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Online Textbook Use and Online Student Success Rates in Community College

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This is to certify that the doctoral dissertation by

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Walden University
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Dissertation

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by

Diane M. Hilbert

MM, Sam Houston State University, 1998

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BA, Rice University, 1991

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Higher Education Administration

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Abstract

Online student success rates in community colleges have continued to fall below student success rates for their on-campus counterparts. The purpose of this causal-comparative quantitative study was to determine the difference in student success between students who used a hardcopy textbook for an online U.S. history course and students who used an online textbook at an urban community college in Texas while also investigating the influence of gender and ethnicity. Secondary data collected included final course grades from the course over a 10-year period with 9,115 students. The theoretical foundation focused on the deliberate construction of online course design and content to support student success from the perspective of Vygotsky's scaffolding. The Mann-Whitney U test was used to analyze correlations between the 2 groups and the chi-square test was used to test if gender or ethnicity influenced the effects of the implementation of the online textbook on student pass/fail rates. The results of the Mann-Whitney U test indicated that providing the online textbook as compared to the traditional hardcopy textbook increased final course grades between the 2 groups. The results of the chi-square tests results showed a positive difference between groups for ethnicity but not for gender. The findings of this research inform educators and administrators of policies and practices that support student success by providing free embedded online course materials to students. Student completion of gateway courses can lead to further education, employment, and positive contributions as a member of society.

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Dedication

The completion of my PhD would not have been possible without the support of my family. They never once questioned if I had to say ‘no’ or holidays were cut a little short. I would also like to thank my dear friend Zarina who prompted me to pursue my PhD and supported me throughout the process.

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Chapter 1: Introduction to the Study

Online student success rates in community colleges have continued to fall below student success rates in their on-campus counterparts (Gregory & Lampley, 2016). Investigating student success strategies is important to improve those rates leading to student completion of courses and programs of study to further education, employment, and positive contributions as a member of society. Studies regarding the use of open educational resources (OER) have resulted in varying outcomes for student success (Feldstein et al., 2012; Hilton, Gaudet, Clark, Robinson, & Wiley, 2013; Hilton & Laman, 2012; Hilton, Robinson, Wiley, & Ackerman, 2014; Wiley, Hilton, Ellington, & Hall, 2012).

My study was designed to determine the effect of providing OER in the form of an online textbook for an online history community college course on student success rates, determined by final grade, as compared to student success rates for those who previously used hardcopy textbooks in the same course. Archival data was disaggregated separately by gender and ethnicity to determine if those variables influenced the effects on student success in either the hardcopy or online textbook group. With addition of online courses in community college curricula, this research was needed to add to the understanding of student success rates in online courses. The results might suggest approaches to community college curricula that would increase success rates and lead to further education, employment, and positive contributions as a member of society. In this chapter, I discuss the background of the study, the problem statement, and purpose of the study. I provide the research questions and hypotheses, identify the theoretical

framework, and describe the nature of the study. Definitions, assumptions, scope and delimitations, limitations, and the significance of the study complete the chapter.

Background

The review of current literature related to OER, free course materials, and student success revealed the limited amount of research focused on OER, free course materials, and student success (Cooney, 2017; Grewe & Davis, 2017; Hilton, Fischer, Wiley, & Williams, 2016; Robinson, Fischer, Wiley, & Hilton, 2014). A few studies (Amro, Mundy, & Kaczynski, 2015; Anthony, 2012; Kaczynski, Brown, Holland, & Uriegas, 2014) included the variables of gender and ethnicity. Most of the studies on OER have focused mainly on perceptions and barriers of OER as well as the cost savings with OER (Hilton & Laman, 2012; Pitt, 2015; Wiley et al., 2012; Zhang & Li, 2017). Studies focused on student success measured student success based on multiple variables (Atchley, Wingenbach, & Akers, 2013; Fischer, Hilton, Robinson, & Wiley, 2015; Hilton et al., 2016). Hilton et al. (2016) measured student success with an aggregate of withdrawal rates, drop rates, and C or better course grades. Fischer et al.'s (2015) study measured student success through an analysis of course completion, C or better grades, overall course grades, and the number of credit hours students were enrolled in. Atchley et al. (2013) focused on course grades as the measurement of student success through the percentages of A, B, C, D, and F course grades earned in the face-to-face and the online courses. Each of these studies included C or better course grades as the measurement of student success. However, there appears a gap in understanding the effects of using a

hardcopy textbook and an online textbook on final course grades and whether gender or ethnicity influence those effects.

Grewe and Davis (2017) cited the definition of OER as "teaching, learning, and research resources" (p. 231) that may include "course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials or techniques used to support access to knowledge" (p. 232). Current studies have included a variety of these types of OER. OER provides free access to tools, resources, and activities that serve as scaffolding mechanisms (Grewe & Davis, 2017).

In the fall of 2012, an urban community college in Texas, the site of this research, adopted an embedded online textbook at no additional costs to the students. This change in policy from the previous 5 years was adopted for a required U.S. history online course to reduce costs for the students and to ensure that they had access to the course material, using a just-in-time learning or scaffolding concept (Vygotsky, 1978), at the appropriate times in the curriculum. Previously, students in the course had been required to purchase a hardcopy of the textbook and assigned material in it. With the new policy, the textbook was added in electronic form to the online course learning management system (Blackboard) course shell and was readily available to enrolled students. The target population for this research study included all 10,478 students who enrolled in the U.S. history online course in the fall and spring semesters between the fall of 2007 and the spring of 2017, with the population divided between those enrolled 2007-2012 who bought the hardcopy of the textbook and those enrolled in 2013-2017 for whom the embedded online textbook was provided in time (scaffolding) for its appropriate use. This

research was expected to confirm the value of scaffolding the free online textbook material into courses that others may then be able to apply to further test my findings.

Problem Statement

Online student success rates in community colleges have continued to fall below student success rates in their on-campus counterparts (Gregory & Lampley, 2016). OER strategies to improve student success rates with community college students were designed to assist students in completion of courses and programs of study leading to further education, employment, and positive contributions as a member of society (Hilton et al., 2016). Additionally, because students in community colleges accrue debt as they enroll in required courses to further their education, having the funds to purchase course materials may be a barrier to student success (Feldstein et al., 2012; Hilton & Laman, 2012). Studies investigating OER as a success strategy have employed a theoretical framework that includes Vygotsky's (1978) scaffolding (Ozan, 2013; Yin, Song, Tabata, Ogata, & Hwang, 2013) where students are provided the appropriate amount of support to guide them to their potential educational achievement. The focus of recent research related to OER, such as free digital textbooks (Hilton & Laman, 2012), has included studies regarding the reduction of costs to the student. Specifically, Hilton and Laman (2012) investigated a case study of the adoption of an open introduction to psychology textbook at a community college with a diverse population and an enrollment of 70,000 students. Additional studies related to OER focused on readiness for adoption and implementation (Hatzipanagos & Gregson, 2015), the barriers to use and quality of OER (De Hart, Chetty, & Archer, 2015) as well as studies on the use of OER at varying levels

of education (Hilton et al., 2014). Studies exploring the use of OER have resulted in varying outcomes for student success (Feldstein et al., 2012; Hilton & Laman, 2012). Limited research in OER has included the variables of gender and ethnicity (Amro et al., 2015).

The problem in the field is knowing whether providing student support in an online course in the form of scaffolding OER as an online textbook affects student success as compared to the previous use of a hardcopy textbook. Archival data was disaggregated by gender and ethnicity to investigate if these variables had any impact on student success through the implementation of the online textbook as compared to student success with the hardcopy textbook previously used in the online history course.

To address this problem in the field and to approach this gap in the literature, I identified an institution that had implemented the use of an embedded online textbook and where archival data was available to measure student success compared to previous practice. Based on the problem and review of current literature, this research appears relevant to address a gap in the literature by determining whether implementing OER in the form of an online textbook in an online course may be related to student success as measured by course grades and whether gender or ethnicity are an additional influence on the success of the implementation.

Purpose of the Study

The purpose of this causal-comparative quantitative study was to determine the difference in student success between history course students who used a hardcopy textbook and students who used an online textbook at an urban community college in

Texas while also investigating the influence of gender and ethnicity. I examined the differences in student success rates between the group of students enrolled in the U.S. history online course from 2007-2012 who had access to course materials by purchasing a hardcopy textbook (Group 1) and the group of students enrolled in the U.S. history online course from 2012-2017 who did not purchase the hardcopy textbook and instead had access to course materials through an online textbook (Group 2). These data were disaggregated by gender and ethnicity to investigate how gender and ethnicity may have influenced the effects of the implementation of the online textbook on student success.

Research Question and Hypotheses

The research questions and hypotheses that guided this study were:

RQ1: What is the difference in final course letter grades between online history students who used a hardcopy textbook and students who used an online textbook?

$H_0$1: There will be no statistical difference in the final course grades in the U.S. history online course between students who used a hardcopy textbook and students who used an online textbook.

H_a1: There will be a statistical difference in the final course grades in the U.S. history online course between students who used a hardcopy textbook and students who used an online textbook.

RQ2: What is the association between gender and students passing the online history course before and after the implementation of the online textbook?

$H_0$2: There will be no association between gender and students passing the online history course before and after the implementation of the online textbook.

H_a2: There will be an association between gender and students passing the online history course before and after the implementation of the online textbook.

RQ3: What is the association between ethnicity and students passing the online history course before and after the implementation of the online textbook?

$H_0$3: There will be no association between ethnicity and students passing the online history course before and after the implementation of the online textbook

H_a3: There will be an association between ethnicity and students passing the online history course before and after the implementation of the online textbook.

Theoretical Framework

Vygotsky (1978) defined education as a "systematic, purposeful, intentional, and conscious effort at intervening and influencing all those processes that are part of the individual's natural growth" (p. 58). Vygotsky's zone of proximal development focused on students' abilities and their learning potential through what he called mediation. The zone of proximal development was defined as "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in

collaboration with more capable peers" (p. 86). Mediation comes in the form of tools, activities, resources, and interactions (Vygotsky, 1978).

A connectivist mobile learning environment, identified as a network for learning and being part of society, was the source of Ozan's (2013) study focusing on four types of scaffolding: social scaffolding, managerial scaffolding, instructional scaffolding, and technical scaffolding. A scaffolding model called "introduction, connect, apply, reflect, and extend" (p. 1) was employed in the Salyers, Carter, Cairns, and Durrer (2014) study in online course for nurses.

Constructing online course design and content from the perspective of scaffolding may support student success. That was the purpose a Texas college had in deciding to use OER by embedding an online textbook for a U.S. history course rather than ask students to purchase a hardcopy. Because the online textbook was the resource provided by the university as mediator in scaffolding to increase student learning, this study used Vygotsky's (1978) theory as a possible example of bringing scaffolding theory into practice as it relates to understanding if there was a difference in student success as measured by course grade when providing a free online textbook.

Nature of the Study

The study was a causal-comparative quantitative approach utilizing archival data of final grades in an online U.S. history course analyzed with SPSS through the Mann-Whitney U test for RQ1 and the chi-square test for RQ2 and RQ3. I chose the Mann-Whitney U test to align with RQ1 with the ordinal dependent data collected to determine the differences between two groups (Laerd Statistics, 2019). I examined archival data to

compare the final course letter grade of A, B, C, D, or F with student success measured as a C or better final course grade (pass) and a D or F (fail) for the group of students in the U.S. history online course prior to the online textbook adoption from 2007-2012 (Group 1) with the final course letter grade for the different group of students in the U.S. history online course after the implementation of the online textbook from 2012-2017 (Group 2).

Data was also disaggregated by gender and ethnicity to investigate how gender and ethnicity influenced the effects of the implementation of the online textbook on student success as noted in RQ2 and RQ3. I chose the chi-square test to align with RQ2 and RQ3 to determine if there were associations between the categorical variables (Laerd Statistics, 2019). Data was collected representing all final course grades from the enrollment in the online U.S. history course to compare passing rates from the fall of 2007 through the spring of 2012, when students used the hardcopy textbook, with passing rates from the fall of 2012 through the spring of 2017, when students used the online textbook. Student passing rates prior to the fall of 2012 were considered for Group 1 and student passing rates after the fall 2012 were considered for Group 2.

Definitions

The following terms were used in this study:

Ethnicity: The data that was analyzed by ethnicity fell into the following categories: Anglo, African American, Hispanic, Asian, Not Reported, and Other.

Gender: The data that was analyzed by gender fell into two categories: male and female.

Group 1: The group of students enrolled in the U.S. history online course from 2007-2012 who had access to course materials by purchasing a hard textbook was Group 1. In the output from the statistical tests, this group is referred to as Group1.hardcopytxt in the title of the bar charts.

Group 2: The group of students enrolled in the U.S. history online course from 2012-2017 who did not purchase the hardcopy textbook and instead had access to course materials through a free embedded textbook composed Group 2. In the output from the statistical tests, this group is referred to as Group2.embeddedtxt in the title of the bar charts.

Online textbook: The embedded textbook for the U.S. history online course is an electronic form of the textbook that is available in the online course learning management system (Blackboard) course shell was readily available to students enrolled in the online course at no extra cost.

Open educational resources (OER): The McKerlich, Ives, and McGreal (2013) study indicated that OER are available in a variety of forms such as audio, video, text, and courses. The OER investigated in this study was in the form of a free embedded textbook in the online course.

Passing rates: Participants obtaining final course grades of A, B, and C were considered passing grades and combined to calculate the passing rate.

Student success: In an investigation of current research on the use of OER and student success rates, studies measured student success based on multiple variables. Hilton et al. (2016) measured student success with an aggregate of withdrawal rates, drop

rates, and C or better course grades. The Fischer et al. (2015) study measured student success through an analysis of course completion, C or better grades, overall course grades, and the number of credit hours in which the student was enrolled. Atchley et al. (2013) focused on course grades as the measurement of student success through the percentages of A, B, C, D, and F course grades earned in the face-to-face and online courses. Each of these studies included C or better course grades as the measurement of student success with C or better indicating a passing grade and with D and F indicating a failing grade. For this current study, the measurement of student success was solely on C or better course grades for the online U.S. history course.

Assumptions

Although the course materials were available to students who took the community college online history course between 2007-2012 and were embedded and provided free to the students who took the community college online history course between 2012-2017, the first assumption was that students enrolled in the online course did use the online textbook. Another assumption was that students enrolled in the online course completed graded work for the course. A third assumption was that students in the online course between 2007-2012 who were not provided the online textbook did have access to the hardcopy textbook for purchase and used it. I also assumed that the instructors in the online course sections were using the same curriculum for the course throughout the time period. In Chapter 3, I detail four specific assumptions associated with the Mann-Whitney U test as well as two specific assumptions associated with the chi-square test.

Scope and Delimitations

The setting for this study was a large urban community college district in Texas. The district comprised of seven individually accredited colleges of varying size. This study took place at the largest college in the district with an average enrollment of approximately 20,000 credit students. The scope of the study included one required undergraduate U.S. history course. Although the course was offered face-to-face and online, this study used archival data from only the online sections of the course that ran beginning the fall 2007 though the spring of 2017. Data from the face-to-face sections of the course were not used in this study because they did not implement the online textbook. Only data from the fall and spring semesters were used to accurately represent the population of students attending an urban community college in Texas. Summer and winter sessions generally have a high number of transient students from local universities, which might bias the results of the study. Data was disaggregated by gender and ethnicity to investigate if gender and ethnicity influenced student success as measured by final course grades for the group with the hardcopy textbook as compared to the group with the online textbook.

Vygotsky's (1978) theory as it relates to scaffolding contributed to the boundary of the study through the policy of providing online students in Group 2 with the just-in-time support they needed in the form of an online textbook associated with the curriculum. An indication that providing an online textbook in online courses increases student success, could be generalized to the application of online textbooks in other online courses because of the large size of the population over the course of 10 years.

Limitations

One limitation of the study was that the students were not randomly assigned to either Group 1 or Group 2. Assignment to either group was based solely on when they self-selected the online U.S. history course at the time of their community college enrollment. There also may be unknown variables that could affect the dependent variable in that different faculty taught the U.S. history course and student grades were not determined by standardized tests but by the evaluation of the individual instructors based on rubric guidelines. Finally, in this study, there were different participants in each group depending on when they were enrolled in the course.

