools that will provide a more comprehensive assessment of these course offerings as they compare to the equivalent traditional course delivery methods.

Career and technical education programs that offer courses in traditional, hybrid, and online formats should also remain aware of the higher number of student withdrawals in hybrid and online courses. While the reasons for this discrepancy were not addressed in this study, career and technical education programs should be aware of issues that may lead to higher withdrawal rates and develop strategies to lessen the differences in withdrawal rates. By improving student capabilities with technology, analyzing student backgrounds prior to enrollment in hybrid and online courses, and altering curriculum offerings to ensure student skills with time management, technology use, and experience with hybrid and online course

formats, career and technical education programs may equip students with necessary skills that will lessen the number of withdrawals in these courses.

Students enrolled in career and technical education programs tend to be older than students in academic college programs and are often combining work, school, and family (Xu & Jaggars, 2013a). The present study looked at data for two age groups, traditional and nontraditional students, and found that nontraditional students averaged 7.20% higher transferable grade percentages than traditional students, regardless of course delivery method. Institutions should evaluate the student population in the courses offered to determine the ages of students as they relate to each institution's course offerings and analyze the support services that are in place for these groups of students. Older students may require services such as tutoring, advising, and laboratory support in evening or weekend formats in order to work with their schedules. A review of these support services may indicate areas that require modification to meet the scheduling needs of older students.

Colleges may also look at the appropriateness of course delivery methods to course content. Career and technical education programs should closely examine the courses offered in hybrid or online formats and the associated laboratory activities and course components that require students to demonstrate a skill or develop physical abilities. While tools may exist to provide the ability to demonstrate or develop these skills or abilities outside of the traditional classroom, certain course offerings will not have appropriate options for the traditional course offerings. Each institution should review its hybrid and online offerings prior to development of these offerings and on a regular basis after implementation to ensure that these courses are equivalent to traditional course offerings in content, assessment, and learning outcomes.

Recommendations for Further Research

Although the results of this study indicate that differences do exist between course delivery formats and student outcomes in career and technical education courses, there remain many areas of course delivery method research that could provide major benefits. By analyzing data on existing programs, it may be possible to identify those areas that would lead to improvements in course selection, course design, and student learning. Studies suggested below indicate directions that may be taken to broaden the field of research and provide valuable input into the future implementation of technology into career and technical education courses.

1. In the present study withdrawal rates for all course delivery methods averaged 6.67%. The study did not determine at what point in the semester a student withdrew from the course. A study that investigates withdrawal rates across other programs of study could determine if this is a common occurrence. It could also attempt to define correlations between withdrawals and other student factors such as program of study, student employment, student age, or student progress in the course or program.

2. While the present study focused on career and technical education programs, it did not address other areas of workforce training, such as certificate programs, noncredit programs, or programs intended to transfer to 4-year institutions. Expanding a study to include certificate or noncredit programs or to include students who transition from 2-year to 4-year programs could provide background to build stronger courses that improve retention and outcomes.

3. The present study did not examine factors such as instructor interaction and student experience and their impacts on student course outcomes. Further evaluation of the same semesters of student learning outcomes for both career and technical education courses

and academic courses such as composition and mathematics may provide data to

determine whether the withdrawals and lower grades are specific to career and technical

education courses or whether there is a broader question to be investigated.

4. Career and technical education courses offered in more than one course delivery method

    have the same student learning outcomes and course objectives, and Allen et al. (2016)

    found that over 80% of institutions with online courses reported that learning outcomes

    for online classes were equal to or superior to traditional classes. Research to determine if

    the same held true for the subset of classes defined as career and technical education

    courses would be helpful in determining the appropriateness of the delivery method to the

    subject matter of the course.

5. The present study only addressed courses at one community college. Factors unique to

    this college, such as location, programs of study, or relationship to business and industry

    partners in the community may have impacted the outcomes. A study that included more

    than one institution or that surveyed outcomes for a system of colleges could provide a

    different data set that would indicate the need for further research.

6. The present study compared multiple courses in multiple career and technical education

    programs. A future study may focus on specific career and technical education programs

    in order to reduce the differences in the outcomes being studied. For example, a study of

    an Engineering Technology program could make use of factors such as local

    employment, special topics courses, times of course offerings, and specialized programs

    to investigate relationships that were not included in the present study. This may also

    provide a more focused comparison in terms of traditional, hybrid, and online courses, as

these courses within a single program would be more likely to be related in terms of content and applicability.

