

12-2019

A Case Study on the Differences in Scores of Undergraduate Students in Traditional, Online, and Hybrid Classes

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A Case Study on the Differences in Scores of Undergraduate Students in
Traditional, Online, and Hybrid Classes

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Curriculum and Instruction

by

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Abstract

The primary purpose of this research was to ascertain whether there are variances in academic performance between students taking an educational technology course in traditional, online, and hybrid learning environments. As a secondary goal, the study assessed the differences in academic performance of male and female students in these classes.

All students in this study held an undergraduate status of junior or above. They had earned a minimum of 45 hours and had a minimum 2.75 overall GPA. These students also passed the certification test for state educators and had been accepted as teacher candidates of the College of Education in the Teacher Education Department at a state university in the southwestern part of the United States. The state university was designated by the United States Department of Education as a postsecondary minority institution. The students were given identical instructions and rubrics for a WebQuest project. Two different instructors taught each of the three types of classes in the study. The results were analyzed through quantitative investigation of the students' scores for their individual projects. The WebQuest scores of a total of 1,052 students were collected over 14 semesters (fall 2009 through spring 2016). The scores involved students in 48 one-semester classes (16 traditional, 16 online, and 16 hybrid). Each instructor taught the students in eight of each of the three types of classroom settings, for a total of 24 classes for each instructor. The study was a casual-comparative research (ex post facto). Findings from the study may provide educators and curriculum specialists a resource for building better curricula and instruction for undergraduate classes offered in either traditional, online, or hybrid format; encourage academic institutions and policymakers to invest in learning systems in a variety of forms; and encourage students to access online and hybrid classes without concern about quality implications.

Acknowledgements

I am especially indebted to my dissertation chair and dissertation committee. I appreciate the time, advice, and patience of my faculty advisor Dr. Betsy Orr and committee members Dr. Michael Daugherty and Dr. Jan Emory. In addition, I must acknowledge Dr. Wen-Juo Lo, who gave me sage advice on how to analyze my data.

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Chapter 1: Introduction

Background of the Study

The rapid growth in online education makes it vital to understand whether there are differences in learning outcomes according to delivery mode. Since 2012 distance growth has continued its steady increase, while traditional class enrollment has decreased. The Babson Survey Research Group reported that online classes grew “by 5.6% from fall 2015 to fall 2016.” (Seaman, Allen, & Seaman, 2018, p. 3).

This research study examined academic performance results of one project in an educational technology course. The study examined performance results of the students of two different instructors in all three modes of classes (traditional, online, and hybrid).

The purpose of the course was for students to focus on integrating current and horizon technologies into curriculum through the teaching and learning process. In the course, students explored critical thinking, problem solving, and digital communication through hands-on activities and application in the areas of robotics, web-based resources, digital tools M-learning (mobile learning), and social media.

Many studies have been conducted evaluating the final course grade of traditional students against that of online learners. Research on students’ traditional classroom outcomes versus online class outcomes has generated unpredictable results. Some studies have assessed the equivalent exam performance of traditional classroom students versus online learning students and found no significant difference (Elvers, Polzella, & Graetz, 2003; Hemmati, Omrani, & Hemmati, 2013; Hollister & Berenson, 2009; Jensen, 2011; McGready & Brookmeyer, 2013; Stowell & Bennett, 2010; Summers, Waigandt, & Whittaker, 2005). Other researchers have found significant results. When McCarty, Bennett, and Carter (2013) investigated the academic

performance of students in microeconomics courses, they found that the average final grades in the online classes were higher than the average grades for the traditional classes. Some studies report that exam scores were higher for traditional classes than online classes (Brown & Leidholm, 2002; Figlio, Rush & Yin, 2010; Parsons-Pollard, Lacks & Grant, 2008) while others report the reverse, that student performance is higher for online sections (Gratton-LaVoie, 2009; Harmon & Lambrinos, 2006; Means, Toyana, Murphy, Bakia, & Jones, 2010).

Most studies on the results of online courses concentrated mainly on exam scores and final grades, generating a variety of outcomes. Various researchers compared traditional and online course exam scores (Hemmati et al., 2013; Hollister & Berenson, 2009; Jensen, 2011; McGready & Brookmeyer, 2013; Stowell & Bennett, 2010; Summers et al., 2005). Some of these studies found no real differences in final grades between students using traditional or online classes. Russell (2001) confirmed the existence of no substantial differentiation between the two modes of study. Mosalanejad, Shahsavari, Sobhanian, and Dastpak (2012) discovered that even though there is no difference in abstract test scores, nursing students' online-course scores surpass their traditional-course scores in a factual examination. The researchers suggest that tests entailing memorization may be simpler online, possibly because of the students' ability to look up the appropriate answers.

An analysis conducted at Georgia Gwinnet College (Kakish, Pollacia, & Heinz, 2012, p. 11) found:

No substantial difference between academic results between student performance in a traditional classroom and students in a hybrid class. Based on the results of their findings, they discovered that there was no significant difference between the performances of the two groups, with a 95% level of confidence. The data showed that students in the traditional sections perform slightly better than their counterparts in the hybrid sections, but the differences are not statistically significant.

As the use of the internet for online and hybrid courses grows, higher education programs struggled with their response to growing directives for accountability. The federal government has expected accrediting organizations to supply evidence that students attain the expressed knowledge objectives (Suskie, 2004). Consequently, these powerful demands force instructors to record learning success, in addition to trying to continuously improve the learning results.

The growth of online and hybrid classes and of instructors' accountability requirements compounds the issue of providing quantitative proof of the success of online learning as compared to traditional classroom learning. This study investigated the academic results of traditional classroom learning weighed against that of online and hybrid learning. The research focused on the academic performances of students in traditional, online, and hybrid classes of two instructors, in a course in educational technology in a teacher education program. All results were derived using the same grading rubric for one specific technology project (WebQuest). The two instructors worked together to design the rubric and used identical instructional resources.

This research reviewed the learning environment literature and investigates past studies on the effectiveness of traditional classroom learning as compared to online and hybrid learning. It then explained the research setting and the methodology. In conclusion, the results are presented and discussed to deduce critical concerns, lessons learned, and directions for research in the future.

Purpose of the Study

The main purpose of this study was to ascertain whether there are any differences in academic performance between traditional, online, and hybrid-learning students who take the same educational technology course. As a secondary goal, the study assessed the differences in academic performance of male and female students in the same classes. The population sample

of this research constituted upper-class undergraduate students admitted to the Teacher Education program, who chose to attend either a traditional, an online, or a hybrid class.

This research compared traditional, online, and hybrid instructional modes of delivery of curricula by examining student performance on one specific WebQuest project. A similar study was conducted by Neuhauser (2002), who evaluated just two sections of the same course. Neuhauser analyzed the students' final grades from a traditional course and an online course. The same instructor taught the two sections using identical instructional resources. On comparing the final grades from the two sections, Neuhauser found no meaningful distinction, with the online students averaging only marginally higher. In comparison, this research compared the final WebQuest project grades of 1,052 students in 48 sections of the same course taught in traditional, online, and hybrid classes by two different instructors using the same project, instructional materials, and grading rubric for assessment.

This quantitative, causal-comparative (ex post facto) study explored pre-existing differences in groups of individuals, where both the effect and the declared reason have occurred previously and the study was in retrospect. The outcome dimensions measure the included students' final grade scores on one identical project required for an undergraduate educational technology class, with an identical rubric and the same two instructors grading all of the students' WebQuest projects in all three learning modes.

This study first used an independent samples t-test to see if there were any significant differences in academic performance between the students of the two different instructors. Normality was then tested with histograms and the Kolmogorov-Smirnov test. The results should indicate whether a significant difference exists in scores earned between the traditional students, the online students, and the hybrid-class students under the two instructors. The sample size was

large enough that the assumption of normality was not a concern. Finally, the homogeneity of variance was tested with Levene's test. As there was no significant difference in the performances of the students of the two instructors, a two-way ANOVA was conducted to determine the effect of the three types of course delivery: onsite traditional, online distance, and hybrid classes. This was used to test if there was a meaningful variance in the scores on the WebQuest project by all the students and/or the scores on the WebQuest project between class delivery modes and between male and female students.

Significance of the Study

The results of this study may be important to others as it is empirical research conducted on a subject that is relevant to academic and social policy. The results may aid educators in building better curricula and instruction for undergraduate classes offered in traditional, online, and hybrid formats; in encouraging academic institutions and policymakers to invest in learning systems in a variety of forms; and in reassuring students to enroll in online and hybrid classes without concern about quality implications.

Educational Foundations

To determine the measurable outcomes of teaching and learning, evaluation is a necessary final step in the educational process (Vandever & Norton, 2005). It can take a variety of forms. Formative evaluation tools and strategies are diagnostic and can assist faculty in identifying areas of deficiency or difficulty for students; these diagnostic tools allow corrective intervention designed to facilitate further learning (Vandever & Norton, 2005). Summative evaluation methods refer to the data collected at the end of an activity or course with the focus on the event and all the work completed (Bourke & Ihrke, 2005). For the purposes of the current study, the researcher used a formative method of evaluation for one required project, to

determine mastery of content-specific concepts by traditional, online, and hybrid-course undergraduate students in a required educational technology course.

Acquisition of teaching knowledge begins with a foundation specific to the discipline and progresses to mastery of the content. Constructivism provides a solid framework for the educational processes of teacher education, with each subsequent course building on previous knowledge. The use of content-specific assessments to evaluate knowledge levels serves as a building block to construct the concepts of teaching. Without the foundations of teaching, additional concepts within the discipline are more difficult to acquire. For the current study, the combination of knowledge acquisition and constructivist views supports the educational practice of using uniform assessments to analyze the results of traditional, online, and hybrid learning.

Research Design

This quantitative, causal-comparative design sought to determine the relationship between students' scores on one content-specific education project, a WebQuest. The study covered seven years of traditional, online, and hybrid technology in education classes, taught by two instructors at a regional university in the southwest United States. The independent variable was the individual students' score on the WebQuest project administered during semester, in a traditional, online, or hybrid class. The dependent variable was the dichotomous outcomes. Fourteen consecutive semesters from fall 2009 to spring 2016 of students' WebQuest scores provided the data for analysis. The students' scores were obtained from the two instructors, who taught eight of each type of class (traditional, online, and hybrid) over the fourteen semesters.

Research Questions

The research questions guiding the inquiry are:

1. Was there a significant difference in academic outcomes among undergraduate baccalaureate students engaged in traditional, online, and hybrid instruction?
2. Was there a significant difference in academic performance between genders in traditional, online, and hybrid instruction?

Assumptions

The following assumptions were made for the purposes of this research study:

1. The data received from the records of student scores accurately and appropriately reflect the scores of undergraduate students in traditional, online, and hybrid educational technology classes between fall 2009 and spring 2016.
2. The Technology in Education faculty committee established the reliability and validity of the standardized assessment rubric for the WebQuest project.
3. The students could read and comprehend the English language at the proficiency level required to comprehend the materials.
4. All students in the study sample in the three types of classes (traditional, online, and hybrid learning) received the same instruction from semester to semester, from the same two instructors.
5. The grading of all assessments for all students was consistent, following the requisites of the same rubric.