Significance of the Study

Whether there is a relationship between student success rates and providing an online textbook in an online U.S. history course, as compared to using a hardcopy textbook in that course, may help college administrators decide whether there is sufficient return on investment in altering policy and curriculum regarding access to online textbooks. In addition, investigating if gender and ethnicity influence the effects of this policy implementation on student success may help to determine whether access to an online textbook is a significant contributing factor in student success rates for these populations. If the analysis of the data had indicated that students with access to the online textbook produced increased course grades, the practice of using this form of OER could be scaled up to include other online courses and at other institutions. More students being able to complete courses and programs of study may lead to further education, employment, and positive contributions as members of society.

Summary

Studies regarding the use of OER have resulted in showing varying outcomes for student success (Feldstein et al., 2012; Hilton et al., 2013; Hilton & Laman, 2012; Hilton et al., 2014; Wiley et al., 2012;). The adoption of OER by an urban community college in Texas in the form of an online textbook was in response to the high cost of traditional hardcopy textbooks and the gap in current research because of a low adoption rate of embedded online textbooks. The purpose of this causal-comparative quantitative study was to determine the difference in student success between history course students who used a hardcopy textbook and students who used an online textbook at an urban community college in Texas while also investigating the influence of gender and ethnicity. I examined the differences in student success rates between the group of students enrolled in an online U.S. history course from 2007-2012 who purchased a hardcopy textbook (Group 1) and the group of students enrolled in the same course from 2012-2017 who instead had the textbook embedded in their online course (Group 2). These data from the two groups were also disaggregated by gender and ethnicity to investigate how those factors may have influenced the effects of the implementation of the online textbook on student success.

By nature of the decision to embed the online textbook material at appropriate times into the course, this study is reflective of Vygotsky's (1978) scaffolding approach to learning. The online textbook was the resource provided by, in Vygotsky's term, the mediator as a scaffolding mechanism to increase student learning from the student's current abilities to their learning potential, bringing theory to practice.

In this first chapter, I included a summary of the topic and background of OER and student success. I also provided the theoretical framework as well as the research questions and nature of the study.

Chapter 2: Literature Review

Online student success rates in community colleges have continued to fall below student success rates in their on-campus counterparts (Gregory & Lampley, 2016). OER strategies to improve student success rates with community college students are designed to assist students in completion of courses and programs of study (Hilton et al., 2016). For this study, I investigated student success rates in a required online U.S. history course where one group of community college students had to separately purchase a hardcopy of the textbook and a second group was intentionally provided scaffolded course material in the form of an online embedded textbook. The purpose of this causal-comparative quantitative study was to determine the difference in student success between students who used a hardcopy textbook in an online U.S. history course and those who used an online textbook at an urban community college in Texas, while I also investigated the influence of gender and ethnicity.

I conducted a review of current literature regarding scaffolding, OER, student success, and gender and ethnicity to identify a gap in current literature as well as to establish the relevance of the problem. Current studies on the application of scaffolding in face-to-face courses, online courses, and higher education have been limited, which supports its use as a basis for this study. For instance, Smit et al. (2013) focused on whole-class scaffolding in face-to-face classes at the elementary level, Chen (2014) used a population of eighth grade students, and Salyers et al. (2014) focused on working adults' additional instruction in an online learning environment. However, few current studies were found on college age undergraduate students such as studies by Ozan (2013)

and Chang, Wang and Chao (2009). Additionally, Yin, Song, Tabata, Ogata, and Hwang (2013) developed, implemented, and evaluated a mobile learning simulation where graduate level students experienced interactions in the simulation as well as in the real world to enhance their learning and motivation.

Research focused on OER such as free digital textbooks (Hilton & Laman, 2012) has included studies on the reduction of costs to students (Hatzipanagos & Gregson, 2015). Studies such as Yin et al. (2013) focused on scaffolding and its application in an online environment. The Hilton et al. (2016) study used data from Tidewater Community College after the implementation of the Z Degree, which was a degree path that included only OER courses. Hilton et al. (2016) sought to determine the relationship between drop rates, withdrawal rates, and C or better grades with the use of OER as opposed to traditional textbooks. Palacios and Wood (2016) investigated the effects of gender and ethnicity in online learning.

Despite these studies' focus on college age students, there has been a lack of research on the general population of undergraduate students; therefore, this study involved scaffolding to examine effects on student success rates in an online course for a general undergraduate course that all students were required to complete.

In this chapter, I provide the literature search strategy, theoretical foundation for the study, and a review of current research literature. Four main themes emerged for the literature review: scaffolding, OER, student success, and gender and ethnicity influences in student success.

Literature Search Strategy

I searched multidisciplinary and education specific Walden University library databases ERIC and SAGE for peer reviewed studies from 2012 to 2018 related to *OER, free course materials, embedded textbook, student success, online learning, scaffolding,* and *gender* and *ethnicity*. I also searched ProQuest Dissertations and Thesis for *OER, student success, online learning*, and *scaffolding*. Searches that combined *OER* and *student success* resulted in most findings applicable to this study. I also investigated citations used in previous studies to determine their applicability to this study. I identified Vygotsky's work regarding scaffolding as the theoretical foundation for this study based on its inclusion in previous studies researched as well as its relevance to this study.

Theoretical Foundation

Vygotsky's (1978) theory regarding the zone of proximal development is focused on the current abilities of the individual student as well as their learning potential through mediation. That mediation can come in the form of tools, activities, resources, and interactions. The application of this theory is known as scaffolding where the mediator provides the type and amount of support that the individual learner needs at the time that they need it. Scaffolding is the support for the learner to bridge the gap between their current abilities and their learning potential (Vygotsky, 1978).

Researchers have suggested adapted forms of scaffolding to apply to different situations. For example, Poitras and Lajoie (2014) employed a MetaHistoReasoning tool as an adaptive form of scaffolding. Further, Smit et al. (2013) suggested an alternate perspective of scaffolding, expanding the focus on the individual student to whole-class

scaffolding. Smit et al. examined whether whole-class scaffolding would support the emerging independence of students while making connections to cultural and social scaffolding (see Vygotsky, 1997). Mediation in the whole-class scaffolding was implemented in the form of student interactions between teachers and peers as well as other tools and resources (Smit et al., 2013). Smit et al. identified three aspects to whole-class scaffolding: "diagnosis, responsiveness, and handover to independence" (p. 817). Diagnosis is an essential first step in identifying the current developmental level of the students to support student progress toward their potential learning abilities, responsiveness equates to the adaptability of scaffolding, and handover to independence refers to scaffolding support being reduced with the final goal for the students to achieve independence (Smit et al., 2013).

Like Smit et al. (2013), Chen (2014) focused on an adaptive scaffolding, applying it to online learning for middle school students. In the e-learning system in Chen's study, students' progress was guided through a four-step adaptive scaffolding system including the "student model, presentation model, cognitive scaffold model, and motivational scaffold model" (p. 345). The student model is what the student already knows, the presentation model provides the new learning materials, the cognitive scaffold model diagnoses the current learning abilities of the student and selects appropriate scaffolding tools for the student, and the motivational scaffolding diagnoses the motivational levels of the learner and provides appropriate motivational scaffolding treatments for the individual. Chen identified three types of scaffolds that could be sent to individuals via text message to support their learning and motivation. Intrinsic motivational scaffolding

focuses on the goals and values of the leaner, external scaffolding supports the self-efficacy of the student, and the "amotivation" (p. 345) scaffolding supports student behaviors that have a goal. Overall, the results of the Chen study indicated that the adaptive learning environment improved student performance and motivation especially for students who were originally diagnosed as performing at a lower level.

Literature Review Key Concepts

Research related to Vygotsky's (1978) scaffolding theory, OER, student success in online learning, and gender and ethnicity became my four topics for the literature review. Studies of the use of scaffolding in higher education with both face-to-face and online implementation (Chen, 2014; Ozan, 2013; Smit et al., 2013; Yin et al., 2013) is the first topic I discuss. The review of current literature related to OER resulted in two subthemes: OER perceptions, barriers, and use; and OER cost savings. Research focused on student success and OER was the third topic. Finally, I cover a few studies that investigated the influence of gender and ethnicity in student success related to OER.

Scaffolding in Higher Education

With mediation being identified in various forms such as tools, activities, resources, and interactions (Vygotsky, 1978), current studies incorporating Vygotsky's zone of proximal development and scaffolding have focused on a variety of tools and types of scaffolding. Most of the research has been focused on face-to-face learning, though more recent research had also addressed online learning as will be seen in the following discussion.

Yin et al. (2013) tested participatory scaffolding in a mobile learning environment. Chang et al. (2009) investigated the relationships between the application of constructivism and scaffolding in a blog system and its effects on learning styles and the learning environment. Additionally, Davis (2006) used procedural scaffolding in the design of an online course to incorporate interactions by creating an activity-based learning environment for group and individual work. Further, Demiray (2016) investigated the roles of scaffolding in distance education with the recent trends in the use of OER and massive open online courses.

Similarly, Salyers et al. (2014) supported the connections between theory, e-learning, and practical applications with the following scaffolding model: "introduction, connect, apply, reflect extend" (p. 1). Salyers et al. also identified six steps in the scaffolding process: diagnosis of the current abilities of the student, creating goals, continued diagnosis through the process, providing student support as needed, reflection, and opportunities for internalization. As students create their knowledge networks through interactions with peers, teachers, or others, they may still require additional support in the form of scaffolding to achieve learning objectives and to make meaning of what they are learning. Therefore, creating opportunities for a variety of types of scaffolding activities and tools in online courses can aid in developing engaging learning environments. For example, Salyers et al. used a framework of scaffolding called ICARE in an e-learning environment for nursing students and found that it supported teaching and learning online.

Ozan (2013) sought to identify how to provide scaffolding to students in a mobile learning environment, which can support students as they learn in the network, as they manage their network, as they interact in the network, and as they use the tools in their network society. Ozan focused on four types of scaffolding in a mobile learning environment: social scaffolding, managerial scaffolding, instructional scaffolding, and technical scaffolding. Ozan concluded that the use of mobile devices and social scaffolding had the greatest impact on the learning process, increased student motivation, and had a perceived positive learning experience.

In lieu of the face-to-face interactions in traditional classrooms, procedural scaffolding is a method that can be used to create online interactions with the teacher, peers, and the learning content (Davis, 2006). Procedural scaffolding involves creating "effective learning experiences online by establishing a personal learning environment, structuring group and individual communication, and creating work-based contexts" (Davis, 2006, p. 144). Davis also included that the basic idea of scaffolding is to provide support. Three types of procedural scaffolding include personal homepages, e-mail interactions between the teacher and peers, and feedback from the teacher and peers (Davis, 2006). Additionally, synchronous and asynchronous individual and group interactions can occur through online chats, discussions, and assigning groups to communicate and work together (Davis, 2006).

Other research has also supported the use of traditional scaffolding in an online environment. Chang et al. (2009) focused on constructivism and scaffolding in a blog system to explore learning styles. Constructivism changes the focus on learning from the

teacher to the learner as an active participatory process between instructors and peers (Chang et al., 2009). In this perspective, knowledge may be constructed by individuals and in social groups. In social constructivism, the group of individuals negotiate, problem solve, and make decisions together. In Chang et al.'s study, the blog environment allowed for individuals, peers, and teacher to interact. The results indicated that student learning styles do not significantly affect student learning; however, teaching strategies based on scaffolding may increase student learning in addition to an interaction of teaching strategies and learning styles.

Smit et al. (2013) suggested an alternate perspective of scaffolding. Traditionally, Vygotsky's (1978) zone of proximal development focused on the current abilities of the individual student and their learning potential through mediation. Smit et al. (2013) adapted individual scaffolding to a new concept of whole-class scaffolding. Smit et al. (2013) sought to keep this new conceptualization aligned with Vygotsky's (1978) original individual focus on scaffolding where over time the exposure to whole-class scaffolding would support the emerging independence of the students. Additional connections were made to cultural and social scaffolding as noted in Vygotsky's (1997) theory. Mediation in the whole-class scaffolding was implemented in the form of student interactions between teachers and peers as well as other tools and resources. Smit et al. (2013) identified three aspects to whole-class scaffolding: "diagnosis, responsiveness, and handover to independence" (p. 817).

Smit et al. (2013) continued to align their aspects of whole-class scaffolding with Vygotsky's (1978) original zone of proximal development and scaffolding by stating that

diagnosis is an essential first step in identifying the current developmental level of the students to supports student progress toward their potential learning abilities. The second aspect of whole-class scaffolding was identified as responsiveness. Smit et al. noted that responsiveness equates to the adaptability of scaffolding. The final aspect of whole-class scaffolding was denoted as handover to independence. As the student develops through the scaffolding process, eventually scaffolding support is reduced and the final goal of the process is for the students to achieve independence.

Smit et al. (2013) focused on the application of whole-class scaffolding in a teaching experiment in a multi-lingual classroom with most of the students speaking Dutch as a second language over the course of two years in a class of 22 students ages 10-12 years old. The teaching experiment was conducted with one teacher facilitating none lessons. The lessons were conducted once a week for approximately one hour for each lesson. The lessons focused on scaffolding language abilities and the goal of the lessons were to increase reading and writing skills. To achieve this goal, material was "introduced, modeled, jointly practiced, and eventually individually performed by the pupils" (p. 823).

Data for the Smit et al. (2013) study were collected through recordings of the lessons, student work, and reflections from the teacher. The recordings, student work, and reflections were also part of the three aspects of whole-class scaffolding: diagnosis, responsiveness, and handover to independence. In the process of diagnosis, the teacher interacted with students during the class but also reviewed their written work as well as listening to recordings of the lessons and writing reflections. The teacher applied

responsiveness by adapting subsequent lessons to address any deficiencies in student performance. Mediation activities and tools employed during these lessons included a vocabulary words where the teacher kept a running list of subject specific words. Alternately, students were presented with an unidentified graph where they were working together to identify appropriate words to describe the parts of the graph.

Smit et al. (2013) did not provide any conclusions about the benefits of whole-class scaffolding or whether it would be reasonably applicable to scalable in different settings. Smit et al. sought to review the theoretical framework of Vygotsky's (1978) scaffolding as they conceptualized and applied whole-class scaffolding in a classroom setting. Future research was suggested in different settings.

Like the Smit et al. (2013) study, Chen (2014) focused on Vygotsky's (1978) theory regarding the zone of proximal development and adaptive scaffolding. Smit et al. (2013) noted the significance of the adaptive nature of scaffolding. Chen (2014) provided an overview of scaffolding and the need to diagnosis the current abilities of the student, to employ scaffolding to support the learning needs of students, and to work towards independent learning where the student takes responsibility for their learning. Chen focused on an adaptive scaffolding for online learning for middle school students. The results of the Chen study indicated that the adaptive learning environment improved student performance and motivation especially from students that were originally diagnosed as performing at a lower level.

In a review of current literature, Chen (2014) denoted the difference in hard or fixed scaffolding as opposed to adaptive scaffolding. Chen commented on the intrinsic

issues with hard scaffolding that included the inability to adapt to individual student needs, the lack of motivation for the student to take responsibility for their learning, as well as the lack of any diagnosis of the learning levels of the students. As opposed to hard scaffolds, soft scaffolds provide "just-in-time and personalized support" (p. 343) for the students with the teacher mediating those needs. Chen reviewed adaptive learning systems that were intelligent and adaptive to the learning styles and goals of students. Although student learning has been seen to improve with these systems, Chen commented that research has not identified why they have a positive impact on learning or what aspects of the systems are effective. Opposed to these previous studies, the Chen study included the relationships between prior knowledge and motivation of the students. Although previous studies reviewed by Chen indicated a focus on learning styles in existing adaptive systems, Chen focused on the motivation of the learner as related to Vygotsky's (1978) theory on the zone of proximal development.

The Chen (2014) experimental study that focused on adaptive scaffolding in an online learning environment. The 170 students were divided into four classes with two classes assigned as the experimental group and two classes assigned as the control group. The experimental group included 81 students were provide access to the e-learning system and received the support of adaptive scaffolding. The control group with the remaining 89 students also received access to the e-learning system but did not receive any scaffolding support.