7. This study analyzed the achievement of transferable final course grades by traditional and nontraditional students but did not investigate differences between these two groups in other areas. One recommendation would be to further analyze traditional and nontraditional groups of students to determine whether factors such as earlier college work, prior learning through work, or technical skills might impact student ability, knowledge, or preparation. Career and technical education programs focus on coursework related to workforce preparation, and research on differences between traditional and nontraditional students may provide insights that could clarify the differences in student course outcomes found in the present study.

8. This study addressed the issue of age as it related to course delivery methods. A study that focused more on the relationship between age and student outcomes may provide insight into areas of need to support nontraditional students and improve the outcomes of this demographic. A future study may also focus specifically on traditional or nontraditional students and examine relationships between academic course outcomes and career and technical course outcomes.

In conclusion, the results of the present study demonstrate that there are relationships between student course outcomes and course delivery methods in career and technical education courses. It should be noted that the present study was a single institution study; however, significant differences were shown in student course outcomes in selected areas. This type of analysis should be completed on a regular basis by colleges in order to identify those differences between traditional, hybrid, and online courses that could lead to unequal student outcomes.

These studies should also review age and gender data, as these demographics were shown to have some impact on the outcomes of this study.

Career and technical education courses meet a need for both continuing education and for employers. Consistent outcomes regardless of delivery method ensure that a student who completes a career and technical education course meets established criteria that are consistent and of high quality. Alternative course delivery methods and career and technical education programs provide a wealth of research opportunities that change with the demands and skills of the workplace and should be reviewed regularly to ensure that degree holders meet necessary standards.

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APPENDIX

CAREER AND TECHNICAL EDUCATION PROGRAMS OF STUDY

Business – Accounting

Business – Agriculture Business

Business – Culinary Arts

Business – Hotel and Restaurant Management

Business – Management

Business – Paralegal Studies

Clean Energy Technology

Computer and Information Science – Computer Science

Computer and Information Science – Information Technology

Computer and Information Science – Networking

Engineering Technology – Biomedical Equipment Technology

Engineering Technology – Drafting and Design

Engineering Technology – Electrical/Electronics

Engineering Technology – Electromechanical Technology

Engineering Technology – Manufacturing

General Technology

Production Horticulture – Golf Course and Turfgrass Management

Production Horticulture – Greenhouse Management

VITA

THOMAS RAY SEWELL

Education:	B.S. English Education, The University of Tennessee, Knoxville, Tennessee, 1987
	M.S. Education Curriculum and Instruction, The University of Tennessee Knoxville, Tennessee, 1988
	M.S. Computer Information Systems, University of Phoenix, Online, 2004
	Ed.D. Educational Leadership, East Tennessee State University, Johnson City, Tennessee, 2016
Professional Experience:	Network Administration Instructor, South College; Knoxville, Tennessee, 1999 – 2002
	Department Chair, School of Technology, South College; Knoxville, Tennessee, 2003 – 2006
	Dean for Technical Education, Walters State Community College; Morristown, Tennessee, 2006 – present
Conference Papers:	Sewell, T. (2011). *Why Disruptive Technologies Fail to Disrupt Education.* Presented at Educomm 2011, Orlando, FL.
	Sewell, T. (2008). *Content Delivery Methods in Career and Technical Education: An Evaluation.* Presented at the College Teaching and Learning Conference, The Clute Institute, Orlando, FL.
Conference Presentations:	Mobile Technology Lab Costs: Emerging Mobile Technologies

and Gadgets Transforming Teaching, Learning, and the

Workforce. Presented at the Online Learning Consortium

International Conference (2014)

Using the OLC Quality Scorecard for Distance Education

Evaluation. Presented at the Regents Online Degree

Program Quarterly Meeting (2014)

Developing a Mobile Technologies Concentration in Computer

Science. Presented at the Middle Tennessee Skills Advisory

Council (2014)

Implementing Mobile Technology: Strategic Planning for

Mobilization: Mobile Devices and Apps for Increasing

Student Engagement and Outcomes. Presented at the 19th

Annual Sloan Consortium International Conference on

Online Learning (2013)

Models of Innovation: Educational Institutions as Incubation Hubs

and Centers for Sustainability. Presented at the Growing

the Appalachian Food Economy Forum (2012)

Graduation Rates of Career and Technical Education (CTE)

Concentrators. Presented at the MidSouth Educational

Research Association Annual Meeting (2010)

Honors and Awards: Chair, Tennessee Technology Deans' Council, 2008 – 2014

South College Outstanding Faculty Member, 2005