Delimitations

These findings may not be generalizable to the larger population of all undergraduate students in traditional, online, and hybrid education classes. The population sample was comprised of upper-level undergraduate teacher candidates, who might be expected to perform above the mean. Admission to the Teacher Education program was a prerequisite to taking the

Technology in Education course. The admission requirement for the program was a minimum GPA of 2.75. The students also had to pass the certification test for state educators and then be accepted as teacher candidates in the College of Education. The students were allowed to participate regardless of gender, race, nationality, or religious affiliation. Students who enrolled but did not complete the course were not counted.

Limitations

There were several limitations in the study. First, the study considered only one university, thus limiting the results to the students at that institution. Second, since there was no first-hand teacher observation of the work-in-progress of online students, there was no means of establishing whether the online students completed their projects independently, without outside help. Third, because the curriculum in this class was technology, students taking the class online might have been more advanced and confident in their computer technical skills than those students who chose the traditional or hybrid format.

Another possible limitation was the teaching styles of the two different instructors.

Definition of Terms

Asynchronous: In digital communication in online education, students could access course material and engage with instructors and other students from geographically disparate locations at different times, but not simultaneously.

Blended (or hybrid) course: A course that combines traditional attendance in class and online learning. The hybrid course included the benefits of the best features of both traditional and online learning.

Distance education: Education delivered remotely through a learning management system, such as Blackboard, with electronic communication via the internet to present classes online.

Face-to-face learning: Education delivered within each other's sight or presence, having met and/or talked. It is also referred to as *seat time*, meaning the students sat in a traditional classroom for learning.

Hybrid course: See *Blended (or hybrid) course*.

Hyperlink: An electronic link that connected one marked place in a document to another in the same or in a different document.

No significant difference: No significant difference (NSD) findings are as important as significant difference (SD) findings. However, instead of showing us that the two compared items are different, and possibly how they are different, they showed us that the two compared items are not different.

Online learning: This is a method of distance education where class is delivered online over the internet and can be retrieved from a computer or other electronic device with a Web browser.

Projects: An organizing strategy for educating students. Students will typically be assigned a project or series of projects that required them to use diverse skills—such as researching, writing, interviewing, collaborating, or public speaking—to produce various work products, such as multimedia presentations, video documentaries, WebQuests, PowerPoints, or other technology-based assignments.

Rehearsal strategy: Using ideas already know to help remember another idea.

Traditional learning: See *face-to-face learning*.

Web-based education: Web-based education (sometimes called e-learning) is anywhere, anytime instruction delivered over the internet.

WebQuest: A WebQuest is an inquiry-oriented lesson, where students interact with hyperlinked Web pages for information on the lesson's subject.

Summary

The purpose of the study is based on the difference in academic success for a specific WebQuest project in an undergraduate educational technology class, according to mode of delivery: traditional, online, or hybrid classes. This chapter also provided the assumptions, delimitations, limitations, and significant terms that would be used throughout this study. The next chapter will provide a review of related literature on the effect of traditional, online, and hybrid modes of learning on student performance.

Chapter 2: Review of Literature

Research on the effect of traditional, online, and hybrid modes of learning on student performance has produced varied results. Some studies have shown significant differences, while others have not. The intent of this literature review was to discover whether other researchers' findings are consistent or inconsistent with the no significant difference phenomenon described in Russell's (2001) book. Russell's findings indicate minimal outcome variations between traditional courses and online courses.

The review focuses on research published between 1995 and 2016, in recognition of the significance of Microsoft Windows, a platform offering the necessary features to enhance web-based education. The search phrases "online versus face-to-face education technologies," "online education versus traditional classroom learning," and "comparing hybrid education with traditional classroom and online education" aided in locating the most useful sources. Database sources, including ERIC and Academic Search Premier, provided sites for information retrieval, while Google Scholar offered the necessary interface to search the internet for sites containing original texts. The review closely focused on 105 studies that compared traditional learning, online and hybrid learning.

Background

Access to higher education can be achieved in various ways. One way can be to enroll in a traditional classroom program, which involves attending classes and accessing educational materials within the learning institution (Chen & Jones, 2007). Alternatively, students can enroll in an online program, whereby they complete schoolwork and communicate over the internet, interconnected through various communication technologies. Some educational institutions may also blend the two by offering both traditional and online coursework in a hybrid or blended

course. Arbaugh (2005) and Chen and Jones (2007) assert that most institutions of higher learning have adopted all three systems in their learning environments.

While most of the debate relating to the efficiency of traditional, online, and hybrid education systems revolves around student performance and satisfaction, other issues of concern to researchers relate to technical expertise, at both a personal and an institutional level. Personal technical issues include skill level and attitude of the student towards the mode of delivery. Institutional issues relate to infrastructural development. A third area of discussion about the differences between traditional, online, and hybrid mode of delivery relates to flexibility, communication, interaction, learning, and skills development (Wills & Stommel, 2002).

Traditional learning. Since the beginning of public education, traditional classroom learning has been the basic and most commonly utilized instructional model. In this model, a typical university classroom environment involved a professor providing a lecture to students, who listened and took notes on the information offered by the lecturer. The crucial element of this mode as compared to online learning was that it provided a platform for immediate interaction between the lecturer and the students. O'Malley and McCraw (1999) discovered that technological improvements leading to the advent of technological devices, such as mobile phones and computers, encouraged a shift in popularity from traditional classroom learning to online learning. They added that the most important technological discovery was the computer and the internet. However, this shift did not mean that the traditional classroom lost its popularity in educational circles. Numerous studies (Kearns, Shoaf, & Summey, 2004; Maki & Maki, 2002; Maki, Maki, Patterson, & Whittaker, 2000) have found that students are more satisfied with traditional learning compared to online learning. Most research studies that compare traditional and online instructional modes of learning, using final grades instead of final exam scores,

showed that students in the traditional classroom received higher scores (Ashby, Sadera, & McNary, 2011; Jaggars, Edgecombe, & Stacey, 2013; Terry, 2007; Washull, 2001).

Ashby et al. (2011) reported that students in traditional classes had higher final exam results compared to those in online and hybrid classes. Washull (2001) found a trend toward higher final exam scores for students in traditional settings compared to those in online classes. Terry (2007) also showed that traditional-classroom test scores are higher than online-course scores. Some research studies have found higher final exam scores in online and hybrid courses compared to the same courses in a traditional setting (Lim, Kim, Chen, & Ryder, 2008; Ni, 2013).

Final grades, as opposed to final test scores, have not received as much attention in studies on academic differences in traditional, online, and hybrid learning. Here, the outcomes are less conflicting: most studies provided evidence for the superiority of the traditional method, although some investigations have found no meaningful difference in final grades between delivery modes (Akyol & Garrison, 2010; Kirtman, 2009).

Online learning. The origins of distance education can be traced back to the nineteenth century in continental Europe. The practice commenced with learning carried out through postal service correspondence (Freed, 2004). Much later, with the advent of the internet and related technology, the same practice became web-based. Online education occurred when teachers and students are geographically and technologically separated from one another, but connected for learning via the internet. However, the distance between them was not defined, and need not be large enough to inhibit traditional classroom education. Freed (2004) suggested that online learning can occur when students and instructors inhabited the same learning institutions as well when students are located far away. Although video conferencing is closely related to the

classroom experience, online learning has transformed learning into an anytime, anywhere experience. Online study can reach wider audiences and provided students an opportunity to study while still in their home or at work. It has internationalized education and addressed the barriers associated with human diversity factors, such as social, economic, or cultural background. The recent advancement in online learning has led several scholars to predict that the traditional mode of prearranged face-to-face classes will vanish in due course (Arbaugh & Duray, 2002; Hiltz, 1993; Kearns, Shoaf, & Summey, 2004; Maki & Maki, 2002).

Ponzurick, Russo, and Logar (2000) found that the increased prevalence of online learning was correlated with the advent of radio and other media that make distant communication possible. Computer-mediated learning technologies—such as video conferencing, online and offline video instructional learning, and two-way audio and video web-based communication— improved the possibility of success. Brown and Liedholm (2002) assert that although online learning has existed for a long time, it has yet to be universally incorporated into learning practices. Most of the challenges in the application of online learning related to the quality or clarity of instruction compared to traditional classroom learning. Other questions associated with online learning are the relative cost of attendance, characteristics of the students, characteristics governing the efficiency of the instructions, and performance of the students. Studies on the efficiency issues have not provided answers to these queries (Noyes, Garland, & Robbins, 2004; Scheines, Leinhardt, Smith, & Cho, 2005).

Although faced with seemingly insurmountable opposition and criticism due to its reliance on expensive and complicated technology, online learning has proven to be superior in terms of quality and student performance compared to traditional classroom teaching in some studies (Arbaugh & Duray, 2002; Wills & Stommel, 2002). Indeed, Lim et al. (2008) discovered

that students' test scores are higher in online classes than in traditional courses. Online learning mimics the features of traditional education, such as lecture information, which enable students to participate from anywhere they have access to a computer and eliminate the costs of commuting. In addition, from an environmental standpoint, students can access learning materials easily from technological data storage devices, such as flash drives and portable personal computers, instead of the hard-copy paper materials traditionally used in face-to-face courses. Furthermore, the internet has facilitated access to virtually all forms of learning materials and sources.

Acknowledging that technology is crucial in promoting educational practices, Schunk & Ertmer (1999) asserted that incorporating online learning could also have far-reaching impacts on employers, because most companies have to equip their employees with the skills necessary for competitiveness in the current technological climate.

Hybrid learning. In hybrid or blended learning, students attend a traditional class part of the time and participate in an online distance education class for the remainder. A study at Central Florida University by EDUCAUSE Center for Applied Research found that blended courses are more likely to improve student learning outcomes while lowering attrition when compared to online classes (Dziuban, Hartman, & Moskal, 2004).

In 2011, researchers monitored 605 college students taking the same statistics course at six different public universities. One group took the course in a traditional classroom, while the other students took it in a hybrid format. The students were pre- and post-tested. The hybrid group performed marginally better, but this result was not statistically significant (Bowen, Lack, Chingos, & Nygren, 2012).

In yet another study involving a medical terminology course, the researchers compared traditional and hybrid courses using quantitative methods to determine student opinions as to whether the two modes of course delivery met the course objective. Satisfaction was significantly stronger for students in the hybrid courses (Martin, Kreiger, & Apicerno, 2015). Gangone (2015) discusses the results of converting a traditional class to a hybrid format, comparing the hybrid students' performance results on a quiz to the students' performance results in the two remaining traditional-classes. Students in the hybrid section in most cases performed better than students in the traditional classes. Finally, a meta-analysis conducted by SRI International for the U.S. Department of Education in 2010 examined studies of hybrid learning from 1996 through 2006 and found that students in blended learning classes outperformed those in fully online or fully in-person classes (Means et al., 2010).