The instructional materials in the Chen (2014) study covered during the experiment were the concepts of velocity and acceleration in physics. Students in both the

experimental and control groups through the e-learning system accessed learning modules. In the e-learning system, teachers could modify learning materials. In the e-learning system, students' progress through a four-step adaptive scaffolding system including the "student model, presentation model, cognitive scaffold model, and motivational scaffold model" (p. 345). The student model is what the student already knows, the presentation model provides the new learning materials, the cognitive scaffold model diagnoses the current learning abilities of the student and selects appropriate scaffolding tools for the student, and the motivational scaffolding diagnoses the motivational levels of the learner and provides appropriate motivational scaffolding treatments for the individual. Chen identified three types of scaffolds that could be sent to individuals via text message to support their learning and motivation. Intrinsic motivational scaffolding focuses on the goals and values of the leaner, external scaffolding supports the self-efficacy of the student, and the "amotivation" (p. 345) scaffolding supports student behaviors that have a goal. The scaffolding mentioned was only available to the students in the experimental group.

Chen (2014) used an analysis of covariance to determine that the students in the experimental group earned higher scores than those students in the control group. Chen concluded that the application of adaptive scaffolding in an e-learning system increased student outcome by increasing their motivation. Chen also commented that students who were originally diagnosed at a lower level of knowledge made more progress than those identified at higher levels of initial abilities. Additionally, Chen reiterated that fixed learning environments do not take into consideration the developmental needs of

individual students and that adaptive scaffolding aids students in making meaning of what they are learning and the learning process.

Yin et al. (2013) developed, implemented, and evaluated a mobile learning simulation where students experience interactions in the simulation as well as in the real world to enhance their learning and motivation. The simulation included a scaffolding cycle with five steps: "initial stage, concrete experience, observation and reflection, abstract conceptualizations, and testing in new situations" (p. 137). Yin et al. concluded that the scaffolding simulation had a positive impact on student learning and motivation as well as increased student success rates with more complicated tasks.

The Yin et al. (2013) study framework focused on the context of the simulations to make meaning of learning. Yin et al. noted that previous applications of scaffolding occurred in the traditional classroom setting and that there was a lack of research focused on scaffolding use in simulated environments. The Yin et al. not only focused on scaffolding but also on the concept of fading where scaffolding support was withdrawn when students no longer needed the scaffolding support. In addition to the lack of studies on scaffolding in simulated environments, Yin et al. noted that there were even fewer studies in simulated environments that included both scaffolding and fading techniques. Yin et al. commented that the results of previous studies of simulated environments failed to achieve significant results. Yin et al. cited a gap in the results of previous studies noting that students were unable to achieve the goals they set for themselves in the simulated environment. Therefore, the Yin et al. implemented scaffolding to bridge the gap between identifying student learning goals and students achieving those goals. The

application of Vygotsky's (1978) scaffolding aided students for them to achieve their potential and then to fade that scaffolding, as students were able to make meaning of their own learning.

Yin et al. (2013) defined the participatory simulations as online environments where students engage each other in real world contexts. The students were actively participating to work through simulations as opposed to inactively viewing a simulation. In addition to scaffolding and fading, Yin et al. included a theoretical background with Kolb's (1984) experiential learning and it's four stages of "concrete experience, reflective observation, abstract conceptualization and testing in new situations" (p. 138). The participatory simulation design combined both the experiential learning sequence of concrete experience, observe and reflect, abstract conceptualization, and application to new situations with the scaffolding sequence of pointing out mistakes, helping the student to correct the mistakes, and discussion. Pointing out the mistakes is immediate just-in-time information about the mistake when the mistake happens. The design of the scaffolding allowed for three types of intervention to aid the student in correctly the mistakes that include a hint, an illustration, and help from the instructor. Discussion occurred between students using mobile devices to collaborate sharing ideas, experiences, identifying learning objectives, and to understand concepts.

In the Yin et al. (2013) study, as students progressed through the experiential learning design with the aid of scaffolding, three levels of fading were implemented according to the existing gaps in the zone of proximal development for each student. These gaps indicated the distance between what a student could do and understand and

meeting the goal of their potential learning. The three fading levels aligned with the three scaffolding levels. The first fading level provided the scaffold of informing the student of a mistake. However, the fading technique required the student to seek out the mistake and how to fix the mistake using their resources including the teacher and peers. The second fading level required the student to identify their own mistakes and correct those mistakes through discussion with peers but not with the instructor. The final level of fading, students had to independently complete the activity without help or discussion from the teacher or peers. Upon completion of this final level of fading, the student reached the goal of understanding the concept.

The Yin et al. (2013) study was implemented with 41 master's degree students. After a pre-test of their knowledge, students were divided into two groups. The experimental-group was comprised of 21 students and the control group with remaining 20 students. The experimental group received the scaffolding and fading treatments while the control group was only notified if a mistake had been made. The results of the Yin et al. study indicated that students in the experimental group made the same mistakes as the control group but made those mistakes fewer times with the use of the scaffolding. The most frequently used scaffolding by the students was the discussion with 48% of the students utilizing that form of scaffold. Pointing out mistakes was used 21% of the time, illustration was used 16% of the time, hints were used 12% of the time, and help from the instructor was only used 3% of the time by students. Following the pilot, students were surveyed using a five-point Likert scale with nine closed ended questions. From this survey, Yin et al. found that 94% of the students preferred using discussion as their

primary scaffold, over half of the student citing that the scaffolds were useful, and that 84% of the students indicated that they preferred this type of learning. Yin et al. summarized that participatory simulations incorporating experiential learning and scaffolding in mobile technologies increases student learning.

Demiray (2016) presented a review of the development of OER and massive open online courses (MOOCS) and the potential roles of scaffolding and meta communication in these online learning environments. Demiray introduced the changing learning platforms and the resulting need for instructors to transform and redesign their traditional course materials for online learning implementation. Demiray commented on the changing perspectives of instructors and teachers from traditional instructional methods where the instructor teaches the student to new student mid sets of wanting to discover knowledge. Demiray noted that although online learning is contributing to the globalization of education, it was not readily available throughout Turkey.

Demiray (2016) investigated the "functional roles of scaffolding and meta-communications for knowledge building in digital learning environment" (p. 274). Demiray defined meta-communication in the online environment as a variety of ways to interact and to communicate in building knowledge and making meaning in a network of learning. Types of meta-communication included synchronous and asynchronous text communications and self and community reflection. Demiray commented that online course design should be interactive and social in nature to create an effective and collaborative learning environment for students in online courses. Demiray's description of the use of communication technologies focused on student reflection and analysis

activities that student would then share with peers. Instructors would facilitate these types of communications by assigning groups for students to share and collaborate as students make meaning of their learning and apply knowledge in creative problem solving in a social context.

Demiray (2016) defined scaffolding as "a teaching method that enables a student to solve a problem, carry out a task, or achieve a goal through a gradual shedding of outside assistance" (p. 277). The instructor's role in scaffolding is to support and facilitate student mastery of concepts. Following this mastery, instructors would then use a fading technique to gradually remove their assistance as students acquire their independence as a learner. Demiray commented on possible scaffolding techniques that instructors could use including the use of initial tasks that are within the student's current level of knowledge to help create a sense of self-efficacy, the creation of a social context to learning in order that students have peer to peer interactions creating a sense of community, and to ensure that fading is implemented gradually and eventually remove all aid once a concept has been mastered. Demiray identified five characteristics of scaffolding: "intentionality, appropriateness, structure, collaboration, and internalization" (p. 278). The instructor's role was in the design of the online course to provide resources and activities and to mediate the learning process. Demiray concluded that scaffolding applications in the online learning environment aid in the understanding and development of the teaching and learning process.

Poitras and Lajoie (2014) focused on the implementation of scaffolding to support "self-regulated inquiry learning (p. 335) in an adaptive online system called a

MetaHistoryReasoning tool for an undergraduate U.S. history course. The Poitras and Lajoie study included twenty-two undergraduate students where data were collected as they were logged into the adaptive online system during a four-hour period. The results indicated that the adaptive system was able to predict performance with 75% accuracy. The system identified student goals and aided in sequenced instruction to identify student errors in the application of skills and to provide students with various types of mediation to improve self-regulated learning.

Poitras and Lajoie (2014) provided a review of previous literature regarding self-regulated learning. The concept of self-regulated learning was identified as an iterative process with the use of "cognitive and metacognitive" (p. 336) activities. Metacognitive activities were employed to support students as they begin to understand what they know and how they learn. These activities would diagnose their current understanding of the learning materials as student reflect and question their progress toward their goals. In the discipline of history, the application of self-regulated learning would take a paradigm shift from learning about history through the study of a textbook to investigating and problem-solving historical events. In this process, historical events would be researched to understand the possible causes and implications of events through the collection of knowledge, collaboration and discourse, and contextualization of the evidence. In the Poitras and Lajoie study the MetaHistoReasoning tool was used to investigate how students acquire, practice, and apply knowledge.

The Poitras and Lajoie (2014) study included 22 university students six of whom were men and the remaining 15 were women. The students participating in the study

were required to be native English speakers with no current knowledge of the subject or currently enrolled in any history courses. The students were presented with an historical event without knowledge of the specific "causal chain of events in relation to the topic (p. 339). By removing the evidence of the causal relationships that led to the historical event, students were left to investigate the possible causes and implications related to the historical event. Students were provided with written and photographic documents to aid in their investigation. Students progressed through the self-regulated learning module where they acquired and practiced skills. For example, investigating existing sources and the evaluating the validity of source. Strategies in this process included identifying events, gathering evidence, asking questions, and suggesting explanations. During this process, students were supported through mediation such as feedback regarding the direction of their investigation and prompts for the students to explain their positions. The results of the Poitras and Lajoie study indicated that using the online self-regulated tool, students learn at varying rates and instruction should be scaffolded to meet the needs of the individual learners.

Open Educational Resources

In a review of current literature related to OER, three main themes emerged: OER perceptions, barriers, and use; OER cost savings; and student success. I discuss the last topic in a separate section as the amount of research focused on OER and student success is limited (Grewe & Davis, 2017; Hilton et al., 2016; Robinson et al., 2014). Most of the studies on OER have focused mainly on perceptions and barriers of OER as well as the

cost savings with OER. The following sections of the literature review investigated the current literature in the three themes related to OER and student success.

OER perceptions, barriers, and use. Pitt (2015) investigated instructor perceptions on the use of OER specifically through an open textbook provider called OpenStax. The Pitt study utilized two surveys between 2013 and 2015 that targeted instructors using a variety of open textbooks. The results of the Pitt study indicated that instructors perceived that they were able to respond to student needs and that their teaching was more effective and, in some cases, prompted changes in their teaching practices.

Pitt (2015) provided an introduction regarding the increasing price of textbooks and the barrier those costs were to student success. Pitt indicated that students were concerned about the effect of not purchasing textbooks on their grades. Pitt noted that students were more likely not to choose to take courses that required costly textbooks. Although Pitt commented that OER use is rising, most educators do not yet have a clear understanding how to access or implement OER in an educational setting. In a review of current peer reviewed literature, Pitt explained that most of literature covered the perceptions of OER and the cost savings to students with the remainder of the studies focusing on barriers to implementation such as the perceived quality of OER by instructors.

Pitt (2015) completed the study using research provided by the OER Research Hub. The OER Research Hub was an international collaborative research project regarding the impact of OER with surveys conducted in more than 180 countries and to

more than 7,000 participants. The Pitt study made use of two surveys that deployed by the OER Research Hub that focused on the Impact of OER on student success, the use of OER versus other online materials, and the impact of OER adoption at the institutional level. Although the OER Research Hub participates in research across the world, most of study participants in these two studies were from the United States. All the participants in both surveys had either previously used and were currently using OER, had previously used and were not currently using OER, or were currently using and had not previously used OER. Of the participants in both surveys, 95% indicated that they were at least part-time instructors with 50% of those part-time instructors teaching in higher education. The themes covered in the two surveys included how the instructors became aware of OER, cost savings of OER, and the impact of use of OER.

Pitt (2015) reviewed both the survey results and found that 18%-27% of respondents between the two surveys indicated that they heard about OER through colleagues with most instructors finding OER through their own online searches for material. Instructor knowledge of where to find OER was indicated as a barrier to the adoption of OER. Most respondents in both surveys (73% and 95%) indicated that they would be more likely to choose a specific OER based on the reputation of the source recommending the OER. Regarding the cost savings with the use of OER, respondents in both surveys perceived that there was a cost savings for students using OER. Although the respondents believed that students saved money by using OER, 59%-62% of respondents in both surveys thought that the institutions benefited financially from the use of OER. However, Pitt noted that previous research determined that identifying the

cost or cost savings of OER for an institution was dependent on the type of OER and how the OER was implemented. The instructors in both surveys commented that having used OER increased the likeliness that they would recommend OER and be involved in institutional adoptions. The impact of OER on the instructors was mixed. Most instructors did not indicate how the use of OER impacted their teaching while 30% in both surveys perceived that the OER made their teaching easier and 25% in both surveys commented that the use of OER changed their teaching practices.

Pitt (2015) concluded that OER in the form of open textbooks did positively impact student participation and resulted in a cost savings for students. Most instructors sought out OER through their own online searches however they were more likely to use OER that was recommended by a trusted source. Once using OER, instructors were more likely to continue using OER and to recommend OER to others. Pitt noted that the review and study of the two surveys did have limitations because participants self-selected and gift cards were provided to the participants. The sample size for the two surveys was small with 127 respondents out of 1,653 OER adoptions during that same time. There were no recommendations for further research.

Zhang and Li (2017) sought to investigate if having online teaching experience impacted faculty perceptions of the use of OER. During the 2014-2015 academic year, a survey was distributed to 380 randomly invited faculty at a university in China. Although the focus of the Zhang and Li study was to investigate the relationship between having online teaching experience and perceptions of the use of OER, only a small portion of the respondents had any online teaching experience. The results of the survey indicated that

online instructors would be willing to share their educational resources with others and had a more positive perception of the use of OER than their non-online teaching colleagues. Based on the results of their study, Zhang and Li recommended that institutions increase the number of faculty teaching online to increase their perceptions of the use of OER.

The Zhang and Li (2017) study utilized a three-part questionnaire and gathered data regarding the demographics of the participants, information regarding their online teaching experience and willingness to share educational materials, and their perceptions regarding aspects of OER. Of the 380 randomly selected participants, 360 faculty responded to the survey. The results of the demographic data indicated that the largest responding group was male associate professors in the field of engineering and between the ages of 25 and 30 years old. Of the 360 respondents, only 14.7% had any online teaching experience and of those 53 faculty, 22 of them allowed open access to their course materials whereas the remaining 30 faculty allowed restricted access to their course materials. With the majority of faculty not having had any online teaching experience their perceptions of OER were positive without having an opinion or knowledge of OER. The response of faculty with online teaching experience toward the use of OER was positive and statistically significant. Zhang and Li noted that although previous studies were conducted regarding the perceptions of OER, they did not focus on the relationship between online teaching experience and perceptions of OER. The recommendation from Zhang and Li was to increase online teaching experience to improve the understanding and implementation of OER in the future.

Lindshield and Adhikari (2013) sought to investigate student perceptions of the use of OER as opposed to traditional textbooks in both face-to-face and online courses citing the lack of significant research on the topic. Lindshield and Adhikari noted that their study explored student perceptions over multiple semesters as opposed to their previous (2011) study occurring within a single semester. The results of the study indicated that students in both face-to-face and online courses positively perceived OER in the form of a flexbook. However, students in online courses used the flexbooks more frequently and subsequently rated the OER higher than the on-campus students.

The Lindshield and Adhikari (2013) study took place over three semesters between 2011 and 2012 with students using the Human Nutrition flexbook in face-to-face and on campus courses. Students were sent an automated email with a link to the survey and they had access to the survey over a two-and-a-half-week period. Instructors were asked to remind students about the survey and students received two email reminders regarding the survey. The survey questions included demographics, technology efficacy, and the frequency in which they used the flexbook. Students responding that they did or did not use the flexbook were then directed to varying follow-up questions regarding the use of the flexbook.

The results of the Lindshield and Adhikari (2013) study indicated that the demographics of the students varied form online and face-to-face. The online students were older, mainly female, and non-traditional students. The response rates to the surveys were significantly higher from the online students. In the spring of 2011, 60.8% of online students responded to the survey as opposed to 36.4% response from the face-to-face

students. Response rates for the fall of 2011were not provided in the results of the study. In the spring of 2012, 71.9% of the online students responded to the survey whereas 43.1% of the face-to-face students responding to the survey. Students in both face-to-face and online courses preferred not buying the traditional textbook in favor of the flexbook. Technical efficacy was not a factor in the perception of OER to either groups of students. Both face-to-face and online students indicated using the flexbook more frequently than they have used traditional textbooks. Lindshield and Adhikari commented that the variety of flexbooks formats available to the students such as PDFs and GoogleDocs may have increased the positive response for the flexbook. Further research was suggested to investigate student perception of OER in other types of courses as well as additional research regarding OER creation and adoption.

Vojtech and Grissett (2017) expanded on the current literature regarding student perceptions of OER to investigate how student perceive faculty members that use OER in the form of open textbooks. Vojtech and Grissett surveyed students in two undergraduate psychology courses by having them read a passage bout an instructor that was using a traditional textbook and a passage about an instructor who used an open textbook. The students then answered open and closed-ended questions about the instructors. The results of the survey indicated that the students preferred the instructor that used the open textbook perceiving the instructor as more engaged and creative than the instructor using the traditional textbook. However, students also indicated that the cost of the textbook was also a factor in determining whether to take a class that used a traditional textbook or an open textbook.

In a review of current literature, Vojtech and Grissett (2017) commented that research in OER is limited because OER itself is a relatively new concept defined in 2002 by UNESCO. Vojtech and Grissett (2017) reviewed the results of current studies that investigated the relationships between OER and student success. The results of these studies were inconsistent. Wiley et al. (2012) found no differences between student success and the use of OER or traditional textbooks whereas Fischer et al. (2015) found an increase in student success rates for those students using OER. In all these studies, the types of OER varied as well as the type of measurement of student success. Vojtech and Grissett (2017) noted that student perceptions of OER were important because previous studies have linked positive student perceptions of learning materials to greater engagement and student success. Previous studies (Hilton et al. (2013) have indicated that students respond positively to the use and quality of OER as opposed to traditional textbooks. Faculty perceptions of OER have also reflected student perceptions of OER as positive in the study by Hilton et al.

Vojtech and Grissett (2017) focused on the student perceptions of faculty that use OER to investigate if students view faculty using OER more positively than faculty using traditional textbooks. Vojtech and Grissett surveyed 23 students using traditional textbooks in two upper-level college psychology courses. Students were not required to participate and were also allowed extra credit for participation. The study took place at the beginning of each of the two classes. These students read a passage on an instructor using a traditional textbook and a passage on an instructor using an open textbook. The gender and experience levels were randomly varied in the passages. The students ranked

the two instructors on a five-point Likert scale based on six characteristics. Open-ended responses allowed students to explain their ratings of each of the instructors. Students then rated on a five-point Likert scale how likely they were to take a class from each of the instructors and then to provide and open-ended response explain their raking decision. The results of the study indicated that students had a positive perception of the instructor using OER as opposed to the instructor using the traditional textbook. A common reason noted in the open-ended responses of the students was the cost savings of the open textbook as opposed to the traditional textbook. Vojtech and Grissett commented that possible previous use of OER or experience with traditional textbooks could have altered student perceptions of OER. The small participant pool including only upper level psychology students may have also impacted the validity of the study as it would relate to other populations. The passages used in the study may have also been biased regarding wording in favor of OER and the lack of a control passage. Future study was suggested to include demographic data and a larger sample size.

Citing the lack of empirical research regarding OER, Bliss, Robinson, Hilton, and Wiley (2013) sought to determine the perceptions of OER by instructors and students. Instructors and students at eight community college in the United States were provided with a survey with questions focusing on their perceptions of the cost of OER, the use of OER, the quality of OER, and student outcomes related to OER. The results of the survey indicated that there was a significant cost savings with the use of OER, that the quality of OER was perceived to be as good as traditional textbooks, and that there were affects to teaching and learning.

The Bliss et al. (2013) study took place during the 2012-2013 academic year within Project Kaleidoscope that includes eight community colleges serving at-risk students. The pilot program including 4,000 students and 80 instructors provided OER textbooks to replace their traditional textbooks. An online survey was provided to the instructors as well as a link to the student survey for the instructors to forward to their students to complete. The surveys were available during the spring semester of the implementation of the pilot. Both instructors and students were asked multiple-choice questions regarding the cost, quality, and their use of the open textbook. Additionally, instructors were asked to comment on how the open textbook impacted their instructional preparation as well as student engagement.

Respondents to the survey included 58 of the 80 instructors and 490 of the 4,000 students that were in the pilot. The results of the Bliss et al. (2013) study indicated that both instructors and students found a significant cost savings by using the open textbooks. Instructors reported that traditional textbooks averaged $80 and student reported that traditional textbooks cost an average of $60 whereas the cost of the open textbooks averaged $20 as reported by instructors and $17 as reported by students. Instructors indicated that they spent more time preparing for the open textbook than with their traditional textbook. However, the instructors found that with the increase in use of technology in their classroom, they had more opportunities to be flexible in the classroom and students appeared to be more engaged. These changes in instructional design from lecture to engagement activities were reported by 75% of the responding instructors. Instructors also perceived student preparedness to be increased with only 11% of

instructors perceiving their students as less prepared. Student responses in the Bliss et al. study included perceptions of learning more and learning better with the online textbook although both student and teachers did not indicate that they used the open textbooks more than they had used the traditional textbooks. The majority of instructor and student perceived the OER to be of better quality than the traditional textbooks with 115 of instructors and 6% of students perceiving the OER quality to be poorer than the traditional textbooks. The main complaints with the quality of the OER had to do with technology issues and the quality of the text. Although the cost savings is evident in the results of the Bliss et al. study, the perceptions of the impact of OER on teaching and learning outcomes in varied. Bliss et al. recommended that future studies focus on improving and replicating their pilot.

Prasad and Usagawa (2014) investigated the willingness of faculty to develop open textbooks considering recent research indicating that the use of OER reduces the expenses of course materials for students stating that traditional textbook costs have increased 812% since 1972 and that 70% of students indicated that they have not purchased course materials because of their cost. Prasad and Usagawa surveyed 39 university instructors to assess their willingness to develop OER. The results of the survey indicated that 17 of the 39 instructors would be willing to develop OER in the form of custom textbooks for their courses.

In addition to determining faculty willingness to develop OER, Prasad and Usagawa (2014) investigated instructor awareness, perceived barriers, and motivation to develop and adopt OER. Information was also collected regarding the prescription of

traditional textbooks including the number of textbooks per course and instructor awareness of the costs of prescribed materials. The Prasad and Usagawa study utilized an online survey for a descriptive analysis of faculty perceptions of OER. The 20-question survey was divided into 4 categories: demographics, current textbook usage, current use of OER, and willingness to develop OER. The initial population for the study included 229 instructors with a random sampling of 175 instructors. The online survey was delivered via email to the 175 instructors that were prompted to participate in the voluntary survey. Participants had access to the survey over the course of one month in the fall of 2013 and they received an email reminder mid-way through the month.

Of the 175 surveys that were emailed in the Prasad and Usagawa (2014) study, 39 surveys were completed. The demographic data indicated that 67% of respondents were males and 51% of respondents were between the ages of 26 and 40 years old. Data regarding the current use of prescribed textbooks indicated that most instructors (36 out of 39) routinely prescribe textbooks for their courses. Of the 36 instructors that prescribed textbooks for their courses, 17 of those instructors prescribe more than one textbook for their courses. Survey results related to instructor awareness of textbook prices prior to prescribing textbooks indicated that only 27.78% of the 36 instructors always knew the costs of the textbooks prior to requiring the textbooks for their courses. Although the majority (32 out of 39) of instructors responded that they were aware of OER, they did not indicate that they had an in-depth knowledge of OER and only four of the instructors responded that they used OER frequently. Barriers to the use of OER were noted the amount of time to identify OER and the lack of training and skills to develop and adopt

OER. In addition to overall questions regarding OER, Prasad and Usagawa questioned instructor specifically about open textbooks, digital textbooks available online for use online or for download at little or no cost to the students. Even though 74.36% of the instructors surveyed, indicated that they had heard of open textbooks, only 23.08% of those had used an open textbook. The results of the Prasad and Usagawa study indicated that 43.59% (17 instructors) were willing to develop OER even though two of those instructors had not known about OER prior to the study.

Kim, Lee, Lee, and Shon (2015) investigated the factors that influenced adult learners to use OER. Kim et al. noted that previous studies focused on adult learners in the online modality and did not focus on the use of OER. Kim et al. commented that non-traditional students participating in life-long learning may need more flexibility than the traditional on campus student and that the use of online modalities may provide access to education for all learners. In addressing the factors that influence adult learners to use online and OER education, Kim et al. noted that students may not be as successful in the online learning environment due to factors of motivation and individual learning needs. The focus of the Kim et al. study was to identify the factors influencing adult use of OER and to investigate the relationships between those factors. Kim et al. analyzed and online survey of adult students through a regression analysis and the results showed that the key factors for adult use of OER were ease of use and the relationship to their work.

Kim et al. (2015) deployed a survey to university students that were identified as having previous experience using online educational resources to investigate six factors related to their potential intention to use OER. The factors included ease of use,

usefulness, learner attitude, subjective norm, self-efficacy, and work-related factors. These factors were then tested against the dependent variable of their intention to use OER. The online survey was conducted over the course of one month in the fall of 2012 with 1,158 students responding to the survey. Although the participants in the study were university students, Kim et al. considered them as adult learners because the average age of the participants was 39.6 years old. The results of the Kim et al. study indicated that two of the six factors were statistically significant factors in predicting the intent to use OER. Those factors were perceived ease of use and the relationship to their work.

Judith and Bull (2016) examined the implementation of OER in higher education and the barriers that might prevent OER implementation at the faculty, program, and institutional levels. Judith and Bull commented that existing research has explored the potential of OER without investigating the practical implementation of OER. Judith and Bull reviewed current research and identified 20 case studies to seek out effective strategies in the adoption and implementation of OER. Challenges to the adoption of OER were noted as finding OER and finding effective OER, understanding of the legal aspects of OER use, and knowledge of how to use OER. Strategies to support the implementation of OER were identified at the individual, program, and institutional levels. Regarding individual strategies, Judith and Bull suggested that learning about OER was an individual journey to seek out new resources. At the programmatic level, Judith and Bull suggest professional development in OER and creating a culture that was open to OER. Institutionally, OER could be supported through incentives and financial support.

Cooney (2017) conducted a study to investigate the impact of OER on students. Students in three sections of a college health psychology course were interviewed and completed a survey about how they engaged with their course materials after their traditional textbooks were replaced with faculty developed OER. The results of the study indicated that students found the OER materials easy to access and they preferred the variety of OER materials to their traditional textbooks. Students also responded positively to the quality of the OER and stated that they would take additional courses that use OER.

Cooney (2017) noted that the OER initiative at the college was in support of faculty developed OER materials with the support of college stipends and not an open textbook adoption. Cooney discussed the need for accessible materials at the college as 85% of the students at the institution received financial aid, 44% were first generation college students, and 82% of the students represented underserved populations. Cooney cited numerous previous studies (Feldstein et al., 2012; Hilton, 2016; Lindshield & Adhikri, 2013) regarding OER perceptions and student performance. Cooney (2017) commented that there were limited previous studies that included focus groups with students as opposed to survey results or a variety of performance indicators.

Students who participated in the Cooney (2017) study were limited to those enrolled in the three sections of the health psychology course where the instructor developed OER as part of the pilot initiative and that same instructor taught all three sections of the course. The student focus groups included in the study were comprised of two volunteers from each of the three sections of the course for a total of six interviewed

students. The interviews included 12 questions and lasted approximately 45 minutes each. Students answered questions regarding how they accessed the OER, how they used the OER, how user friendly was the OER, and their perspectives of OER versus traditional textbooks. In addition to the interviews, 86 students in the three sections of the course were provided with a hardcopy survey at the end of class and 67 students completed the survey. The 12 questions on the survey were in the form of multiple choice, Likert scales as well as options for open-ended responses. Questions included demographic information and multiple perspectives on OER including accessibility, use, quality, and comparisons to traditional textbook. The question themes mirrored those of the interview questions.

The results of the Cooney (2017) study indicated that the participating students were in various stages of their education and in multiple different disciplines with 80% of the responding students having already taken three to eight semesters of college prior to the OER course. When accessing the OER materials, 70% of the students preferred using computers while the remaining students preferred using mobile devices. Of the students that accessed OER through a computer, 31% used college computers. Although students could print out the OER, only 16% responded that they printed out the material most of the time and 49% rarely printed the OER. Regarding the ease of use of the OER, students reported that the OER was organized and easy to use. Students also indicated that they preferred having access to all the course materials in one place. Having all the course materials in one place was a significant factor in the student preference of OER over the traditional textbook. Other factors in the preference of the OER over the traditional

textbook included the reduced cost not having to carry around a textbook. Cooney concluded that students preferred OER to the traditional textbooks but also made the point that these results are reflective of a preference for OER materials and not an open textbook as was the focus in previous studies.

De Hart et al. (2015) sought to determine the readiness of the university to adopt OER. De Hart et al. utilized a survey at the institution to investigate existing knowledge of OER, licensing of OER, and perceived barriers to the adoption and implementation of OER. The results of the stud indicated that although university staff knew about OER, there had not been any active adoption or implementation of OER. De Hart et al. determined that the institution would need to plan to make effective decisions and move forward with OER adoption and implementation.

The De Hart et al. (2015) study included all academic staff (faculty, administrators, and professionals) involved in teaching and learning with a total population of 3,800 and 483 respondents to the survey. The results of the survey indicated that 73.5% of the respondents had some knowledge of OER. Even though most staff knew of OER, they indicated very little knowledge of OER licensing. Staff indicated that their use of OER was predominantly with existing OER as opposed to creating and distributing their own OER. The results of the De Hart et al. study regarding barriers to the use of OER reflected the responses from previous studies. Staff indicted that they did not have the tools to find OER, that they could not find appropriate or quality OER. De Hart et al. referred to a 5-stage adoption process and determined that their institution was

in the first stage of the process indicated as the persuasion and decision stages for the adoption and implementation of OER.

Hatzipanagos and Gregson's (2015) examined the role of open access and OER in online learning through a survey of librarians and directors to determine existing practices, possible barriers, and resources in the adoption of open access and OER. The purpose of the case study was to increase awareness of the use of open access and OER in higher education, to identify processes to increase OER use, and to determine the use of OER and how it relates to online learning. Hatzipanagos and Gregson identified open access as free and accessible research articles and data to anyone at any time whereas OER were identified in the case study as resources related to distance education. Although Hatzipanagos and Gregson defined open access as research and data that was free and accessible research, they noted that some open access materials do require journal subscriptions for access. Regarding OER, Hatzipanagos and Gregson stated that OER did not meet the needs of interaction in the online learning environment and that interaction in OER was infrequent or poorly designed. The results of the Hatzipanagos and Gregson study indicated that although the librarians and directors had positive perceptions of OER, there were no processes in place to support using OER, there was also limited knowledge of the licensing in addition to barriers in locating appropriate OER. Hatzipanagos and Gregson concluded that OER must be promoted to increase awareness prior to the adoption of OER.

The Hatzipanagos and Gregson (2015) study utilized an online survey to collect quantitative and qualitative data from university librarians and program directors. Each

group received similar but work group specific surveys. A focus group was also conducted at a distance education conference in 2013. Surveys participants as well as experts attending the conference were invited to participate to discuss the benefits of open access and how to use open access. Results from 21 completed surveys and 30 participants in the focus group were analyzed.

The results of the Hatzipanagos and Gregson (2015) study regarding open access indicated that 54% of respondent institutions has no current polices on open access and 46% of the participants indicated that their institutions were in the process of developing an open access repository. Responses from librarians and program directors also indicated that 64% of them did not make use of OER. Perceived barriers to the use of open access and OER included a lack of knowledge, lack of professional development and support, and time to seek out open access and OER. Hatzipanagos and Gregson concluded that open access and OER are important to the increasing globalization of teaching and learning but that barriers to adoption and use are ease of access and quality.