Gender. Gender was also a consideration in online learning. Chen and Jones (2007) reported that gender significantly correlated to student academic achievement in online learning. In addition, Alstete and Beitel (2004) found that females outperformed males in online learning classes. Bidjerano (2006, p. 6) did a study to examine gender variations in the application of self-management strategies for learning. "The study discovered clear-cut gender differences in the use of six strategies: Female students surpassed male students in their ability to use rehearsal, organization, metacognition, time management skills, elaboration, and effort. The analysis did not indicate statistically significant differences regarding help seeking, peer learning, and critical thinking skills." The findings of the study are consistent with conclusions from earlier research indicating that female students tend to exceed male students in the use of learning strategy. (Niemi-virta, 1997; Wolters, 1999).

The future of web-based learning. Despite many studies that have supported the efficacy of online education, many still question its legitimacy, a factor which may be challenging to overcome (Thorpe & Gordon, 2012). However, considerable technological improvements have led to innovations that overcome such challenges. Improved communication technology has eliminated many obstacles affecting online learning. A recent study by found no significant difference in relation to the students' visual, auditory and tactile preferences of learning methods (Murat, Bülent, & Selahattin, 2016). The explosion in adoption of online learning has advantages as students can proceed through the course material at their own pace. A disadvantage was the lack of in-person contact with the instructor and classmates. Online learning was no longer an idea but a reality that has enabled students to complete their classes and achieve educational qualifications at a rapid pace. Online learning has also helped in changing the way education is perceived, received, and managed by various stakeholders. Many proponents of online education remain optimistic that online education will assist in changing the way different people view education. The Online Report Card, showed a continuous increase of online and hybrid courses being offered by postsecondary institutions. The same report showed a decline in traditional course enrollment beginning in the spring 2011 term (Babson Survey Research Group, 2015).

Debates on the Differences Between the Three Course Delivery Modes

The differences between the classroom-instruction mode of learning, the online-instruction mode, and the hybrid format have been the subject of many studies. The arguments put forth in these studies on the advantages and disadvantages of each mode vary depending on the context of the studies. In his study, Shale (1995) posited there is no difference in learning material whether the student meets physically with the lecturer and when the two parties are physically separated. Shale asserted that regardless of the media used, online education and

classroom learning should produce the same results when applied to various students. On the other hand, research by Maki and Maki (2003) on online learning aptitude among students found that online-based learning provides a superior experience, because it offers an opportunity for the educator to impose deadlines and provide feedback without organizing a face-to-face meeting.

The debate on the efficacy of online learning compared to tradition classroom lectures comprised much of the web-based education literature. Some studies provide evidence of the ability of online-based education to provide a learning experience equal to that of traditional classroom instruction (Arbaugh, 2005; Chen & Jones, 2007; McFarland & Hamilton, 2005; Urtel, 2008; Stanley, 2006; Summers et al., 2005). However, other studies have reported differences in the ability of online courses to provide the same quality of education (Logan, Augustyniak & Rees, 2002; Maki & Maki, 2002; Maki et al., 2000; Urtel, 2008). Varying opinions and conflicting research results have suggested that student factors contribute to the variation in efficacy between the two forms of education (Jahng, Krug, & Zhang, 2007; Sitzmann, Kraiger, David, & Wisher, 2006). The research on the benefits of tradition classes compared to online courses are not definitive. Some researchers support online-based education as superior to classroom-based education due to its flexibility and more student-based approach Limitations (Arbaugh, 2005; Chen & Jones, 2007; McFarland & Hamilton, 2005; Stanley, 2006; Summers et al., 2005). Others protested that online study has yet to prove its superiority due to the distance created between the educator and the learner, as well as between learners and their peers (Logan et al., 2002; Maki & Maki, 2002; Maki et al., 2000; Vandever, & Norton, 2005).

One significant publication that has provoked the debate is Russell's (2001) *No significant difference: A comparative research bibliography on technology for distance education* published by the University of North Carolina. Russell compiled a list of 355 online

learning studies showing insignificant differences between the two modes of learning. In assessing those online courses that applied technology for teaching in addition to an online mode of learning, he concludes that appropriate and practical application of technology in learning does not negatively affect instruction. Russell's argument is that the quality of learning that occurs in a certain course is independent of the medium of technology used. His argument favors the idea that any difference in student learning is related to pedagogical practices. He concluded that effective teaching is possible in any mode of learning provided the student and the instructor are invested in the education process. He adds that students enrolled in online learning programs might experience challenges related to their technological inadequacy or separation from their lecturers. However, Bernard and Abrami (2004) argue that Russell failed to use studies of quality and rigor but rather based his research on insignificant studies directed towards finding evidence for supporting the personal opinions of those who proclaimed no significant difference.

Considering such factors as those identified by Russell could yield differences in the results of comparative analyses. Logan et al. (2002) asserted that the web-based learning does not offer the student-centered learning of traditional classroom-bound education. They noted that students in traditional classes are forced to take responsibility for their work and are coerced to work by their instructor, unlike online students. However, Atkinson and Hunt (2008) indicated that online education reinforces knowledge because the students are encouraged to seek their own answers to the questions that require their attention, for the lecturer is not nearby to respond to their questions promptly. This provided students an opportunity for additional research on the topic of interest, which could provoke weighty and comprehensive responses. Thus, students can participate directly in the enhancement of their academic knowledge instead of relying on the directives and instructions provided by lecturers (Summers et al., 2005). Despite these

advantages, the remote nature of online learning created structural requirements unlike those of traditional classroom instruction.

The hybrid course design has offered the benefits of both traditional and online class formats. In hybrid classes there is still some social contact with other students and the instructor but at the same time students can reduce commuting time and expenses. Hybrid classes offer the benefits of personal interaction with instructor and peers: the opportunity to receive first-hand explanation of assignments and solicit help from their instructor with any of their questions about the coursework. In addition, they can learn to improve technical skills and communicate in multiple formats. Hybrid classes also can give students more flexibility in their personal schedules.

Student performance. Students apply the same strategies to ensure success in their academic work, regardless of the mode of delivery of their course. Most of the research relied on the evaluation of student performance designed around strong pedagogical standards (Summers et al., 2005; Logan et al., 2002; Olson, 2002) while other studies focused just on final grades (Urtel, 2008; York, 2008). However, fundamental differences exist in the evaluations and rubrics used for grading by different instructors in comparable courses. Urtel (2008) downplays the efficiency of academic tests in measuring differences in student performance because evaluations vary in their capability to record genuine learning. However, Suskie (2004) asserts that exam results are the most effective indicators of the differences in academic performance between students undertaking online-based courses and classroom-based courses.

Studies on the effectiveness of online learning as measured by student performance have returned conflicting results, some positive and some negative. However, the variation is related to other factors, such as student motivation level, time and availability of the supportive

infrastructure, and access to technological devices that ensure efficiency in online learning (Vogt, Atwong, & Fuller, 2005). Research by Maki and Maki (2002) found that online education proved superior in terms of quality and student performance compared to traditional classroom learning. One reason cited as promoting the performance of online students is technology, such as the internet, that provides wide and immediate access to the academic information necessary to improve performance. This is contrary to the traditional mode of education where learners, while sitting in the classroom, are limited to the information received from their educators.

However, Shachar and Neumann's (2003) review of 86 studies conducted between 1990 and 2002 revealed a dismal performance for students enrolled in online learning compared to those in traditional classroom lessons. Bernard and Abrami (2004) affirmed this finding in a review of more than 500 studies, when they found that students in the traditional classroom performed better in terms of attitude and retention than students in online classes. Another study, by Allen, Bourhis, Burell, and Mabry (2002), analyzed 25 studies on online education, showing that most students preferred to return to the classroom after completing an online course, terming it more convenient for learning. Gallagher and McCormick (1999) found that although students recognized that they receive a good education through online learning, they seem more comfortable with traditional teaching techniques. Similarly, Ponzurick et al. (2000, p. 5) report that students taking a graduate marketing education course indicated that while web-based courses are convenient, they believed them to be neither effective nor satisfying. Studies show that convenience is one of the reasons many students cite for taking online courses. Hiltz (1993, p. 82) reports that almost three quarters of students stated that "online courses are preferable, as they are 'more convenient' than traditional instruction." Several other studies have found convenience and flexibility to be the main reasons that students select online learning courses

(Aslanian & Clinefelter, 2013; Benbunan-Fich, Hiltz, & Turoff, 2003; Farris, Haskins, & Yemen, 2003; Hittelman, 2001; Noel-Levitz, 2006). However, introducing online classes based solely on convenience is both ethically and academically problematic.

Students involved in online education store most of the academic information in technological gadgets, such as in their computer's memory. This implies they may not find it necessary to encode the information in their natural memory to help them digest the knowledge by taking notes on the material, as is necessary in a traditional class. Kiewra (1987) found that taking notes helps create internal storage in students' memories. Online learning students are more likely to fail academic tests and assignments if they save the studied information on their gadgets instead of in their memories. Teachers in traditional classrooms often use various methods of instructional design, such as classroom discussion, guest speakers, and videos, that encouraged students to analyze instructional materials. The benefit of this was supported by Brown and Liedholm (2002), who theorized that students enrolled in traditional education make full use of their natural memory because they have no access to the artificial gadgets of memory storage. This means that those in the traditional education system have a relatively high probability of performing better in academic tests, which required the application of their natural memory to provide responses to various queries.

In another study comparing traditional lecture courses and online courses, Scheines et al. (2005) found that the majority of students who attended lectures in a traditional classroom performed relatively poorer than those using online modules in the same course. However, the researchers did refer to other studies that showed either the opposite result or little difference in the performance (Brown & Liedholm, 2002; Carey, 2001; Yumuk, 2002). Focusing on classroom education, Yumuk (2002) found that small recitation lectures are more reliable and effective than

large and prolonged lectures delivered to a larger audience. Most of the reviewed literature did not provide specifics as to the audience size of the traditional classroom lecture, which prevented accurate comparative analysis of traditional classroom and online learning. However, a comparative study by Arbaugh and Duray (2002) of web-based programs, wherein one class involved face-to-face meetings while the other was totally online, found that large class sizes in traditional classrooms negatively impacted the perceived results of learning.

Noyes et al. (2004) asserted that online students failed to apply the required effort to enhance their performance due to the perception that online education entails relatively more work than traditional classroom instruction. Thus, they conclude that low-performing individuals are at a disadvantage if they choose online education. Brown and Liedholm (2002, p. 444) discovered that “students in online-based courses worked harder” but understood fewer concepts than those attending lectures in the traditional classroom. The researchers account for differences of technology, such as variations in typeface for final submissions submitted electronically versus in hard-copy and in the resolution of computer monitors as possible causes. The research found that some students viewed submitting their assignments through computer-mediated channels to be more difficult than preparing a hard-copy.

Finally, Logan et al. (2002) suggested that the content of discussion could differ between the traditional classroom and online forms of education because instructors normally formatted and purposively transformed classroom lectures to fit the confines of web-based transmission. Ideally, online content should encourage participation by all students involved in the online course while considering the differences among students in learning styles and time constraints.