Farrow et al. (2015) used secondary data from the OER Research Hub to investigate the relationship between OER and teaching and learning. The OER Research Hub was a project funded by the Hewlett foundation and operated out of The Open University in the UK. The Research Hub project began collecting data in the form of surveys, interviews, and focus groups from educators and learners regarding their use of OER. The survey data were compiled from various countries between 2013-2015. The dataset reviewed by Farrow et al. was created in 2015.

The 2015 dataset used by the Farrow et al. (2015) study included data from over 20 different surveys from different sample populations. Although the sample sizes and populations varied, the question themes remained consistent between surveys. The dataset included demographics of instructors and students, OER usage, motivations for using OER, Challenges of using OER, and the relationship between the OER and instructional practices. The types of OER used by participants ranged from textbooks, multimedia, lesson plans, quizzes, and other learning activities.

From an examination of the dataset, Farrow et al. (2015) found that 37.6% of educators and 55.7% of students indicated that the use of OER increased student satisfaction and agreed although to a lesser extent that OER improves test scores. The most significant response regarding the use of OER was from 88.4% of students indicating that the cost savings with the use of OER was what prompted their decision to take a course with OER. Farrow et al. acknowledged that the variety of surveys and methodology for deploying those surveys may have been inconsistent and effected the participant responses.

The McKerlich et al. (2013) study measured creation and use of OER in higher education to identify factors to increase the creation and use of OER. In the fall of 2012, McKerlich et al. deployed a quantitative survey with question pertaining to use, creation, and perceptions of OER to faculty and staff at the university. The results of the survey indicated that of the sample population at the institution, 43% were using OER and 31% were creating OER. McKerlich et al. suggested that the ratio between use and creation

might be used to measure future adoption of OER and that future research could be conducted to compare use and creation of OER at other institutions.

McKerlich et al. (2013) provided a definition of OER stating that OER may be any type of educational materials that are free and accessible for use and modification such as videos, lessons, quizzes, and articles. One factor supporting the attention to open textbooks was the financial savings for students. McKerlich et al. noted that barriers to the adoption of OER included knowledge of OER and licensing as well as technical skills to find and use OER.

The McKerlich et al. (2013) quantitative survey including 22 questions was deployed to approximately 1,300 faculty and staff at the university with a 10-day window for completion of the survey. Out of the total population of faculty and staff that received surveys, 154 responded to the survey with only 90 of those surveys being complete. McKerlich et al. argued that even though the response rate was significantly small, there were only 200 faculty and course development staff at the university and that they would not have an expectation that other staff would have responded to the survey. McKerlich et al. included all 154 respondents in their analysis regardless if the survey was complete.

The results of the McKerlich et al. (2013) study indicated that 41% of respondents used OER in courses however 21% of the respondents did not provide an answer to that question. The majority of faculty and staff indicated that they would most likely use journals, multi-media, and textbooks as OER resources. 78%-87% of respondents answered that they would most likely increase their use of OER if they knew more about OER, if they had time to find OER, and if the quality of the OER was good. Most

respondents (72%) indicated that they are not currently creating OER. To increase the creation of OER, respondents indicated that they would need knowledge of OER and administrative and technical support. McKerlich et al. suggested that their survey tool could be deployed at other institutions to benchmark against their findings.

The Mtebe and Raisamo (2014) study examined the perceived barriers to using OER in higher education in Tanzania. To collect data between October 2013 and January 2014, semi-structured interviews were conducted with 92 instructors that were randomly selected. The results of the study indicated that the primary barriers for the use of OER were the lack of computers and Internet as well as the lack of skills and knowledge to create and use OER.

Mtebe and Raisamo (2014) commented that enrollment in higher education in Tanzania equates to 1.48% of the population however the population participating in higher education would increase as the government increased the availability of secondary education. Mtebe and Raisamo noted that the costs of printed educational materials and the lack of availability of the materials as barriers to access for students. Mtebe and Raisamo commented on OER as the solution to provide access to course materials and higher education across Tanzania however they also noted that most of higher education institutions in Tanzania do not currently use OER. Although Mtebe and Raisamo cited several existing studies related to perceived barriers in using OER in Sub-Saharan Africa, Mtebe and Raisamo commented that those studies were not empirical and that Mtebe and Raisamo focused specifically on the challenges to OER specifically in Tanzania.

Mtebe and Raisamo (2014) identified 11 higher education institutions across Tanzania through a convenience sample and then 163 instructors were contacted regarding the study and 92 interviews were conducted for the study. In addition to the interviews, Mtebe and Raisamo reviewed documentation from the institutions regarding the availability of learning management systems (LMS), Internet bandwidth, and institutional policies as well as having the participants to rate 10 perceived barriers on a 5-point Likert scale.

The results of the Mtebe and Raisamo (2014) study showed that 73% of the faculty was aware of OER however the majority of faculty indicated having never used OER. Of the faculty that had used some form of OER in their courses, their responses indicated that they incorporated readings and quiz questions from OER sources. Instructors that did not use OER commented that they did not have the knowledge to seek out OER or to use OER. Although institutional information collected revealed that bandwidth was sufficient at the institutions, use of OER was problematic because 45.5% of the institutions had no LMS that would house the OER and 68% of the faculty responded that they did not have access to computers. Mtebe and Raisamo concluded that institutions of higher education in Tanzania would need to provide improved Internet access, professional development to increase knowledge and skills for OER, and to adopt policies to support OER.

Hilton (2016) reviewed 16 studies related to perceptions of OER by faculty and students and the impact of OER on student success. Hilton utilized five criteria in determining which studies to include in the review of OER research. The studies had to

have been comparing the use of OER, in any form, to traditional materials in higher education, the research must have been published in a peer-reviewed journal or be part of an institutional review or dissertation, the research must have included some data on faculty and student perceptions of OER or student outcomes, the research must have included a pool of at least 50 participants, and the research must have been published in English prior to October 2015. Hilton sought out potential studies through searches regarding perceptions of OER, Google Scholar, and authors that had previously written about OER. The findings from the review of current studies indicated that faculty and students generally have a positive outlook regarding OER and that student outcomes were not significantly different with or without the use of OER.

The results of the Hilton (2016) review of literature yielded nine studies related to student outcomes when replacing traditional textbooks with OER. These studies ranged from 2005 through 2015. The sample sizes varied from 66 to 4,909 in the treatment groups of the studies and the types of measurements ranged from exam scores, pass rates, withdrawal rates, and completion rates. The results of the nine studies were inconsistent with three studies indicating that there was not a statistically significant relationship between OER and student success whereas three other studies had results in favor of OER and one study favored traditional textbooks. The remaining two studies did not indicate the statistical significance of the results. Hilton suggested that future research would benefit from being able to randomly assign students to either OER or traditional textbooks or by using a pre- and post-test for student efficacy as it related to OER.

Hilton (2016) reviewed nine studies related to faculty and student perceptions of OER with two of the nine studies having been included in the review of OER and student outcomes. Only three of these studies investigated both faculty and student perceptions of OER with eight of the nine studies examining student perceptions. The Allen and Seaman (2014) study was the only study to focus solely on faculty perceptions of OER. The results of the studies indicated that the majority of faculty and students perceived OER as good as or better than traditional textbooks. Future research was suggested to create research methods that would aid in the elimination of any bias on the side of the faculty or students.

OER cost savings. Recent research (Bliss, Robinson, Hilton, & Wiley, 2013; Hilton et al., 2013; Lindshield & Adhikari, 2013) focused on perceptions and cost saving of OER. Wiley et al. (2012) focused on the use of OER in the form of open textbooks and their impact on cost savings and student success for secondary school science classes. Wiley et al. deployed and implemented the use of open textbooks in lieu of traditional textbooks in middle school and high school science courses over a period of two years. Over the course of those 2 years, 20 science teachers and approximately 3,900 students used the open textbooks instead of the traditional textbooks. The results of the Wiley et al. study indicated that the open textbooks cost 50% less than the traditional science textbooks. Upon analyzing the standardized test scores of the students using the open textbooks, Wiley et al. found that there was no difference in the standardized test results of the students using the open textbook versus students of those same teachers using

traditional textbook s in the previous years. Wiley et al. suggested further research on the use of open textbooks due to the limited sample of participating teachers.

Wiley et al. (2012) provided a brief review of OER and the barriers to implementation in secondary schools. Wiley et al. noted that the use of OER usually takes place within online courses and as supplementary materials. The increasing costs of traditional textbooks and diminishing school budgets was cited by Wiley et al. as an opportunity to investigate the use of OER to alleviate the financial issues related to secondary school learning materials. However, the implementation of OER and changing textbook use is slow due to the current curriculum processes in place in secondary schools.

Wiley et al. (2012) focused on the impact of open textbooks on cost and student learning. The study included a mixture of seven middle school and high school science teachers that replaced their traditional textbooks and used open textbooks for one academic year. The open textbooks were provided to most of the students in a printed format and approximately 300 students used the open textbook in an online format. When determining the costs of adopting traditional textbooks to the costs of adopting open textbooks, Wiley et al. did not include the adoption costs related to identifying and vetting traditional textbooks, but Wiley et al. did include the costs of adopting open textbooks as it related to time and effort of the teachers adopting and modifying the open textbooks. The costs of traditional textbooks were retrieved from the school district purchasing department, but these costs did not include additional costs such as shipping. The costs for the open textbooks was determined by adding monies paid to teachers for

professional development, estimated monetary value of unpaid time that teachers spent on the adoption process, and all the costs associated with the printing, binding and delivery of the open textbooks. The results of the cost effectiveness in the Wiley et al. study indicated that open textbooks were over 50% less expensive than traditional textbooks.

Wiley et al. (2012) also investigated the impact of open textbooks on student learning as opposed to the use of traditional textbooks. Although Wiley et al. intended to compare the standardized test scores for students using the open textbooks to the standardized tests scores for students using traditional textbooks with the same teachers in the previous three years, these data were not available for all the participating teachers because some teachers new or had transferred from other schools. Wiley et al. commented that because of the lack of data, they could only provide a descriptive analysis of the impact of open textbooks on student learning. The results of the Wiley et al. study indicated that the type of textbook whether traditional or open did not have a significant impact on student learning. Wiley et al. did comment that the ways students use open textbooks by highlighting and writing in the margins could be a predictor of student success.

Vojtech and Grissett (2017) cited current research on the cost savings of OER use. Hilton et al. (2014) found that students would save money by using OER whereas Wiley et al. (2012) concluded that in K-12, developing OER was initially higher than traditional textbooks but the costs decreased as the OER was used over multiple years.

Hilton and Laman (2012) provided an overview of the rising costs of traditional textbooks and perceptions regarding the quality and educational impact of open textbooks. Hilton and Laman cited the low adoption rates of open textbooks as a contributing factor to the lack of current research on their effectiveness. Hilton and Laman mentioned the Wiley et al. (2012) study, which indicated that the use of open textbooks did not increase student success on standardized tests. Hilton and Laman (2012) commented that at the case study institution, there is a large and diverse student population of 70,000 and that many students may not be able to afford the high cost of traditional textbooks and therefore do not purchase textbooks or take fewer courses resulting in a longer time for college completion thus interfering with student success.

The Hilton and Laman (2012) study included seven full faculty teaching college psychology with 23 sections of the course and a total of 690 students using the open textbook. Spring 2011 courses were compared to the fall 2011 courses that had implemented the open textbook. Data included a comparison of final exam grades, retention rates as well as a student survey. The results of the 2012 case study indicated that students using the open textbook had increased final exam grades, increased GPAs, and increased retention rates. Students were surveyed to determine their use of the open textbook. Of the 690 participating students, 157 students responded to the survey with 57 students indicating that they purchased a print copy of the open textbook. Hilton and Laman stated that 62% of surveyed students used the free open textbook indicating that there was an overlap of students that used the open textbook but also printed the open textbook. Hilton and Laman noted that limitations to identifying a direct causality

between using the open textbook and increased student success lay in other factors such as instructor bias or an increased quality of the open textbook impacting student success. An additional factor that may have impacted student success was a change in the final exam test bank for the fall of 2011. Therefore, a true comparison of student success on the final exam from the spring 2011 to the fall 2011 is problematic to determine. Hilton and Laman suggested that further research is required to determine if open textbooks were the predictor of increased student success. Hilton and Laman also suggest that future research in the relationship between open textbooks and student success be examined in other disciplines.

Fischer et al. (2015) investigated the relationship between open textbooks and student success in college level courses. Students using OER were compared against students not using OER across ten four-year institutions in fifteen varying courses in the same semester. Fischer et al. evaluated student success as it related to course completion, C or better course completion grades, overall course grade, number of credit hours taken in the same semester, and the number of credit hours taken in the semester following the study.

Fischer et al. (2015) provided a brief review of the increasing costs of higher education and traditional textbooks. The literature review provided a definition of OER and the forms in which OER could manifest such as public domain textbooks, videos, test banks, and software. Current studies related to costs savings of OER, perceptions of OER, and student success with OER were reviewed. Fischer et al. noted in their discussion of previous literature that as of the date of their 2015 study, only six previous

studies had been completed related to the comparison of student performance with and without the use of OER.

The Fischer et al. (2015) study included 10 community college and university institutions and 15 different courses in a single semester. Courses in each discipline were required to be using traditional textbook and open textbooks in the sections offered. Initially, there were a total of 4,909 students taking courses in the sections that used open textbooks (treatment group) and there were 11,818 students taking courses in the sections using traditional textbooks. Fischer et al. used propensity scoring to create subsets of students based on gender, age, and minority status. All participants included in the treatment versus control comparison were required to have all data related to gender, age, and minority status. Students with missing data were excluded from the logistic regression. The resulting sample size included 4,147 students receiving the treatment and 4,147 in the control group.

Regarding the results on the effect of OER on student completion of a course, overall there was no significant difference between the completion rates of students in both the treatment and control groups. However, two courses (biology and business) showed a higher rate of completion for those in the treatment group. Mixed results were observed in the relationship between passing a course with a C or better and OER with nine of the courses indicating no significant difference between groups and four of the courses showing a higher success rate for those in the treatment group. Adversely, student in the control group of the business course received significantly higher grades than those in the treatment group. Although students in the treatment group of the

business course were more likely to complete the course, they were more likely to have higher course grades and higher grades of a C or better if they were in the control group. Results of the Fischer et al. (2015) study indicated that students in the treatment group were enrolled in more credit hours during the semester of the study as well as in the subsequent semester. Fischer et al. discussed the limitations of the study as it related to a course-by-course comparison between treatment and control groups and that the conclusions made from the results of the study should be viewed as probabilities and not causation. Further study is suggested to replicate the study or to focus on differing variables.

In a previous study, Feldstein et al. (2012) also investigated the relationship between the use of open textbooks and increased student access and outcomes. Feldstein et al. conducted a pilot over the course of one academic year where nine core courses at the university replaced traditional textbooks with open textbooks in the school of business. The Feldstein et al. study included 991 students and did not indicate whether the courses using open textbooks were on face-to-face classes or online classes. The results of the 2012 study indicate that more students accessed the open textbook than had previously purchased textbooks and that courses using the open textbook saw higher student grades.

Feldstein et al. (2012) introduced the historical purchases of textbooks at the university and the initial investigation into the adoption of open textbooks. The university data indicated that only 47% of students were purchasing textbooks for their courses. Students cited the cost of traditional textbooks as the main reason for not purchasing the

required course materials. Faculty concerned with the negative impact on student success engaged in an investigation to adopt open textbooks to increase access and student success. Feldstein et al. noted the Sheppard (2008) that determined e-texts did not impact student success versus traditional textbooks. Feldstein et al. noted that e-texts cost approximately half the price of traditional textbooks as opposed to free open textbooks. In the Feldstein et al. study, the open textbook was supplemented financially by the institution to allow student access to additional online materials.

Data were retrieved from the online system in the form of activity reports for the Feldstein et al. (2012) study to determine how much students accessed the material. In the first semester of the yearlong pilot, approximately two-thirds of the students downloaded at least one file. The following semester, 85% of the students downloaded at least one file. Compared to the 47% purchase rate of traditional textbooks, the open textbook and related materials indicated increased student access to course materials. Although data showed students downloading files, the data did not isolate what types of files were being used such as the open textbook, flashcards, or quizzes. At the end of each of the two semesters of the pilot, students were prompted to complete a survey regarding their experience with the open textbook. At the end of the first semester, 33% of the students responded to the survey and 90% of those responding students indicated that they accessed the open textbook. At the end of the second semester, 30% of the students responded with 90% of those students indicating that they accessed the open textbook. Feldstein et al. emphasized that the primary goal of the faculty was to increase student access to course materials. However, data indicated that students in the courses with the

open textbook earned higher grades and lower withdrawal rates than courses with traditional textbooks. Feldstein et al. commented on the limitations of the study as there was no prescribed methodology or ability to determine causality. Additionally, it was undermined how faculty may or may not have presented the materials differently. Suggestions for future research included consideration of the subject matter including a focus on lower level or introductory courses.

Hilton et al. (2014) reported on the cost savings to students by replacing traditional textbooks with OER at eight higher education institutions across the United States. Hilton et al. sought to determine how much money students in OER course sections saved by not purchasing traditional textbooks and how much money was spent by students in course sections using traditional textbooks. The results indicated that students in OER course sections incurred no cost for course materials whereas the average cost for students in course sections using traditional textbooks was $90.61 per student per course.

Hilton et al. (2014) provided a brief introduction of the rising costs of traditional textbooks and types of OER such as courses, textbooks, videos, and supplemental materials. Hilton et al. noted that there has been limited research concerning perceptions of the use of OER and the educational impact on students. Hilton et al. cited the Hilton and Laman (2012) study indicating that the use of OER as opposed to traditional course materials did not negatively impact student performance.

The Hilton et al. (2014) study included eight higher education institutions that were involved in the "Kaleidoscope Open Course Initiative (KOCI)" (p. 70). The KOCI

project focused on removing textbook costs for students, creating effective course design, and establishing a collaborative interaction between participating institutions. Although the initiative resulted in the creation of nine courses with solely OER content, not all the nine courses were offered at each of the eight institutions. The OER courses were offered at the institutions where the OER was created and at some of the institutions that were not involved in the creation of the OER course. The institutions that offered the OER course sections also offered face-to-face sections of the same course. The disciplines represented in these OER courses included developmental and foundational courses in the sciences, business, English, psychology and math. During the 2011-2012 academic year, a total of 14,606 students were enrolled in the discipline courses across the participating institutions in both the face to face and the OER sections. Students enrolled in course sections using traditional textbooks accounted for 10,739 enrollments and the remaining 3,867 students were enrolled in the OER course sections. Of the 256 instructors teaching the discipline courses both face to face and OER, 194 instructors taught solely with traditional textbook, 48 taught solely with OER and only 14 instructors taught both traditional course and OER courses.

To collect data on textbook costs for students, Hilton et al. (2014) identified the number of students in the courses using traditional textbooks and the individual textbook pricing for each instructor's course. Although the study was conducted in the 2011-2012 academic year, Hilton et al. did not gather textbook pricing data in the same year. Hilton et al. collected textbook pricing data in the spring of 2013. The results of the Hilton et al. study indicated that the students in OER course sections incurred no costs for course

materials whereas students in courses using traditional textbooks averaged a cost of $90.61 per course. Textbook costs for disciplines varied at each of the eight colleges with textbook for the sciences constantly being the most expensive. Hilton et al. commented on the limitations of the study acknowledging that students could purchase, borrow, or rent textbooks thus changing the cost to the individual student. The fact that data were collected regarding textbook pricing in the spring of 2013 as opposed to during the term of the study puts into question the actual costs of textbooks during the 2011-2012 academic year as well as the possible variance in the textbooks used in the spring of 2013 as opposed to the textbooks used during the study.

Wiley, Williams, DeMarte, and Hilton (2016) investigated a program established at Tidewater Community College called the "Z-Degree" (p. 1) where students are provided a pathway of courses allowing them to complete an Associate of Science degree in business without purchasing a textbook. In relation to the Z-Degree, Wiley et al. introduced a concept called "INTRO" (p. 2) meaning increased tuition revenue through OER. For example, Tidewater Community College was able to retain tuition revenue by decreasing withdrawal rates of students in the Z-Degree program of study.

Wiley et al. (2016) provided a brief review of literature related to OER including adoption, student success, and cost savings. Specifically, Wiley et al. comment on the adoption and sustainability of OER. Faculty and institutions must locate, review, and manage OER adoptions while taking into consideration the required infrastructure as well as the adaptation of teaching and learning best practices. From data collected from the Florida Student Textbook Survey, Wiley et al. noted that more than half of the

responding 22,129 students do not have financial aid that covers the costs of traditional textbooks. This lack of funding predicted that 31% of those students chose not to register for courses with 35% registering for fewer courses and 24% of the students either dropped or withdrew from their courses.

In the Wiley et al. (2016) study, a team of faculty created the Z-Degree courses for the AAS in business and then the program was initially piloted in the fall of 2013. The degree path included a total of 21discipline specific and elective courses. Instructors on the four campuses of Tidewater Community College taught the first semester Z courses in a variety of modalities including face-to-face, online, and hybrid. In the pilot semester of fall 2013, 303 students enrolled in the Z courses and 12,574 students enrolled in the traditional sections. Within that pilot semester, Z courses experienced a 2.64% drop rate whereas the traditional courses encountered a higher drop rate of 3.72% equaling a variance of .89% in the drop rate. Wiley et al. applied that .89% variance in the drop rate to the total number of enrollments in traditional sections and the rate of tuition to hypothesize that if all traditional course sections were made into Z courses and fewer students dropped the courses that the college would retain $101,422.78 in previously refunded tuition.

Hilton et al. (2013) investigated the relationships between the adoption of OER in a community college math department and student retention rates, course grades, and cost savings for students. Hilton et al. compared student retention rates and course grades between the fall 2012 semester where 2,043 students enrolled in five types of math courses versus student retention rates and course grades from the previous two years.

Hilton et al. stated that their results indicated no change in the student outcomes but that the students did experience a reduced cost for course materials.

Hilton et al. (2013) presented an introduction regarding the increasing costs of traditional textbooks and how those costs can be a significant proportion of the overall educational costs especially in community colleges. Hilton et al. indicated that OER can provide savings to students while still maintaining educational quality. Hilton et al. (2013) cited the Lindshield and Adhikari (2013) study that demonstrated that students had a positive perception of the use of open textbooks. Hilton et al. (2013) indicated that their current study would seek to add to this body of literature.

The Hilton et al. (2013) study took place at a community college with a student population of 10,000. Hilton et al. commented that through a survey of 966 math students, they found that 451 of those students were on some form of financial assistance. The faculty determined that adopting OER would provide access to the course materials to all students thus aiding in the learning process. In the fall 2012, OER was deployed in five math courses including three levels of algebra, trigonometry, and pre-calculus with the course materials available online at no cost.

Hilton et al. (2013) investigated three questions: how much money did students save with OER, was there any change in retention or student success rates, and what were the perceptions of the quality of the OER? The Hilton et al. study was implemented in the fall of 2012 with 2,043 students enrolled in 65 sections of the five types of math classes both on campus and online combined. Hilton et al. surveyed faculty to find that traditional math textbooks costs ranged from $125 to $220 each. Hilton et al. assumed

that if all 2,043 students in the math courses bought and paid a minimum of $125 per textbook the total cost would be $255,375 therefore that same amount would be the amount of money saved by students with the implementation of OER in the math courses. Hilton et al. compared student grades of a C or better for the courses from the fall of 2010, the fall of 2011, and the fall of 2012. Although the success rates varied from course to course, three of the five types of math courses indicated a decrease in student success rates during the OER implementation in the fall 2012. Retention rates were also compared for the same fall semesters. In this case, three of the five math courses had equal or better retention rates in the fall of 2012 than the previous two fall semesters. In a survey of student perceptions regarding the quality of the OER 83% of students felt that the OER was adequate and they would recommend OER course to their peers. As opposed to the students, faculty did not agree on the quality of the OER in comparison to traditional textbooks. Future research was suggested regarding student perception of OER face to face versus online.

Student Success in Open Educational Resources Research

Student success appears as a variable in a number of studies already discussed in previous sections of the literature review. Studies focused on student success generally measured student success based on multiple variables (Atchley et al., 2013; Fischer et al., 2015; Hilton et al., 2016). The Hilton et al. (2016) conducted a case study comparing students that used traditional textbooks to those who were using OER in both on campus and online courses. The study gauged student success through a combination of drop

rates, withdrawal rates, and grades of C or better. Hilton et al. concluded that students using OER performed significantly better than students using traditional textbooks.

Hilton et al. (2016) provided a review of current literature regarding cost, availability, quality, perceptions. Hilton et al. noted that most students that did not purchase textbooks for classes because of the high cost of traditional textbooks and that their success rates were lower because they did not purchase the course materials. Although the use of OER has increased over the past decade and perceptions of OER were positive, Hilton et al. indicated that the awareness and use of OER was limited. Hilton et al. commented on the limited amount of literature regarding the relationship between OER and student outcomes.

The Hilton et al. (2016) study used data Tidewater Community College after the implementation of the Z Degree which was a degree path that included only OER courses. Hilton et al. sought to determine the relationship between drop rates, withdrawal rates, and C or better grades with the use of OER as opposed to traditional textbooks. Data were collected over four semesters from the fall of 2013 through the spring of 2015 for 67 courses. Hilton et al. noted that of the 67 courses most of those sections used traditional textbooks making the control and experimental group sizes disproportionate.

The results of the Hilton et al. (2016) study indicated that fewer students in OER courses, both face-to-face and online, dropped or withdrew from the courses. Additionally, more students in OER courses earned a grade of C or better. Although Hilton et al. commented that the nature of their study did not establish causation between OER and student retention and success, they did note that student access to course

materials may increase student success. Hilton et al. acknowledged that the significance of their study was limited because students self-selected to take OER sections and that faculty in the numerous disciplines could have been a contributing factor in the results of the study. They suggested further research was to focus on specific courses where pre- and post-samples might be more equivalent.

Robinson, Fischer, Wiley and Hilton (2014) sought to identify the relationship between OER in the form of an open textbook and student learning outcomes in secondary school science courses. The Robinson et al. study used a quasi-experimental design with a population of 3,780 secondary students to determine variances in student success for students using the open textbook versus students using a traditional textbook. Although students using the open textbook "scored .65 points higher on end-of-year state standardized science tests" (p. 341), there was a significant change in student success for students using open textbook for chemistry whereas there was no significant change for students using open textbooks for physics courses. Even through the results were not consistent across the secondary science courses, Robinson et al. determined that open textbooks were at least as effective if not more effective as traditional textbooks.

Robinson et al. (2014) provided a brief review of previous studies relating to OER. Robinson et al. noted that there has been limited research to compare the use of OER textbooks with their traditional counterparts. Robinson et al. cited two previous studies including Bliss et al. (2013) that focused on surveying instructors and students regarding their perceptions of the quality of OER. The second study referenced by Robinson et al. (2014) was the Hilton and Laman (2012) study which compared the

student success of 690 college students using OER in a psychology course versus the student success of only 370 students using traditional textbook in the prior semester. Even though Hilton and Laman concluded that students using the OER had higher success rates, Robinson et al. (2014) commented that Hilton and Laman (2012) acknowledged that the design of the study was not rigorous enough to be considered a true experiment and they recommended future research regarding the impact of OER versus traditional textbooks on student success.

Robinson et al. (2014) study used a population of secondary students taking science courses in physics, biology and chemistry. Instructors created OER in the form of a textbook that was printed out and provided to 43% of the 3,780 secondary science students. Although students using the OER scored slightly higher on the annual standardized tests, it seems less evident that the OER was a predictor of that change in student success because the textbook was OER. Robinson et al. stated that the OER textbook was printed out and provided to the students just as a regular textbook was provided to the students. The only difference as noted by Robinson et al. was that the students could have written notes in the margins of the OER textbook as opposed to the traditional textbook.

Gregory and Lampley (2016) investigated student success in online courses as compared to student success in on campus courses in a two-year institution. Gregory and Lampley noted that student populations at two-year institutions generally comprised of higher risk student and that students in online courses typically had a higher withdrawal rates and earned lower grades than those students in face-to-face courses. In addition to

investigating the variance in student success between on campus and online courses, Gregory and Lampley explored the relationships between student success and selected demographics. Secondary data were used in quantitative analysis with the results indicating that there was a significant difference in student success between students in on campus courses as compared to students in online courses. There was also a statistical difference in student success as disaggregated by age and gender.

Gregory and Lampley (2016) used secondary data at a two-year institution disaggregated by age and gender for courses taught between fall 2012 and spring 2015. The courses selected were taught by faculty that were the instructor for the same course on campus and online. The resulting sample was 4,604 students that were enrolled in on campus and online courses during the three-year time span. Of the 4,604 students, 76% were traditional aged students with 24% being non-traditional aged students. The gender of the sample population included 61% female students and 39% male students. The results indicated that students in the online courses were more likely to earn grades, of A, F, or W whereas students in the on-campus courses earned more B, C, and D grades than the students in the online courses. In a comparison of student success and age groups, traditional aged students were more likely to earn an F grade in both the on campus and online courses whereas non-traditional aged students were more likely to earn course grades of A in both on campus and online courses. Traditional aged students were also less likely to withdraw from an on-campus course. In a comparison of student success and gender, both males and females were more likely to earn course grades of A or F in online courses as compared to males and females in on campus classes. Both males and

females in online courses had a significantly higher withdrawal rate than male and female students in on campus courses. The results also indicated that the success rates of A, B, and C course grades were the same for male students in the on-campus courses and the online courses whereas female students earned a higher percentage of A, B, and C grades in the online courses 79.9%) as compared to the on-campus courses (73.3%). Gregory and Lampley indicated that the 2016 study was limited using a single two-year institution and by the fact that the sample population only included students in courses in which instructed taught the course both on campus and online.

Croteau (2017) the effects of OER adoption and student success as measured by drop/fail/withdrawal rates, A, B, C, and D final course grades, completion rates, and course assessments as compared to those previously using traditional textbooks. The results of the study indicated that there was no statistical difference between student success pre- and post- OER use as compared to traditional textbooks.

Croteau (2017) reported that 29 proposals in 36 different courses were submitted to receive funding to adopt OER for the 2015 spring semester within a State university system. Quantitative data were collected for student drop/fail/withdrawal rates, student A, B, C, and D final course grades, completion rates, and course assessments. In addition to these quantitative data, some instructors also submitted qualitative data that were collected from students in the form of surveys, focus groups, and student testimonials. Qualitative questions were not uniform across the study. Courses were removed from the study that did not provide the required quantitative data or did not compare data pre- and post- OER implementation. The resulting actual pool of participating courses was 27

courses. These courses were facilitated across a variety of disciplines with varying numbers of students enrolled in each course. The total student population between the 27 courses was 3,847.

Croteau (2017) indicated that several statistical tests were used through the process of data analysis such as a Levene test, a Shapiro-Wilk test, and a paired *t*-test to ultimately test the null hypothesis that there would be no difference in student success pre- and post-OER implementation. The results indicated that there was no statistical difference in student success as measured by student drop/fail/withdrawal rates, student A, B, C, and D final course grades, completion rates, and course assessments pre- and post- OER implementation thus supporting the null hypothesis. Croteau commented that this 2017 study was the first study to assess student success with these variables and to do so on such a large scale. Croteau noted that a limitation of the study was inconsistent data reporting and inconsistencies in course design because of the varying nature of the 27 courses. Croteau suggested future studies should be on a large scale as well as investigating the relationships between OER and student success within a singular course taught by numerous instructors.

Colvard, Watson, and Park (2018) studied the impact of OER in the form of OpenStax textbooks on student success as measured by final course grades and drop/fail/withdrawal rates while disaggregating the data by Pell recipient/non-Pell recipient students, part-time/full-time students, and White/non-White students. The results indicated that in courses using OER final course grades increased while drop/fail/withdrawal rates decreased for all students. And, OER use courses increased

final course grades while drop/fail/withdrawal rates for Pell recipient students, part-time students, and non-White students.