Learning outcomes. Researchers have found varying results when focusing on the learning outcomes of students participating in traditional and online systems of learning. Their results have identified trends, the factors required for success, and the advantages and disadvantages related to web-based learning (Hollenbeck et al, 2005). Multiple examples of mixed results exist. For example, Vogt et al. (2005) found that students achieved the same level of proficiency in a communication course in both traditional and online classes. Benbunan-Fich et al (2003) found no significant variation between the two systems for students enrolled in a nursing course. Similarly, Sankaran, Sankaran, and Bui (2000) report no significant difference in pre-test and final exam results between students enrolled face-to-face and online. In his 1993 study, Hiltz found the same results in almost all courses except computer science, where traditional classroom-based students performed better than their colleagues in web-based classes.

However, a study carried out in a web-based undergraduate nursing program by Kearns, et al. (2004) found that students in online courses scored significantly higher in their examinations than did students enrolled in traditional courses. The same results were derived in a similar study on a psychology class by Maki and Maki (2002). The opposite results were found in Buckley's (2003) study on a nutrition course, in which online students performed less well than their face-to-face counterparts in the final examination. Wang and Newlin's (2000) comparative study affirmed that students enrolled in a traditional classroom scored higher in a statistics course than their colleagues in a web-based statistics class.

Researchers Xu and Jaggars (2011) investigated enrollment patterns and academic outcomes in traditional, online, and hybrid courses among students who enrolled in the Washington State community and technical colleges in the fall of 2004. The students were tracked for nearly five years, until the spring of 2009. The results were similar to those found in a

parallel study in Virginia (Xu & Jaggars, 2010). Both studies found that students with stronger academic preparation were more likely to enroll in online courses. Regardless of their initial level of preparation, however, students were more likely to fail or withdraw from online courses than from traditional or hybrid courses.

Studies that compare student achievement between online and traditional classes have some inconsistent findings as well as some recurring conditions (Bray, Harris, & Major, 2007; Brown & Leidholm, 2002; Figlio, Rush, & Yin, 2010; Gratton-Lavoie & Stanley, 2009; Harmon & Lambrinos, 2006; Means et al., 2010; Parsons-Pollard et al., 2008; Shachar & Neumann, 2003). In almost all these studies, the students freely selected to enroll in either online or traditional classes. Since the characteristics of online students may differ from their traditional counterparts, in terms of such characteristics as GPA, age, marital status, maturity, and learning style, this type of selection could prejudice the results on academic achievement (Allen & Seaman, 2013; Bray et al., 2007). Also, the procedures involved in the measurement of student achievement are mostly uncertain. Many online examinations are given with little or no supervision, and so provide more opportunities for dishonesty; whereas in traditional classes the examinations are supervised, which minimizes any collaboration in test taking. There is evidence that the incidence of overall dishonesty (including dishonesty in exams, papers, projects, and other types of evaluation) in online classes is as much as four times greater than that in traditional classes (Lanier, 2006; Moten, Fitterer, Brazier, Leonard, & Brown, 2013). If unethical behavior is more prevalent in online classes than in traditional classes, differences between the two groups in student achievement should be taken with care.

Technical Issues

A fundamental issue facing instructors of online courses is the technical skill of the students, especially in matters related to computer skills. Su (2005) discovered that differences in the skill levels of students constitute the most challenging factor that online instructors are likely to experience. Although this factor may not be viewed as critical by some, it acts as a predictor of results for students taking online courses, whereas possession of technical skills is not critical for students in traditional classroom-based courses (Martins & Kellermanns, 2004). Other technical issues emanate from various factors, such as infrastructural requirements, technology requirements, interaction and social environment, flexibility and accountability, communication, and learning and skills development (Su, 2005).

Infrastructure requirements. The advent of the internet and webcam and the increased use of computers for various learning activities have enhanced the explosive popularity of online learning. According to the Babson Survey Research Group more than a quarter of higher education students (31.6 percent) were enrolled in least one online course in 2016 (Seaman et al., 2018), p. 11).

Contrary to classroom learning, online technology required investment in physical infrastructure as well as training of students to handle online studies. Consequently, some institutions failed because they lack the necessary resources to promote online learning. For instance, research on online learning conducted on Kentucky's higher education system found that the faculty was willing to implement online courses but they didn't have institutional support (Wilson, 2001). In arriving at this conclusion, Wilson (2001) focused on four phenomena: (a) policy context for distant learning, (b) attitudes towards incorporating technology, (c) adoption barriers faced by learning institutions, and (d) the proficiency of the employees in online

instruction skills. The failure to implement online learning in Kentucky was because of lack of conviction in the instructional capability of the teaching staff and their personal commitment to new developments in education. According to the respondents in this research, lack of support as well as insufficient hardware and software are the central inhibitory factors in the adoption of online learning. However, Wilson (2001) failed to consider that some learning institutions would adopt instructional technology targeted towards improving student performance. In fact, one third of the respondents indicated they were satisfied with the technology, computer-support devices, and the instructional design support in their institutions (Wilson, 2001).

Sherry (1996) asserted that the factors making it difficult for most institutions to implement online learning included under preparedness and the perception that most instructors might not embrace changes. Time was also a limiting factor, because time spent in training online instructors and acquiring equipment for online-based learning could be utilized for classroom learning.

However, other researchers, such as Webster & Hackley (1997) and Sonner (1999), view personal factors as the most crucial for the implementation of online studies. This provides some level of contradiction to Sherry's (1996) and Wilson's (2001) studies, which emphasized the weighty impact of the lack of infrastructural support over personal willingness.

Interaction and Social Environment

For most learners, social interaction was crucial to any successful learning exercise. Kearns et al. (2004) showed that students needed to share their experiences not only with educators but also with their peers. This does not imply that online learning programs were devoid of interaction. McKissack (1997) asserted that some online learning systems used message boards and video conferencing to link course mates to each other as well as to their

instructors. Thus, individuals involved in learning have an opportunity to discuss academic issues online. Additionally, many online classes involved people worldwide, which provided learners with an opportunity to speak to and interact with other learners globally. On the other hand, the individualistic nature of long-distance learning as well as its low interactivity did not motivate all learners.

Schunk & Ertmer (1999) and Logan et al. (2002) posited that most learners require the intervention of an authoritative figure capable of motivating them to participate actively in classwork and invest more time and concentration on assignments and studies. Students under such conditions performed better than those relying on self-efficacy. Online education was efficient for learners who could exercise self-control and motivation, because there was minimal supervision. Bernard and Abrami's (2004) research showed that online learning has deeply ingrained challenges. The separation of the response to learning and the real action of learning lead to myriad challenges. The two researchers asserted that online learning ignored the characteristic five-factor model of learning, characterized by the presence of purposeful educational leadership, active involvement of the student and the teacher, direct challenges to the student, and maintenance of a positive learning climate between the student and the instructor. These factors are often missing in web-based learning due to the distance challenges between the learner and instructor. The study affirmed that the fundamental factor in ensuring effectiveness in teaching was for the learners to maintain a close association with the teaching staff. This implied that wherever there was a physical separation between the learner and the educator, the lecturer's responsiveness to the needs of the learner was insufficient, the flexibility of classroom dynamics was ignored, and the efficiency of communication was relatively inadequate compared to a traditional system.

A study conducted by Thorpe & Gordon (2012) found the participation level of students involved in online education classes has decreased, with most students completing their assignments at the last minute. Most ignore the online interactive forums meant to involve them with their classmates. Interactive discussion and cooperation between online students did not work well because most of the students followed their own schedules. This undermined the spirit of collaborative work (Thorpe & Gordon, 2012). On the other hand, groups that met face-to-face to handle their projects performed relatively well. Their timeline was also superior and more organized compared to those that communicated solely through the internet. However, this study does not identify other factors that might affect the performance of the online group work, such as the size of the group involved, or the availability, accessibility, and affordability of the technological paraphernalia applied in online learning (Sankaran et al., 2000).

As noted by Thorpe & Gordon (2012) online students often ignore group work because they perceived other students as independent rather than part of a learning community working collectively towards a common goal. This is supported by Kearns et al. (2004), who argued that the most productive and efficient personal and learning advancement arises from group work and cooperation. Other studies, such as McKissack (1997) and Buckley (2003), supported the relevance of group work. In fact, Buckley (2003) asserted that learning could be viewed as a social-cognitive and interactive process, with intellectual growth exclusively tied to social interactions. However, this was disputable because such ideas undermined the integrity of the online education system in the provision of quality education among the participants. Additionally, not all social interactions possess the capacity to provide quality learning. Some academic discussion groups may not be keen on educational tasks, which can affect the

performance of the whole group. Clark-Ibáñez and Scott (2008) stated that online education provided a perfect environment for students who are shy and lack confidence in public settings.

Some scholars argued that the media of interaction provided by online-based forms of learning, such as email and video conferencing, cannot measure up to the standards offered by in-person communication, offered in classroom interaction (Summers et al., 2005). The failure of online-based learning forums to provide interactivity could make learners feel alienated and isolated from the learning systems (Gallager et al., 1999). The content of discussion might also be different between students enrolled in traditional classroom-based education and those in online education. Logan et al. (2002) noted that students taking classroom sessions asked logistical and technical questions, whereas online students dwelled on content-based questions.

This indicated that the classroom students had a higher probability of understanding the instructions and requirements of various tasks. Summers et al. (2005) viewed comprehension as the greatest contributor to the relatively low performance of online students compared to classroom-based students. The learning situation can become worse if online students did not receive direct instructions, concern, and interest from the instructor. Online teaching was an emerging and effective form of teaching, considering the recent advances in the digital world, new practices and strategies continue to be developed in an effort to improve its effectiveness. Although the practices required for quality teaching are the same across the two systems of learning, translating the elements of teaching into an online environment has presented a unique challenge (Summers et al., 2005).

Flexibility and Accountability

Brower (2003) reports that an online course allows students to work asynchronously. That is, contrary to the on-campus system, where students are restricted to completing their

academic work in a classroom, those taking online courses have the freedom to complete their academic work at the destination and time of their choice. The asynchronous design allowed students to study “at their own pace, reread, or review the components of the lectures they might find challenging. The environment also enabled them to rest when tired and work during times conducive to their learning” (York, 2008, p. 161). However, the ability of students to complete their academic assessments required personal commitment and management of time. Thorpe and Gordon’s (2012) study of British students enrolled in a nursing course found the students complained that the responsibility related to temporal accountability was difficult for them.

Most of the students also complained that the requirement to sit in front of computer screens could be detrimental to their health, especially their vision. They negatively compared the use of computers to using books that could be carried anywhere (Thorpe & Gordon, 2012). However, the advent of portable gadgets, such as iPads and Palmtop computers, has solved the issues related to portability (Maki & Maki, 2002).

Thorpe & Gordon (2012) noted that lecturers offer mandatory discussions because students do not participate willingly. This may be a convenient way for lecturers to ensure students completed their assignments, but the students might feel discriminated against, making them perform dismally due to lack of self-motivation or free will. Other scholars, such as Sitzmann et al. (2006) and Brower (2003), noted that imposing mandatory discussion sessions for students taking online courses implied a limitation of their freedom of choice.

Although online learning may encourage students to ignore their duties because of the freedom it can provide, it nevertheless can provide students the freedom to take responsibility for their actions through the proper management of time as a resource. This is especially crucial for working students who need to balance their time between work and coursework. However,

Sitzmann et al. (2006) warned that students struggling to be self-motivated might face various challenges. They found that students in traditional courses were more organized and more likely to complete their tasks on time than their online peers. One of the reasons cited is the close watch provided by the lecturers, which encourages students to complete their academic assignments on time. On the other hand, close monitoring by lecturers might be intimidating for learners, making them complete the assigned tasks due to coercion and not due to personal willingness. Such tasks may be of low quality and reveal deterioration of performance.

Communication

The fundamental determinant of the successful incorporation of online learning into the existing education environment was communication. Communication, in this case, was technologically mediated, contrary to traditional communication whereby learners engage educators in face-to-face interaction. However, students most often communicate asynchronously. New developments that have improved the efficiency of internet technology included online chatting and video conferencing. However, Vogt et al. (2005) noted that these new technological developments cannot replace the learning experience offered by face-to-face communication. Most students accustomed to the quick exchange of ideas with lecturers may realize they prefer to learn in the traditional classroom. Vogt et al. (2005) claimed that some online learners might feel intimidated by the skills required, the need to acquire costly technological gadgets, and the cost of internet services. However, proponents of online learning argue that online delivery allows some students to avoid the anxiety of standing up in front of their classmates to speak by allowing them to just type their responses online.

Another area of contention was the direction of student participation and cooperation through the internet. Bernard and Abrami (2004) and Ponzurick et al. (2000) agreed that using

the internet created more difficult communication than face-to-face contact. This was especially related to using an interface through computers and the internet to contact and talk to a third party. The interface might create a barrier to communication, such as internet connection problems or technical problems with the computer. It is also easier to talk directly to a student than to type the contents of a lecture into a computer-mediated means of communication.

Learning and Skills Development

Although many students have adopted web-based education due to its innovative pedagogy and the comfort of taking courses away from the classroom, research on the effectiveness of the methods employed in online courses was still limited. Online learning as evolutionary freedom, which was not present in the traditional classroom, characterized the system. Online learning enabled those in rural areas to access quality education without necessarily attending college, which may be unaffordable. It allowed those that cannot physically access lessons to access education through other means. Web-based education was also financially fair to those who cannot afford the additional expenses associated with classroom attendance, such as travel costs, babysitters, and other expenses incurred by attending classes. Freed (2004) reported that online programs make the completion of a degree possible regardless of students' lifestyles or other activities. However, Freed focused on a one-sided perspective that the internet can overcome the challenges related to web-based online learning, ignoring the fact that the application of the technology required huge investments.

Arbaugh and Duray (2002) report that allowing students to respond at their own pace enabled them to produce meaningful, thoughtful, rounded, and reflective responses, whereas the classroom did not give them ample time to think about the answers they are bound to provide. However, the classroom learning environment can enhance understanding, because the student

may immediately ask the lecturer to explain unclear issues; in-class discussion may even proliferate and provide extra information related to the subject under study. A prominent reason for enrolling in an academic system is to acquire new knowledge and develop skills, and some learners may find it difficult to achieve this goal without direct face-to-face information from their instructors. A study conducted by York (2008) on online study practices found that most students reported they struggled to understand the content of the online resources if they did not learn directly from their instructors, especially when the instructor did not offer instant feedback. Therefore, such learners would perform best in institutions that offer in-class or hybrid forms of instruction.

However, online coursework provided learners with an opportunity to explore modern and unique opportunities for development of skills, although it is imperative for students first to develop improved standards of computer use. The process of acquiring expertise in computer use helped the student develop a new set of technical skills.

Numerous researchers casted doubts about the effectiveness of the online setting for delivering instruction. Some argued that online studies lead to standard classes developed using “generic academic content and multiple-choice questions that replaced the comprehensive lectures taught by faculty” (Ritzer, 2004, p. 56). Most of the doubts concerning the effectiveness of the modes of communication used in online education relate to the inability of the learner to interact face-to-face.

Rovai and Barnum (2003) showed that students learned better in traditional courses than in online courses. Others researchers, such as Summers et al. (2005), argued that although online courses offer electronic forms of communication, such as email and discussion boards, they could not provide the efficiency of direct communication provided by face-to-face encounters.

This lack of face-to-face communication implied that if online instructors could not provide other effective methods of communication, they were at a serious disadvantage when it came to promoting effective learning.

Summary

This review has excluded a variety of studies because they represent the opinions and perceptions of educators and students without any supporting data on the review topic. The studies are divided, finding either that students in traditional classroom environments outperform those taking the web-based course or that there is no substantial distinction between the two types of education. Several studies show higher post-test scores for students taking online courses over those in traditional courses (Arbaugh, 2005; Chen & Jones, 2007; McFarland & Hamilton, 2005; Stanley, 2006; Summers et al., 2005), while others found the opposite (Logan et al., 2002; Maki & Maki, 2002; Maki et al., 2000; Urtel, 2008). One recurring complaint involved the higher student workload associated with online education compared to the classroom instruction (Noyes et al., 2004).

Chapter 3: Methodology

Introduction

The sample for this research project comprised upper-class undergraduate students enrolled in a required course in educational technology for a teacher education program. The students enrolled in the one-semester class, in a traditional, online, or hybrid format. The same two instructors taught all three types of classes, using the same rubric to evaluate the WebQuest projects. The study compared the performance-related scores of each student on the assigned WebQuest project. Existing data on the scores of the project and on gender were collected from the academic records of both instructors.

Purpose of the Study

The primary purpose of this study was to determine whether there are any differences in academic performance between students (and genders) in traditional, online, and hybrid learning environments. Given the increasing use of online instruction, it is important to assess the learning outcomes of students enrolled in the different genres of delivery as higher education programs struggled with their response to growing directives for accountability.

Research Questions

This study sought to answer the following research questions:

1. Was there a significant difference in academic outcomes among undergraduate baccalaureate students engaged in traditional, online, and hybrid instruction?
2. Was there a significant difference in academic performance between genders in traditional, online, and hybrid instruction?

Participants

The WebQuest scores of a total of 1,052 students over fourteen semesters (fall 2009 through spring 2016) were collected. The scores were received by students in 24 one-semester classes (16 traditional, 16 online, and 16 hybrid). Each of the two instructors taught students in eight of each of the three types of classroom settings, for a total of 24 classes for each instructor. All students in this study held an undergraduate status of junior or above. They had earned a minimum of 45 hours and had a minimum of 2.75 overall GPA. The participants had also passed the certification test for state educators and been accepted as teacher candidates of the College of Education in the Teacher Education Department at a state university in the southwestern part of the United States. The state university was designated by the United States Department of Education as a postsecondary minority-serving institution. Participants were allowed participation without regard to gender, race, nationality, or religious affiliation. This study did not require Institutional Review Board approval from the University of Arkansas-Fayetteville (see Appendix A.) The study reviewed the final scores on the WebQuest project of participants, with all identifiers anonymous and coded by numbers.

Research Design

The research design formed the blueprint for the collection, measurement, and analysis of data, and included a detailed explanation of the purpose of the research. High ethical standards were applied by protecting the anonymity of the students involved and using integrity and confidentiality. Limitations require a critical, overall appraisal and interpretation of their impact. The study covered seven years of traditional, online, and hybrid classes taught by the two instructors, who developed instruction lessons as similar as possible for the onsite traditional classroom course, the online distance course, and the hybrid course, using the same guiding

rubric for the WebQuest project (see Appendix B.). The dependent variable was the score on a WebQuest project administered during the class. The independent variables included mode of delivery and gender.

The researcher adopted a causal-comparative research design, in which the independent variable was not manipulated in order to observe its effect on the dependent variable. A significant dynamic of this kind of research design was that the independent variable was measured in categories (Gall, Gall, & Borg, 2003).

Performance

During the study, traditional classroom students received the course content in a lecture format. Online students read the content through PowerPoints and written materials and watched videos. Students in the hybrid classes benefitted from both the onsite and online formats. Students in the traditional and hybrid classes had the individualized help of the instructor to guide their projects. Although they completed the course entirely through a Learning Management System, online students were free to make appointments with the instructor if they wanted individualized help. They had text and video tutorials to aid the step-by-step development of their WebQuest project, as well as the same rubric (see Appendix B.) for assessment as the traditional classroom students. The same two instructors taught in all three formats and graded all the projects for their specific students. For the purposes of the current study, scores for the WebQuest project were compared to determine how each mode of course delivery affected grade outcomes.

Data Analysis

Since the study was ex post facto, the researcher used archival data recorded between the fall of 2009 and the spring of 2016. Fourteen consecutive semesters of students' WebQuest

scores (0 to 100) provided the data for analysis. The students' scores were obtained from eight of each type of class from each of the two instructors.

The researcher entered the assessment data into the Statistical Package for the Social Sciences (SPSS), version 25, for data analysis with various statistical tools. To see if there was a significant difference between the WebQuest scores of students of the two different instructors, an independent samples t-test (hereafter, independent t-test) was used. This test compares the means between two unrelated groups on the same continuous dependent variable; for the purposes of this project, it indicates whether the WebQuest scores differ based on instructor, mode of instruction (traditional, online, or hybrid), or gender (male/female).

The data was required to meet several assumptions in order for an independent t-test to provide a valid result:

1. The dependent variable was measured on a continuous scale (i.e., at the interval or ratio level). As the WebQuest scores were measured on a scale of 0–100, this criterium was met.
2. The independent variable should consist of at least two categorical, independent groups. The independent variables—mode of delivery (traditional, online, or hybrid) and gender (male or female)—meet this criterium.
3. There should be independence of observations, which means that there was no relationship between the observations in each of the two instructors' groups or between the groups themselves. For example, there must be different participants in each group.
4. There should be no significant outliers.

5. The dependent variable should be approximately normally distributed for each group of the independent variable. The researcher tested for normality using histograms and the Kolomogorov-Smirnov test.
6. There must be homogeneity of variances. The researcher used Levene's test for homogeneity of variances.

A t-test was then used to determine if there is a significant difference between the means of two instructors' groups. The t-value measured the size of the difference relative to the variation in the sample data. As there was no difference in mean academic performance between the students of the two instructors, the researcher combined the two datasets in order to analyze the research questions using a two-way ANOVA. The two-way ANOVA compared the mean differences between groups that have been split in two independent variables, called factors. For example, a two-way ANOVA was used to understand whether there was an interaction between gender and WebQuest scores, where gender was the independent and WebQuest score the dependent variable. Research Question 2 asked if there were any differences in the academic performance of males and females among the traditional, and hybrid class students.

Summary

This research adopted a quantitative causal-comparative design and pre-existing data to determine whether there were any differences in academic performance between traditional, online, and hybrid learning students, and between male and female students, taking the same educational technology course. The independent variables were gender and mode of delivery and the dependent variable was the WebQuest project score.

Chapter 4: Research Findings

Introduction

The study group for this research project included undergraduate students enrolled in a required course in educational technology for a teacher education program. The students enrolled in the one-semester class either onsite in a traditional classroom, online through distance education, or in a hybrid course of their choice. The same two instructors taught all three types of classes, using the same rubric for evaluating the WebQuest project. The study compared the performance-related scores of each student on the assigned WebQuest project. Existing data on the scores of the project and on gender was collected from the academic records of both the instructors.