Colvard et al. (2018) investigated the relationship between the use of OER and student success in eight courses in varying disciplines at a university with a total of 10,141 students enrolled in non-OER and OER courses between the fall of 2010 and the fall of 2016. The implementation of non-OER and OER in these courses was inconsistent through the time of the study with varying numbers of semesters offered. The results indicated that in courses using OER final course grades increased while drop/fail/withdrawal rates decreased for all students. And, OER use courses increased final course grades while drop/fail/withdrawal rates for Pell recipient students, part-time students, and non-White students. Colvard et al. noted that the limitations of the study included the fact that the study was conducted at the university level only and that final course grades across disciplines could have represented different numbers and levels of assigned work within any given course. Colvard et al. also acknowledged that the nature of the study could not prove causation. Colvard et al. concluded that providing students with course materials on the first day of class helped to close the student success gap. Colvard et al. recommended that further research focus on two-year institutions and additional disaggregated data.

Winitzky-Stephens and Pickavance (2017) investigated the impact of OER on student success rates through the implementation of OER in two math courses in the summer of 2014 at a two-year institution. Student information was also disaggregated by age, gender, and race. The initiative was a result of increasing textbook costs and the

need to reduce expenses for students. The results indicated that OER had no effect on course grade, passing course grade, or withdrawal rates for continuing students however new students experienced increased grades with OER as compared to traditional textbooks. Since the initial pilot, the institution has increased the number of disciplines and courses sections offered using OER.

Winitzky-Stephens and Pickavance (2017) identified comparison groups in a variety of disciplines from fall 2012 through 2016 resulting in 37 courses. A multilevel methods approach was used with the levels identified as student, instructor, and course. The dependent variables were course grade, pass/fail, and withdrawals. Student information was disaggregated by age, gender, and race with the independent variable of OER. Winitzky-Stephens and Pickavance noted that the data set included more than 34,000 enrollments over 11 semesters. In the summer of 2014, 1,416 students were enrolled in sections that used traditional textbooks and 131 students were enrolled in course sections using OER. The results indicated that there were no significant differences in student success between courses using traditional textbooks and those using OER. However, success rates as measured by final course grade saw a slight increase of .1367 for new students. The results also indicated that there was no significant difference for new students in their pass/fail and withdrawal rates between courses using the traditional textbook as compared to courses using OER. Further research was suggested to focus on the effects of OER on long term educational goals such as persistence from semester to semester, completion of a degree, and transfer.

Wiley, Webb, Weston, and Tonks (2017) sought to identify the relationships between student created OER, its sustainability, and student success. The study focused on students in secondary school from grades 7-12 who took the digital photography course that was created using OER in 2011-2012. Each year, students could add OER content to the course and by 2014-2015 Wiley et al. indicated that 5% to 10% of the course content was student created OER.

The content of the digital photography course in the Wiley et al. (2017) study remained the same from 2011-2015 except for the added student OER content. Wiley et al. investigated to see if the addition of the student created OER impacted student success. The results of the study indicated that grades increased in four of the ten assignments in the course as well as in overall course grades.

Grewe and Davis (2017) acknowledged that although there has been an increase in OER use, there have been a limited number of studies that focused on OER efficacy and student success. Grewe and Davis investigated the relationship between OER and student success in an online course while controlling for prior academic success identified as student GPA prior to taking the OER course. The study included 146 students that were enrolled in five sections of the 8-week online introductory course from the fall of 2013 through the spring of 2014. The results indicated that previous academic success was a predictor of student success in the OER online course. Although the results of the study could not be definitively identified as causal, Grewe and Davis could not conclude that OER in the online courses resulted in increased student success. Grewe and

Davis suggested that future research could include a larger sample size over a longer period.

Atchley et al. (2013) sought to compare course completion and student success between online and face-to-face courses. The study also investigated if there was any variance in completion and student success delineated by discipline. Secondary data were used from a university for a population of 319,153 students enrolled in 16-week course from the fall of 2004 through the spring of, 2009. The purposeful sample selected varied based on the objective. To measure student success, final course grades were identified for 4,120 students that completed the course. Course completion rates were investigated for 4,307 students that enrolled in the courses and 3,932 students were enrolled in 14 disciplines that offered courses every semester between 2004 and 2009. Results indicated that students enrolled in the online courses earned a larger percentage of A grades however the students in the face-to-face courses earned a higher percentage of C or better final course grades. Retention rates for students in face-to-face courses were 95.6% whereas online student retention rates were slightly lower at 93.3%. Retention rates varied significantly across disciplines with finance courses having the lowest retention rates at 82.2% and reading courses having the highest retention rates at 98.2%. Although the Atchley et al. study resulted in increased student success in online course as opposed to face-to-face courses, they did comment that previous studies had indicated the opposite results.

Gender and Ethnicity Influence in Student Success

Amro et al. (2015) focused on student success in face-to-face and online courses; however, Amro et al. delineated the data by age and gender. The study focused on college algebra courses using secondary data to investigate if age or gender were predictors of student success in face-to-face and online courses. The results of the study indicated that age and gender were predictors of student success in face-to-face courses but not in online courses. The results further indicated that students were more successful in the face-to-face sections of the college algebra courses than the online course sections.

Amro et al. (2015) provided a brief review of literature related to student age, gender, and ethnicity. Amro et al. noted that face-to-face courses were preferred by students who were over the age of 30 years old and that there has been limited research on the connections between gender and ethnicity on student performance and the results of those studies varied. Amro et al. study compared the face-to-face and online courses with the independent variables of gender and ethnicity with the dependent variable of course grade. From the total population of the institution between 2010-2013, a sample size of between 7,500-9,000 was determined and selected randomly. Descriptive statistics and a One-Way Analysis of Covariance was used to analyze the data. The results indicated that age was a predictor of student success in face-to-face courses but not in the online courses. Gender and ethnicity were not identified as predictors of student success in online courses. Overall, final course grades were higher in face-to-face courses as opposed to the online courses. Further recommendations for research included the need to

investigate the relationships between face-to-face and online course student success with larger sample sizes.

Kupczynski et al. (2014) investigated the relationship between gender and academic success online. The study compared final course grades in an online course, gender, and overall GPAs. The results indicated that there were differences in student success by gender for students with lower overall GPAs. However, there were no differences in student success by gender for students with mid-level to high -level GPAs.

Kupczynski et al. (2014) collected data from a southern Texas Hispanic serving institution of higher education with a total enrollment of 6,200 students. A sample size of 959 education students was selected out of over 1,000 total education majors. The genders of the sample population were 69% female and 31% male. An analysis of covariance was used to investigate the relationships between gender and student success with overall student GPAs as a covariate to determine the influence on overall student success. Although Kupczynski et al. categorized three groups for GPAs as low, medium, and high, the values of those three categories was not defined for the reader. For students with low GPAs, female student success was significantly higher in the online courses than male student success. In the mid-level GPA group, female student success was slightly higher than male student success but not significantly different. In the high-level GPA group, male student success was slightly higher than female student success but not significantly different. Although Kupczynski et al. investigated the relationship between gender and student success in online courses, the independent variable of GPA encompasses an unknown number of courses outside of the online course. With these

results focusing on GPAs, there were varying student success rates between genders based on low, medium, and high GPAs.

Gonzalez-Gomez, Guardiola, Rodriguez, and Alonso (2012) investigated the relationship between gender and e-learning satisfaction. The study included a sample size of 1,185 students enrolled in online courses at an institution of higher education in Spain. Gonzalez-Gomez et al. sought to identify what aspects of online learning are important to males and females. The results of the study indicated that female students were more satisfied than male students in their online courses. Additionally, female students were found to place more emphasis on planning for their online courses as well as being more satisfied with having a variety of ways to contact the instructor.

Data collected for the Gonzalez-Gomez et al. (2012) study was in the form of an annual questionnaire from the institution to students. The sample population of 1,185 students that were enrolled in 27 different online courses in the 2008-2009 and 2009-2010 academic years. The 27 different online courses were selected if the online courses had been taught for at least 2-years and if the student participation level in the survey was high. Students enrolled in the courses were prompted via email to complete the anonymous survey based on a Likert scale with a return rate of 50.5% resulting in the sample size of 1,185. Of the surveys completed, 69.49% represented female students and 34.51% represented male students. The results of the study indicated that female students have a higher satisfaction with online learning than male students. Female students were more satisfied and placed more importance on teaching methods, planning, participation and active learning, and student-instructor interaction. From the results of the study,

Gonzalez-Gomez recommend that online courses include varying paths for learning, interaction, and collaboration. The focus of the Gonzalez-Gomez was student satisfaction in online courses by gender. Although the (2012) study did not include student success as a variable, there might be inferences to make regarding student satisfaction and student success. If female students are more satisfied in the online course, they might be more likely to have higher success rates than male students.

Lowes, Lin, and Kinghorn (2016) investigated gender differences in online courses at the high school level as they relate to behavior and performance. The Lowes et al. study collected data from 802 high school students enrolled on 14 different online courses. The results of the study indicated that students who were more active in the online courses received higher course grades. Although course activity was a predictor of student success, it was a larger predictor of student success for male than females.

The Lowes et al. (2016) study focused on 14 different online high school courses with nine different subjects and a varying number of courses sections per subject. Course sections had approximately 20 students enrolled in each section. Students participate in the course over a 2-year span; however, the Lowes et al. study only focused on the first-year participation behaviors and performance. Participation behaviors included: course logins, time in the course, posts, and viewing of posts. Of the students enrolled in the online courses, 492 were females and 310 were males for a total of 802 participants. Lowes et al. used multivariate analysis to investigate the relationships between gender and course behaviors and performance. The results of the tests indicated that female students performed better than male students as measured by final course grades. The

results also indicated that there was an association between course activity and final course grades. However, the correlation was stronger for male students than female students. Lowes et al. noted that although female students were more active in the courses, the activity did not increase student success as measured by final course grades. The results also indicated that logging into the online courses was as a stronger predictor of student success for both male students and female students than participating in activities. Lowes et al. suggests further research to investigate if the types of activities and the quality of work in those activities differs between male students and female students and how those differences influence final course grades. Although the Lowes et al. study occurred at a secondary institution, the success rates of female students exceeded those of male students at it related to final course grades in the online course.

Anthony (2012) investigated the influences of online course design and participation between genders. The participants in the Anthony (2012) study were enrolled in a university online course. Of those 62 students, 33 were male and 29 were female. Participation in the online course was measured by student responses in the online discussion boards. A repeated measures factorial ANOVA was used to analyze the discussion board responses. The results indicated that discussion board participation decreased similarly for both male students and female students when other assignments were due in the online course. Anthony noted that course design should be evaluated to ensure more consistent participation in the online course to promote increased student success.

Anthony (2012) collected data from four online university history classes. All four classes were taught by the same instructor with the same syllabus. Each class required students to participate in two discussion boards a week for eight weeks. Of those eight weeks, four weeks also had other assignments due and the other four weeks did not have other assignments due. The level of participation was determined by averaging the number of discussions posts in both the week with other assignments and the week without other assignments. The results of the repeated measures factorial ANOVA indicated that there was a statistically significant difference in discussion board participation in the weeks where other assignments were due with discussion board participation decreasing in those weeks as compared to week where there were no other assignments due. The results also indicated that gender was not a statistically significant factor in the number of discussion posts for both male students and female students. Anthony concluded that course design should include measures to ensure a certain level of participation even with the inclusion of assignments. Anthony investigated gender as it related to online course activity. However, as the Lowes et al. (2016) study indicated, participation time in the online course was not a predictor of increased student success as measured by final course grade.

Salvo, Shelton, and Welch (2019) explored common themes for online course completion and success as well as barriers to success by African American males. Salvo et al. interviewed 10 African American males who had successfully completed online courses to investigate variables that the students perceived as beneficial to support online course success. These supportive variables included: financial aid, previous online

experience, academic persistence, access to digital devices, and course topics that appeared less demanding. Perceived barriers to online course success included inadequate instructor – student interaction including instructor lead direction and assessment and lack of timely feedback and communication. As a result of the findings, Salvo et al. made recommendations for strategies in support of African American male student success in higher education.

Salvo et al. (2019) conducted their qualitative study at a southern university with a student population 7625 in the fall of 2016. Of the 7625 students, 6961 were undergraduate students with 40% of those undergraduate students being male and 16% of the undergraduate male students identified as African American. Salvo et al. purposefully selected the 10 sample students to ensure an appropriate depth of responses to the qualitative questions. The selected sample students were either juniors or seniors at the institution with ages ranging from 19 years old to 35 years old, from a variety of disciplines with GPAs ranging from 2.1 to 3.6, and that had previously passed an online course.

With the resulting themes supporting student success, Salvo et al. (2019) noted that financial assistance for African American male students supported academic enrollment and educational costs as well as an uninterrupted education from high school to college. Recommendations were made by Salvo et al. to increase student support for online courses so that African American male students would be more likely to select more difficult subjects in online courses and be more successful online. Recommendations also included adapting online materials so that they could be accessed

and completed on handheld devices such as smartphones. Regarding instructor – student interactions, the students indicated that quicker response times were desired for communication and feedback. Optional ways of communicating included suggestions to have face-to-face drop in meeting times as well as communication through email, phone, and texting between the instructor and student. Salvo et al. recommend further research across genders and ethnicities, at institutions of varying diversity, and with students at different academic success levels. The suggestion for further research is indicative of the gaps in student success across gender and ethnicity in the online modality.

Palacios and Wood (2016) conducted a study across the California community college system to determine the relationship between male students of varying ethnicities and online learning. Palacios and Wood noted that current literature indicated that Asian, Anglo, African American, and Hispanic male students were more likely to be successful when learning face-to-face however there was no clear indication of success trends for these male students in the online modality except for African American men. Palacios and Wood found that African American male students performed better in online courses when those courses were asynchronous with the inclusion of multimedia components. Palacios and Wood recommended that consideration be taken in the presentation of online materials and types of interaction when promoting online learning to varying ethnicities.

Palacios and Wood (2016) collected data from the data management system of the California community college system in the form of student retention and success rates for credit courses. The data set included 3,936,284 students from the 112 campuses in the

system. Retention and success rates for male students were disaggregated by ethnicity and course type. Course retention was identified as the percentage of students that did not drop or withdraw from the courses and student success was measured as passing a pass/fail course or a C or better final course grade. Of the 3,936,284 men in the original sample, 1,771,203 were identified as Asian, Black, Latino, or White and became the sample size used in the study. Modalities were divided into four types: (a) regular asynchronous which included delayed online learning, (b) face-to-face were courses taught in a classroom in real time, (c) synchronous courses that occurred in real time through an interactive online modality, and (d) asynchronous with media courses used varying types of interaction such as videos and audios with delayed reactions. The relationships between student retention and success in the varying modalities and disaggregated by ethnicity were tested though a two-factorial analysis of variance (factorial ANOVAs).

Palacios and Wood (2016) noted that the results for retention across ethnicities and modalities indicated that the retention scores for Asian and White men were higher than those for Black and Latino men and Black men were more likely to have lower retention rates than Latino men. In regard to modality, face-to-face course had the highest retention rates for all ethnicities. The results for success rates across ethnicities was parallel to the results from retention with Asian and White male students having higher success rates than Black or Latino students and Black students had lower success rates than Latino male students. In regard to student success and modality across ethnicities, the results were similar to the results for retention with student success rates being higher

in face-to-face courses across ethnicities than any other modality. The final results showed that the face-to-face modality provided the higher scores for retention and success for all of the male students across ethnicities. For Asian, White, and Latino male students there was no specific online modality where retention and success rates were higher outside of face-to-face courses. However, outside of face-to-face courses, Black male students saw higher retention and success rates in online asynchronous course with multimedia components. Because face-to-face courses had the highest retention and success rates across ethnicities, Palacios and Wood determined that online courses are not necessarily the best modality for men of color and consideration should be given when promoting the online learning modality.

Corry (2016) explored Hispanic student success in online schools. The population that was investigated include K-12 students in Arizona that were enrolled in 100% online schools and blended schools to examine the relationships between graduation and dropout rates with the type of school (charter and non-charter) as well as the modality (fully online and blended). The results indicated that Hispanic students were less likely to drop out if they were enrolled in a fully online program as compared to a blended program.