Test for Significant Difference in Academic Performance by Instructor

The first step in analyzing the data was to test for significance of difference in academic performance between the students of Instructor 1 and Instructor 2, using an independent samples *t*-test (hereafter, independent *t*-test). The assumptions of the *t*-test were provided on page 39 and 40 of this paper. Assumption 5, normality, was confirmed with histograms (see Figures 4.1 and 4.2) and the Kolmogorov-Smirnov test (see Table 4.1). Figure 4.1 showed that the scores for Instructor 1 were not normally distributed as the data did not fit the bell curve shape typically present when there was a normal distribution. Similarly, Figure 4.2 showed that the scores for Instructor 2 were not normally distributed as the data did not fit the normal bell curve shape. The data for both instructors appeared to be skewed to the right. Although the assumption of normality was violated based on a visual inspection of the histograms, the sample size was large enough that this violation was not a concern (Elliott, 2007). “With large enough sample sizes, the violation of the normality assumption should not cause major problems; this implies that we can

use parametric procedures even when the data are not normally distributed. If we have samples consisting of hundreds of observations, we can ignore the distribution of the data” (Pallant, J. (2007, pp. 179–200).

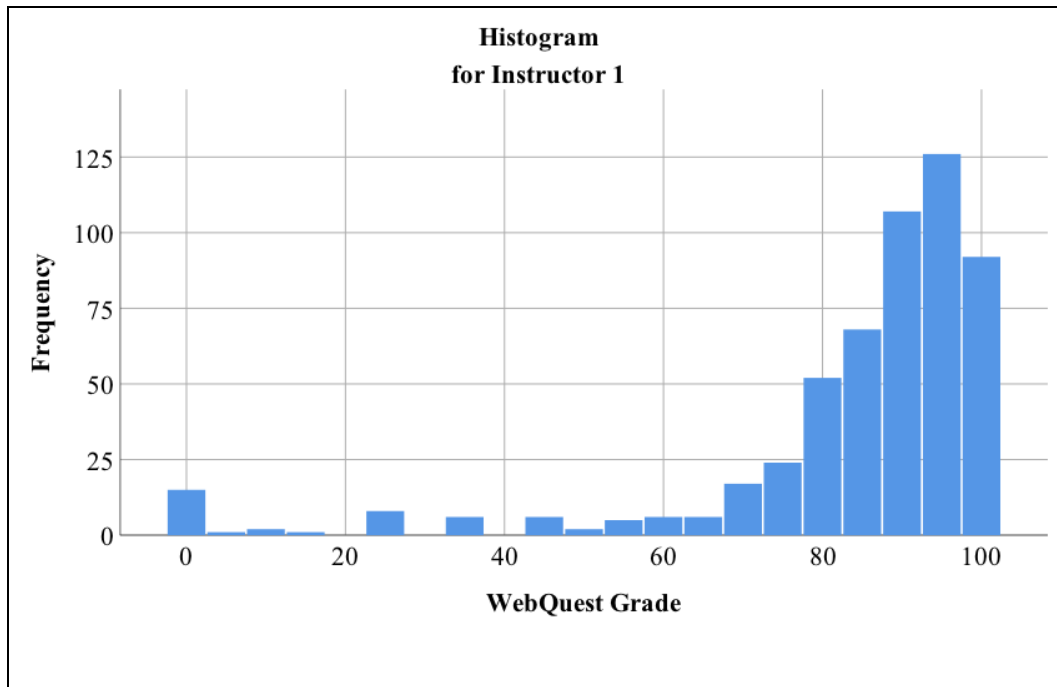


Figure 4.1. Distribution of scores tested with histogram for Instructor 1.

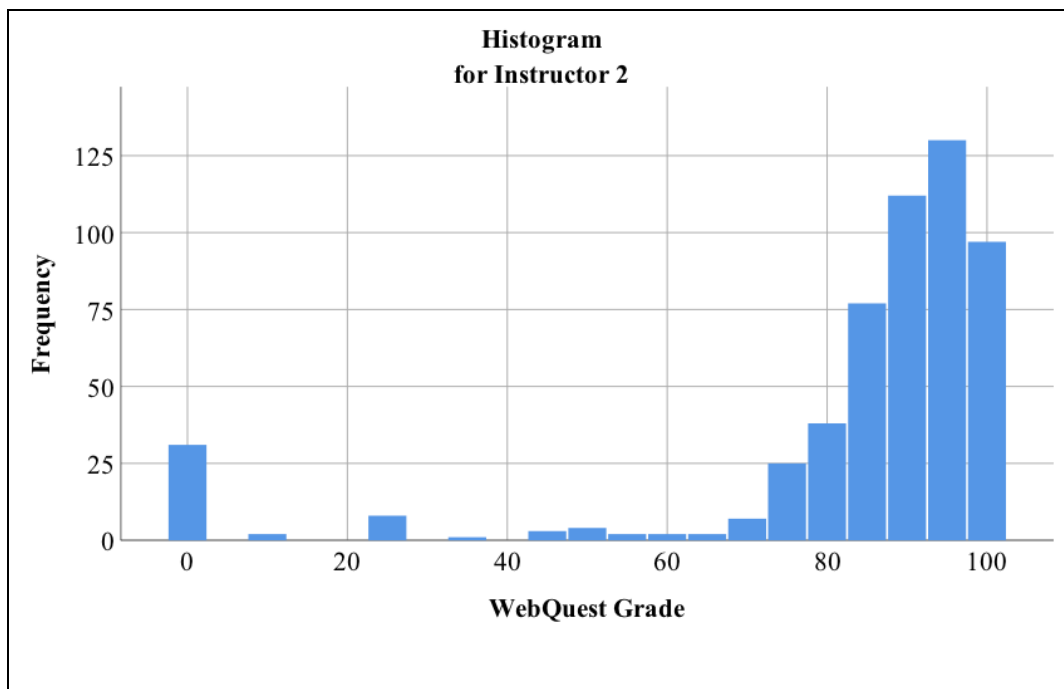


Figure 4.2. Distribution of scores tested with histogram for Instructor 2.

The Kolmogorov-Smirnov test for Instructor 1 and Instructor 2 appeared in Table 4.1. The scores for Instructor I and Instructor 2 were not normally distributed, as assessed by the statistically significant Kolmogorov-Smirnov test value of .22 ($p < .05$). Similarly, the scores for Instructor 2 were not normally distributed, as assessed by the statistically significant Kolmogorov-Smirnov test value of .28 ($p < .05$). The distribution of data for both instructors was not equal to a normal distribution. Although the assumption of normality was violated, the sample size was large enough that this violation was not a concern. It can be assumed that when plotting a large sample size, the distribution of results should approach a normal bell-shaped curve.

Table 4.1

Kolmogorov-Smirnov Test for Normality

Instructor	Test statistic	Df	p-value
Instructor 1	.22	544	<.001
Instructor 2	.28	541	<.001

The results of Levene's test indicate that Assumption 6, homogeneity of variance, was met, $F(1,1083) = 1.74, p = .19$. More specifically, the results of Levene's test indicated that the two samples have similar populations with the same variance; there was homogeneity of variances for the scores for Instructor 1 and Instructor 2.

A t-test was used to determine if there is a significant difference between the means of two groups (The WebQuest scores of Instructor 1 and Instructor 2). As seen in Table 4.2 on page 44, there was no difference in mean academic performance between instructors, $t(1083) = .52, p = .60$. The mean difference of 0.72 between the score of 83.86 ($SD = 20.98$) for Instructor 1 and 83.14 ($SD = 24.26$) for Instructor 2 was not statistically significant. Therefore, the researcher combined the two datasets in order to analyze the research questions.

Table 4.2

Homogeneity of Variance: Tested with Levene's Test

Instructor	Mean	Standard Deviation
Instructor 1	83.86	20.98
Instructor 2	83.14	24.26

Analysis of Research Questions Using Two-Way ANOVA

The research questions are:

1. Was there a significant difference in academic outcomes among undergraduate baccalaureate students engaged in traditional, online, and hybrid instruction?

2. Was there a significant difference in academic performance between genders in traditional, online, and hybrid instruction?

The two-way ANOVA compares the mean differentiations between groups that have been split on two independent variables (called factors). The main purpose of using a two-way ANOVA was to see if there is an interaction between the two independent variables on the dependent variable.

The assumptions of the two-way ANOVA are:

1. Independent observations
2. Normal distribution: tested with Kolmogorov-Smirnov test, histogram of residuals, and normality probability Q-Q plot.

The Kolmogorov-Smirnov tested for mode of delivery (traditional, online, and hybrid) appear in Table 4.3 on page 45. The scores for traditional mode of delivery were not normally distributed, as assessed by the statistically significant Kolmogorov-Smirnov test value of .26 ($p < .05$). The scores for online mode of delivery were not normally distributed, as assessed by the statistically significant Kolmogorov-Smirnov test value of .24 ($p < .05$). Similarly, the scores for the hybrid mode of delivery were not normally distributed, as assessed by the statistically significant Kolmogorov-Smirnov test value of .26 ($p < .05$). The distribution of data for the three modes of delivery were not equal to a normal distribution.

Table 4.3

Kolmogorov-Smirnov Test of Normality on Mode of Delivery

Mode	Test statistic	Df	p-value
Traditional	.26	369	<.001
Online	.24	353	<.001
Hybrid	.26	363	<.001

The Kolmogorov-Smirnov tests for gender appear in Table 4.4. The scores for males were not normally distributed, as assessed by the statistically significant Kolmogorov-Smirnov test value of .27 ($p < .05$). Similarly, the scores for females were not normally distributed, as assessed by the statistically significant Kolmogorov-Smirnov test value of .24 ($p < .05$). The distribution of data for males and females were not equal to a normal distribution. Table 4.4 shows that the distribution for grades by gender violated the assumption of normality.

Table 4.4

Kolmogorov-Smirnov Test of Normality on Gender

Gender	Test statistic	Df	p-value
Male	.27	169	<.001
Female	.24	916	<.001

However, the histogram of standardized residuals for grades in Figure 4.3 showed that the violation was not severe. This histogram depicted the distribution of grades. The data was basically normally distributed with some negative skew, which was typical for grades ranging from 0 to 100.

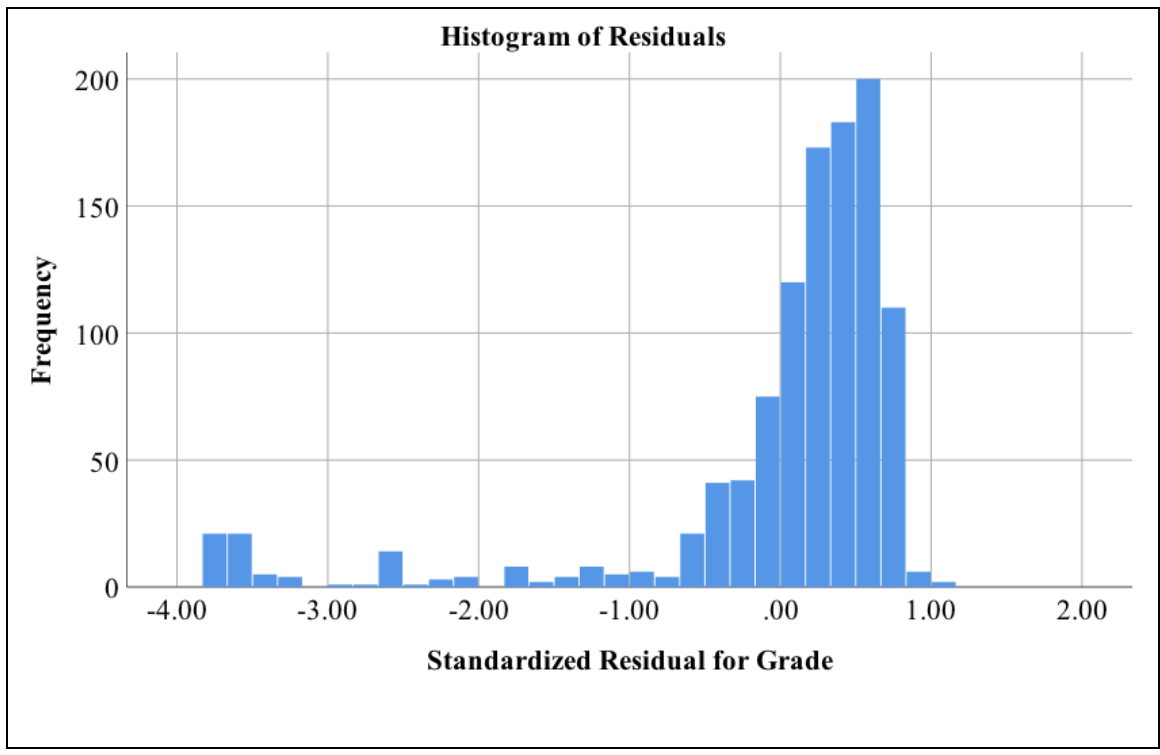


Figure 4.3. Histogram of residuals.

The Normal Q-Q Plot for grades by the traditional mode of delivery appeared in Figure 4.4. The plot below showed that the points were not approximately distributed along the diagonal line for the traditional mode of delivery. Based on the visual inspection of the plot, one can conclude that the data were not approximately normally distributed.

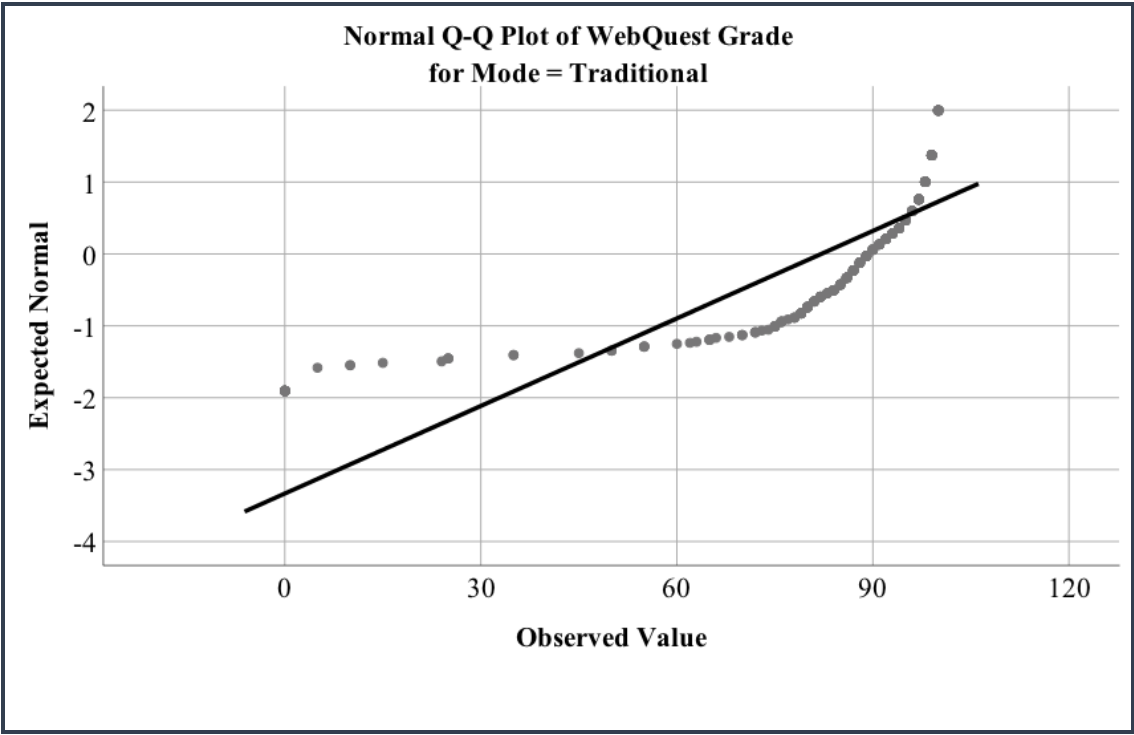


Figure 4.4. Normal probability Q-Q plots of WebQuest grade for traditional mode of delivery.

The Normal Q-Q Plot for grades by the online mode of delivery appeared in Figure 4.5. The plot below showed that the data points were not approximately distributed along the diagonal line for the online mode of delivery. Based on the visual inspection of the plot, one can conclude that the data were not approximately normally distributed.

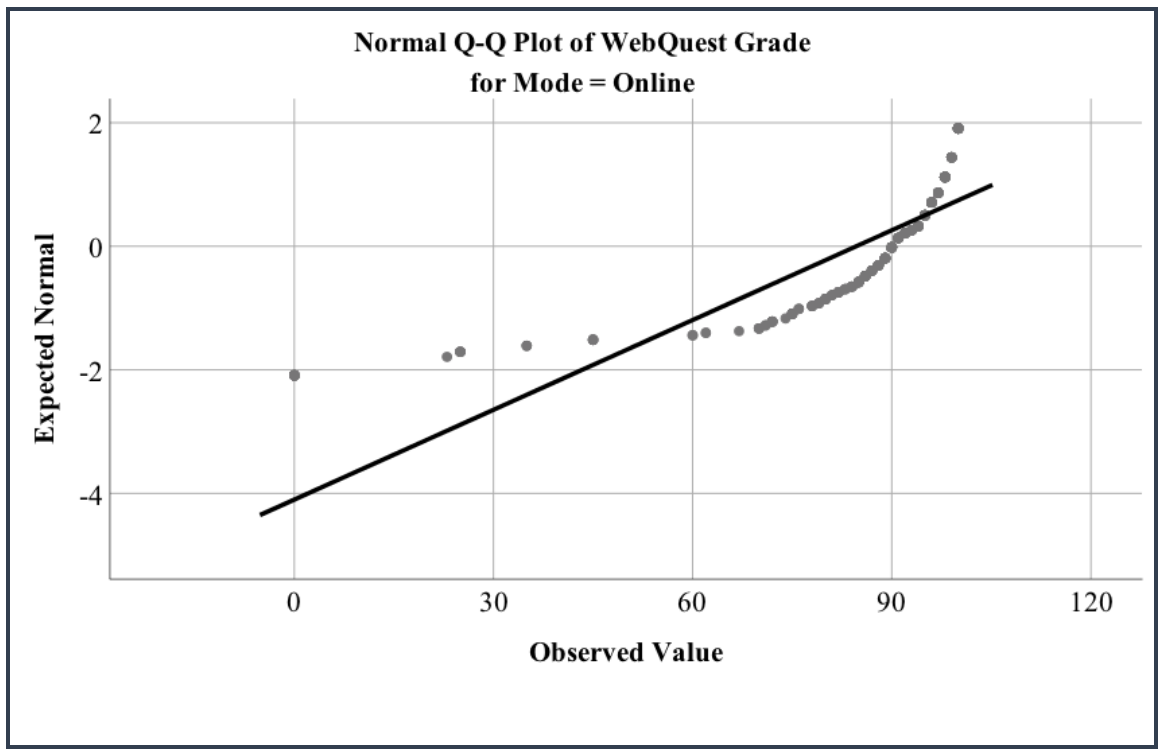


Figure 4.5. Normal Q-Q plot of WebQuest grade for online mode of delivery.

The Normal Q-Q Plot for grades by the hybrid mode of delivery appeared in Figure 4.6. The plot below showed that the points were not approximately distributed along the diagonal line for the hybrid mode of delivery. Based on the visual inspection of the plot, one can conclude that the data were not approximately normally distributed.

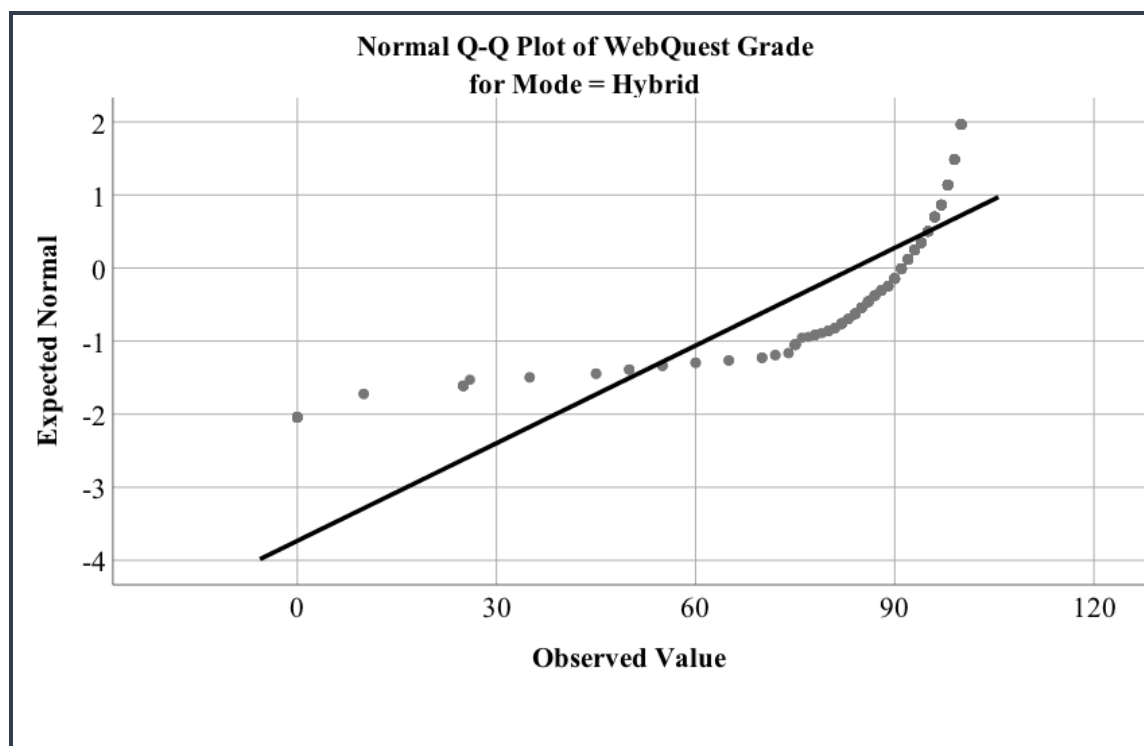


Figure 4.6. Normal Q-Q Plot of WebQuest grade for hybrid mode of delivery.

The data were not normally distributed for the traditional, online, and hybrid modes of delivery, as assessed by visual inspection of the Normal Q-Q Plots for each mode of delivery. Although the assumption of normality was violated, the sample size was large enough that this was not a concern.

Homogeneity of Variance: Levene's Test

Levene's test indicated that the assumption of homogeneity of variance was met, $F(5,1079) = 2.18, p = .06$. More specifically, the results of Levene's test indicated that the modes of delivery had similar populations with the same variance. There was homogeneity of variances for the scores for the online, hybrid, and traditional modes of delivery.

As seen in Table 4.5 on page 51, there was no difference in mean academic performance between instructors, $t(1083) = .52, p = .60$. The mean difference of 0.72 between the score of

83.86 ($SD = 20.98$) for Instructor 1 and 83.14 ($SD = 24.26$) for Instructor 2 was not statistically significant.

Table 4.5

Results of Two-Way ANOVA

Source	SS	df	MS	F	p
Gender	1042.76	1	1042.76	2.03	.16
Mode	1538.64	2	769.32	1.50	.22
Mode X Gender	502.17	2	251.08	.49	.61
Error	554237.04	1079	513.66		
Total	8122013.00	1085			

Table 4.5 shows that the two-way ANOVA found no statistically significant difference in academic performance by gender, $F(1,1079) = 2.03, p = .16$; there was not main effect for gender. There was no statistically significant difference in academic performance by mode of delivery, $F(2,1079) = 1.50, p = .22$; there was no main effect for mode of delivery. Finally, the interaction between gender and academic performance was not statistically significant, $F(2,1079) = .49, p = .61$.

There was no statistically significant difference in academic performance by mode of delivery, $F(2,1079) = 1.50, p = .22$. Table 4.6 showed the mean and standard deviation of the grades by mode of delivery. The differences in the mean scores for the traditional ($M = 82.10, SD = 24.63$), online ($M = 84.65, SD = 20.64$), and hybrid ($M = 83.81, SD = 22.45$) modes of delivery were not statistically significant.

Table 4.6

Difference in Academic Performance and Mode of Delivery

Mode of delivery	Mean	Standard Deviation
Traditional	82.10	24.63
Online	84.65	20.64
Hybrid	83.81	22.45

There was no statistically significant difference in academic performance by gender, $F(1,1079) = 2.03, p = .16$. Table 4.7 showed the mean and standard deviation of the grades by gender. The difference in the mean scores for the males ($M = 81.46, SD = 25.39$) and females ($M = 83.88, SD = 22.12$) was not statistically significant. Finally, there was no interaction between gender and academic performance, $F(2,1079) = .49, p = .61$.

Table 4.7

Difference in Academic Performance and Gender

Gender	Mean	Standard Deviation
Male	81.46	25.39
Female	83.88	22.12

Summary

A two-way ANOVA was conducted to determine the effect of the three types of course delivery—onsite traditional, online distance, and hybrid classes—on student performance and gender. It was used to see if there was meaningful variance in the scores on the WebQuest project according to mode of delivery or gender.

Chapter 5: Conclusion

Introduction

The definitive question of educational research was how to develop instructional designs to make the best use of learning opportunities, in traditional, online, and hybrid courses. No significant difference was detected between the three modes of delivery. A study directed by SRI International (Means et al., 2010) for the U.S. Department of Education, found that online students performed slightly better than those students in face-to-face classes. This research assessed online and traditional learning in higher education institutions and in K through 12 settings over a period of 12 years. There are pros and cons for learning in a traditional classroom and learning online. The pros for traditional classroom learning are the face-to-face instruction, a student can raise a question within the learning and classmates are also there so networking is less hard. The cons of traditional learning are getting to the classroom (time, cost, transportation and parking), and understanding at the speed of the learning.

Some pros of online learning are flexibility to attend, it cultivates interaction among students and instructors more than in large lecture halls, and obliges students to be responsible for their own learning. Some cons of online learning are that students with low motivation or unhealthy study habits could fall behind, students could feel isolated, and slow web connections or older computers could create accessing course materials discouraging.

Summary of Findings

The research questions guiding the inquiry were:

1. Was there a significant difference in academic outcomes among undergraduate baccalaureate students engaged in traditional, online, and hybrid instruction?

2. Was there a significant difference in academic performance between genders in traditional, online, and hybrid instruction?

This study found no difference in academic performance by mode of delivery, $F(2,1079) = 1.50$, $p = .22$ (see Table 4.6), and no difference in academic performance by gender, $F(1,1079) = 2.03$, $p = .16$ (see Table 4.7). There was no interaction between gender and academic performance, $F(2,1079) = .49$, $p = .61$.

Discussion

Research has suggested that teaching and studying online can be as effective as traditional instruction “when the method and technologies used are appropriate to the instructional tasks, there is student-to-student interaction, and when there is timely teacher-to-student feedback” (Mimorov, Vasiliev, & Livshits, 2012, p. 440). Upon completion, this study joined the growing body of research on the success of online learning. The lack of significant difference in results between the three modes of delivery (tradition, online, and hybrid) indicated that all three modes are acceptable in teaching courses to students.

Suggestions for Future Research

All of the instructors of the educational technology course examined in this study worked closely together to ensure all their students received the same content regardless of the instructor or mode of delivery they chose. Many universities and colleges offer basic classes, like English 1 or Algebra 1, using a variety of professors, instructors, and adjuncts. According to Derek Bok (2017) the obvious remedy for such a diverse teaching group was to include all instructors in curricular reviews, not just the tenured faculty. Universities and colleges need more research to verify that students in their traditional, online, and hybrid courses are making the same progress regardless of mode of delivery.

Ultimately, research was needed on related issues outside the scope of this study. For example, retention and graduation rates may be related to mode of delivery. Additionally, research should take into account the methods used for teaching online and in traditional classes.

Conclusion

The results of this study showed no significant difference in the WebQuest scores of students in traditional, online, or hybrid sections of an undergraduate educational technology course. While previous studies provided evidence that online students did significantly better than students in traditional classes (Means et al., 2010; Shacher & Newman, 2003), these results are questionable. It is possible that more self-motivated students are more likely to select online classes, as was found in a study of microeconomics classes (Gratton-Lavoie et al., 2009).

In addition, online students had more opportunity to take advantage of the lack of direct supervision of their WebQuest project. The two instructors in this study had the opportunity to observe the progress of the traditional and hybrid students as they completed their WebQuest assignments. Their online students, on the other hand, turned in their completed WebQuest with no observation of their work by the instructors. The students involved in the current study were above average. All students in this study held an undergraduate status of junior or above. They had earned a minimum of 45 hours and had a minimum of 2.75 overall GPA. The participants had also passed the certification test for state educators and been accepted as teacher candidates of the College of Education in the Teacher Education Department at a state university in the southwestern part of the United States. These findings may not be generalizable to the larger population of students in traditional, online, and hybrid education classes. Despite these issues, the findings of this study were consistent with previous studies (Parsons-Pollard et al., 2008).

Summary

As the number of students enrolled in online courses grows, more research has to be done to determine whether online education is as effective as traditional education. Online education has become a popular change from traditional educational classes. However, there are still questions as to its effectiveness. In a study that compared student learning outcomes in a microeconomics course, Brown and Liedholm (2002) found that students in the online format performed significantly worse on tests than the students in the traditional format even though they had better GPA and ACT scores. Conversely, Allen & Seaman (2013) discovered the academic achievement results can be bias if the characteristics of online students differ from those of the traditional students taking the same class by attributes such as age, marital status, experience, GPA, and learning styles.

In this study, no significant difference was detected, and this result supports the continued development of online instruction programs. The type of analysis used in this study should be carried out consistently by universities in order to pinpoint any differences between results in traditional, online, and hybrid courses that could signify inequalities in learning.

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Appendices

Appendix A: Institutional Review Board statement from the University of Arkansas



To: Patricia Ruth Kuhn
From: Chair, Douglas James Adams
IRB Committee
Date: 02/22/2019
Action: Review Not Required
Action Date: 02/22/2019
Protocol #: 1901171720
Study Title: A Case Study on the Differences in Scores of Undergraduate Students in Traditional, Online, and Hybrid Classes

Please keep this form for your records. Investigators are required to notify the IRB if any changes are made to the referenced study that may change the status of this determination. Please contact your IRB Administrator if you have any questions regarding this determination or future changes to this determination.

Appendix B: WebQuest Rubric

WEBQUEST CLASS RUBRIC ©

	Unacceptable 0-6	Acceptable 7-8	Target 9-10	Points Earned
Engaging Opening & Writing	No attempt made to appeal to learners.	Honestly attempts to appeal to student interests.	Has that something that compels attention.	
The Question & Task	No real question and/or a fuzzy task. Maybe what's asked for is lower level thinking or info retrieval.	There is at least an implicit question and a task that targets higher order thinking. All this may not be totally clear.	Clear question and task. These naturally flow from the introduction and signal a direction for sophisticated learning.	
Background for Everyone	No attempt to access prior learning or build common background.	Some mention of addressing a common body of knowledge. (May not happen within the activity.)	Clearly calls attention to the need for a common foundation of knowledge and provides needed (Web?) resources.	
Roles & Expertise	No roles/use of perspectives or roles are artificial and may lack inherent conflict of interest.	Roles are clear and realistic. They may be limited in scope, but do evoke conflict.	Roles match the issues and resources. The roles provide multiple perspectives from which to view the topic.	
Use of the Web	This activity could probably be done without the Web.	Some resources reflect features of the Web that make it particularly useful such as images, audio, interactivity, current information, etc.	Uses the Web to access at least some of the following: interactivity, multiple perspectives, multimedia, current information, etc.	
Transformative Thinking	No transformative thinking. (This is not a WebQuest, but may be a good Knowledge Hunt).	Higher level thinking is required, but the process for students may not be clear.	Higher level thinking is required to construct new meaning. Scaffolding is provided to support student achievement.	
Real-world Feedback	No feedback loop included.	The learning product could easily be used for authentic assessment although this may not be addressed or it only happens in the classroom.	A feedback loop connecting learners to the Real world is included in the Web page and an evaluation rubric is probably provided (early on!).	
Conclusion	Minimal conclusion. No mention of student thinking or symmetry to intro.	Returns to the intro ideas. May sum up the experiences and learning that was undertaken.	Clear tie-in to the intro. Makes the students' cognitive tasks overt and suggests how this learning could transfer to other domains/issues. Sophistication keeps increasing.	
Submission	Document was not submitted on the due date to the instructor.	Document was submitted within the grace period late to the instructor.	Document was submitted on time to the instructor.	
Grammar and Format	Document was not submitted in template.	Document was submitted in template but held 4 or more errors.	Document was submitted in template but held 0-3 errors.	
Total Points				/100