The population of the Corry (2016) study was identified as 19 K-12 institutions that offered online education (fully online or blended) and had data sets available indicating graduation and dropout rates. Dropout rates were identified as students who were enrolled in the school but were no longer enrolled in the school at the end of the school year and those students did not graduate or transfer to another school. Corry

conducted a multivariate analysis of variance (MANOVA) to investigate the relationships between charter/non-charter schools, fully online/blended modalities with the graduation and dropout rates for the Hispanic students. The results indicated that charter/non-charter schools did not make a significantly statistical difference in the graduation or dropout rates whereas fully online programs influenced student dropout rates. Hispanic students were less likely to dropout when enrolled in a fully online program. However, fully online/blended program did not influence graduation rates. Corry suggested that future research have a more in-depth focus on the students themselves.

Kaupp (2012) noted that there was not much current literature focusing on online courses and the achievement gap between White and Latino students as seen in on campus classes. Kaupp also noted that in California, students in online courses do not perform as well as students in face-to-face courses. With those two statements, Kaupp investigated the influence of online instruction and the achievement gap between Latino and White students. Kaupp used a mixed methods approach and disaggregated data Statewide for community college student outcomes between Latino and White students. The results indicated that online Latino student outcomes were 9% lower than their counterparts in face-to-face courses therefore the achievement gap between Latino students and White students increased in the online modality. With the mixed methods approach, Latino students were interviewed, and the results indicated that the influencing factor for Latino students was student-instructor interaction. Latino students cited a lack of student-instructor interaction in the online courses as opposed to the higher level of student-instructor interaction in on campus classes.

Kaupp (2012) indicated that the population included 4.5 million students between 2005 and 2009 that met the criteria for the study with data including ethnicity, gender, and educational goal. Students average grades were calculated by coding A, B, C, D, and F grades using a scale of 4, 3, 2, 1, and 0 respectively. Students who withdrew from classes in the first two weeks were not included in the study. These data indicated that online classes had success rates of 58.4% as compared to the higher success rates of 65.6% in on campus courses. Kaupp indicated that Latino students were 30% less likely to enroll in online courses than White students. The qualitative portion of the Kaupp (2012) study was conducted at a single college where 10 faculty teaching online courses were asked about their impressions as to why Latino students do not perform as well as White students in online courses and 10 Latino students taking online courses were interviewed three times during the semester of the online course. Faculty attributed lower performance by Latino students to language and technology gaps however the students interviewed demonstrated language and computer literacy during the course of the interviews. Kaupp noted a need for more student-instructor interaction in online courses to increase the quality of instruction ad to address individual students needs for varying types of instruction. Future research was suggested to investigate the impact of literacy on student achievement.

Wolfle (2012) investigated student success in developmental math classes in a community college setting disaggregated by age and ethnicity. Wolfle noted that 40% of first year students in community colleges enroll in at least one developmental course as a result of the open enrollment structure of community college and students that enroll

underprepared for college level courses. Data were collected from the community college system in Virginia to examine student persistence in college from semester to semester and student success in their first college level math course to determine the impact of developmental math on student success in the college level math course and how did age and gender influence student success and persistence.

Wolfle (2012) collected secondary data from one college in the community college system in Virginia from fall 2006 through spring 2011 for students that enrolled in the college for the first time during the fall 2006. The total number of students enrolling for the first time in the fall 2006 was 995 with 53 of those students not meet the age criteria for traditional college students and 186 students that did not enroll in developmental math resulting in a population of 756 students. The data for each of the 756 students included age, gender, ethnicity, enrollment status for the fall 2207, and grades for all math courses taken. Student success was identified as students earning an A, B, or C grade for the math courses. Persistence was measured by continued enrollment from the fall 2006 to the fall 2007. Wolfle used a logistics regression to investigate the influence of developmental status, age, and ethnicity on student success in math courses and student persistence.

The results of the Wolfle (2012) study indicated that there were no statistically significant relationships between developmental status and age or ethnicity concerning student success and persistence. However, Wolfle did comment that the results indicated that White students were 1.29 times more likely to succeed than non-White ethnicities.

Wolfle recommended further research focusing on why more students do not complete developmental courses.

Cotton, Joyner, George, and Cotton (2016) investigated the student success rates for varying ethnic and gender groups in higher education in the United Kingdom. Cotton et al. commented that students from ethnic minorities and males had lower success rates than White students and female students. A mixed methods approach was used to research the gap in student success and the results indicated that there were differences in motivation and self-efficacy between ethnic groups and varying amounts of time spent in class and on course work by gender.

The Cotton et al. (2016) study investigated student success by comparing student experiences by ethnicity and gender. Qualitative data were collected to explore student study habits and social experiences, faculty perceptions of teaching diverse groups if students, and comparing student experiences and success of ethnic groups as compared to White students and a comparison of student experiences and success by male and female groups. Cotton et al. sought to make inferences regarding the correlations between student experiences and success. Data were collected at a single institution with a purpose sample. Of the sample, an online questionnaire was sent to 6,000 students with 1,023 students responding to the online questionnaire. Cotton et al. indicated that 49 of the respondents were ethnic female students, 382 were White female students, 44 were ethnic male students, and 548 were White male students. Data were also collected through six focus groups separated by gender and ethnicity with a total of 28 students. In addition to student data, data were collected from 21 faculty through interviews.

Results of the Cotton et al. (2016) study indicated that extrinsic versus intrinsic motivation may be a factor in student success. Ethnic students appeared to take classes or participate in programs that were supported by family and not necessarily something that the ethnic student was interested in taking and personally motivated to complete. Whereas White students tended to enroll in courses that were personally of interest to them. In an evaluation of time on task for male students as compared to female students, the results indicated that female students were more anxious about succeeding than male students. Cotton et al. noted that male over confidence could be a factor in under performance. Qualitative data from students and faculty indicated that ethnic students, especially those from other countries, found the first year of college more challenging socially. Cotton et al. commented that faculty development was necessary to increase their breadth and depth of understanding of varying ethnicities, cultures, and gender to adapt to the differences and needs of the students to bridge the gaps in student success.

Jost, Rude-Parkins, and Githens (2016) investigated the influence of age, gender, and ethnicity on student success as measured by student GPA in online course at a two-year institution. Jost et al. used a random sample of 320 students who had enrolled in at least one online course in the spring semester of 2008. Age, gender and ethnicity were the independent variables with final course grade acting as the dependent variable in addition to the cumulative GPA. The results indicated that age and ethnicity influenced final course grades although the differences in final course grades between age and ethnicity disappeared when controlled by the cumulative GPA.

Jost et al. (2016) focused on four research questions: (RQ1) what is the relationship between final course grade in an online course and student age, (RQ2) what is the relationship between final course grade and student gender, (RQ3) what is the relationship between final course grade and student ethnicity, and (RQ4) do the interactions between student age, gender, and ethnicity affect final course grades? Jost et al. used a nonexperimental causal-comparative method with secondary data. In addition to the independent variables of age, gender, and ethnicity and the dependent variable of final course grade, the student cumulative GPA was the control variable. The final course grades included A, B, C, D, and E. Students earned an incomplete or withdrew from the course were not included in the final sample. Age, gender, and ethnicity were self-reported by students with eight possible categories of ethnicity including: American Indian/Alaska Native, Asian, Black/African American, Hispanic/Latino, Native Hawaiian/Other Pacific, White, Not Applicable, and Not Reported. The original sample included 400 students in the random sample and after removal of students with incompletes and students that withdrew from the online courses, the final sample size was 320 students. These data were analyzed through a multiple regression acting as an ANCOVA.

The results of the Jost et al. (2016) study indicated that age and ethnicity influenced final course grades although the differences in final course grades between age and ethnicity disappeared when controlled by the cumulative GPA. Based on these results, Jost et al. noted that advisors should not place students in online courses based on age, gender, or ethnicity as these variables did not present as predictors to student success

in the Jost et al. study. Jost et al. stated that students should be placed in online classes based on their previous student success as measured by their cumulative GPA. Jost et al. also indicated that instructional design should not be based on student demographics in online courses. Future research was suggested to extend this type of study beyond a rural area and into an urban setting as well as to focus on online participants in specific disciplines.

Summary and Conclusions

The review of current literature related to scaffolding, OER, student success, and gender and ethnicity highlighted the limited research focused on OER and student success (Cooney, 2017; Grewe & Davis, 2017; Hilton et al., 2016). Most of the studies on OER have focused on perceptions and barriers of OER as well as the cost savings with OER (Hilton & Laman, 2012; Pitt, 2015; Wiley et al, 2012; Zhang & Li, 2017). Studies focused on student success measured student success based on multiple variables (Atchley et al., 2013; Fischer et al., 2015; Hilton et al., 2016). Varying results were reported on the influence of gender and ethnicity on student success in online courses (Amro et al, 2015; Kupczynski et al., 2014) There appears to be a gap in the literature regarding whether the use of free OER in a single online course over a span of multiple years may be related to student success. For this current study, the measurement of student success was based solely on C or better course grades for the online U.S. history course. The methodology of choice for this study, Mann-Whitney U test for RQ1 and chi-square test for RQ2 and RQ3, was not identifiable through the literature review. However, analyzing the archival data for this study was appropriate with the Mann-

Whitney U test and the chi-square test because of the ex post facto nature of the study and the causal comparison investigation of the two groups as well as the nature of the variables.

Chapter 3: Research Method

The purpose of this causal-comparative quantitative study was to determine the difference in student success between history course students who used a hardcopy textbook and students who used an online textbook at an urban community college in Texas while also investigating the influence of gender and ethnicity on the effects of the implementation of the online textbook on student success. I examined the differences in student success rates between the group of students enrolled in the U.S. history online course from 2007-2012 who had access to course materials by purchasing a hardcopy textbook (Group 1) and the group of students enrolled in the U.S. history online course from 2012-2017 who did not purchase the hardcopy textbook and instead had access to course materials through an online textbook (Group 2). These data were disaggregated by gender and ethnicity to investigate how gender and ethnicity may have influenced the effects of the implementation of the online textbook on student success. Chapter 3 includes a discussion of the research design and rationale, the methodology for the study, and threats to validity, ethical procedures, and a summary.

Research Design and Rationale

The study was a causal-comparative quantitative approach utilizing archival data analyzed with SPSS. The first RQ was answered by conducting a thorough Mann-Whitney U test. I used the Mann-Whitney U test to determine the difference in the ordinal dependent variable of letter grades of the five levels, A, B, C, D, and F. The independent variable was categorical with the two options of hardcopy or online textbook. The statistical assumptions for a Mann-Whitney U test are independency and

normality. Independency means that there that there is no relationship between the two groups. In this study, there are different participants in each group. The fourth assumption evaluated the two groups of the independent variable to determine whether they are equally distributed. The determination of the distribution of the groups affected whether the Mann-Whitney U test was used as a test of equal distributions or a test of medians. These assumptions relate to the alignment of the data collected in this study and the Mann-Whitney U test.

Data were additionally disaggregated by gender and ethnicity to investigate if they influenced the effects of the implementation of the online textbook on student success as noted in RQ2 and RQ3. The five levels of grades A, B, C, D, and F were converted to passing rate with A, B, and C grades being pass and D and F grades being fail. I used the chi-square test to investigate if there were associations between categorical variables. Regarding gender, the two groups were male and female. Regarding ethnicity, there were five groups available from the urban community college in Texas including: African American, Anglo, Asian, Hispanic, Not Reported, and Other.

The study design compared two separate groups of students—one group that took the online U.S. history online course using a hardcopy textbook and a different group of students that took the U.S. history online course with the online textbook. I also examined archival data to compare passing rates by gender and ethnicity for the group of students in the U.S. history online course using hardcopy textbooks from 2007-2012 with the passing rates by gender and ethnicity for the different group of students in the U.S. history online course after the implementation of the online textbook from 2012-2017.

Data was collected representing the total number of students enrolled in the online U.S. history course in the fall and spring semesters between the 2007 and 2017. Passing rates prior to the fall of 2012 were for Group 1 and passing rates after the fall 2012 were for Group 2.

Research Questions

The research questions and hypotheses that guided this study were:

RQ1: What is the difference in final course letter grades between online history students who used a hardcopy textbook and students who used an online textbook?

$H_0$1: There will be no statistical difference in the final course grades in the U.S. history online course between students who used a hardcopy textbook and students who used an online textbook.

H_a1: There will be a statistical difference in the final course grades in the U.S. history online course between students who used a hardcopy textbook and students who used an online textbook.

RQ2: What is the association between gender and students passing the online history course before and after the implementation of the online textbook?

$H_0$2: There will be no association between gender and students passing the online history course before and after the implementation of the online textbook.

H_a2: There will be an association between gender and students passing the online history course before and after the implementation of the online textbook.

RQ3: What is the association between ethnicity and students passing the online history course before and after the implementation of the online textbook?

H_03: There will be no association between ethnicity and students passing the online history course before and after the implementation of the online textbook

H_a3: There will be an association between ethnicity and students passing the online history course before and after the implementation of the online textbook.

Variables

The ordinal dependent variable for RQ1 was the final course grades of A, B, C, D, and F. For RQ2 and RQ3, the participants obtaining A, B, and C were combined to calculate the passing rate for gender and ethnicity. The categorical independent variable included the group that was not provided with free course materials and the group that was provided with free course materials. Gender included two groups (male or female) and ethnicity archival data were available from the urban community college in Texas in these five groups: African American, Anglo, Asian, Hispanic, Not Reported and Other.

Causal-Comparative Research Design

The study was a causal-comparative quantitative approach utilizing archival data of final grades in an online U.S. history course analyzed with SPSS through the Mann-

Whitney U test for RQ1 and the chi-square test for RQ2 and RQ3. I chose the Mann-Whitney U test to align with RQ1 with the ordinal dependent data collected to determine the differences between two groups (Laerd Statistics, 2019). I examined archival data to compare the final course letter grade of A, B, C, D, or F with student success measured as a C or better final course grade (defined as pass) and a D or F (defined as fail). for the group of students in the U.S. history online course prior to the online textbook adoption from 2007-2012 (Group 1) with the final course letter grade for the different group of students in the U.S. history online course after the implementation of the online textbook from 2012-2017 (Group 2).

Data were disaggregated by gender and ethnicity to investigate if they influenced the effects of the implementation of the online textbook on student success between the two groups as noted in RQ2 and RQ3. I chose the chi-square test to align with RQ2 and RQ3 to determine if there was an association between the categorical variables (Laerd Statistics, 2019). I used data representing passing grades from the enrollment by gender and ethnicity in the online U.S. history course to compare passing rates for the group of students in the U.S. history online course prior to the online textbook adoption from 2007-2012 (Group 1) with the passing rates for the different group of students in the U.S. history online course after the implementation of the online textbook from 2012-2017 (Group 2).

Methodology

The archival data was collected from the office of planning, research, effectiveness, and development at the urban community college in Texas. This office,

which had indicated cooperation to provide the data, collects and stores student data for internal purposes. I applied to Walden University's IRB to obtain conditional approval of the study, then I submitted that notification along with an application to the cooperating institution for its IRB approval. I forwarded the receipt of the institution's approval to Walden University's IRB to obtain final approval (#10-09-19-0401913) before gaining access to the data. In the following sections I describe the methodology regarding population, sampling, variables, and the data analysis plan.

Population

The setting for this study was a large urban community college district in Texas. The district was comprised of seven individually accredited colleges of varying size. This study took place at the largest college in the district with an average enrollment of approximately 20,000 credit students. The scope of the study included one required undergraduate U.S. history course. Although the course was offered face-to-face and online, this study used archival data from only the online sections of the course that ran beginning the fall 2007 though the spring of 2017. Data from the face-to-face sections of the course were not used in this study because they did not implement the online textbook. Only data from the fall and spring semesters were used to accurately represent the population of students attending an urban community college in Texas. Summer and winter sessions generally have a high number of transient students from local universities, which might bias the results of the study. The total population of students meeting that criteria were 10,478. Data was disaggregated by gender and ethnicity to investigate if gender and ethnicity influenced the effects of the implementation of the

online textbook on student success as measured by passing rates for the group with the hardcopy textbook as compared to the group with the online textbook.

Sampling and Sampling Procedures for Archival Data Collection

Through the Walden University IRB process, I requested archival quantitative data from the urban community college in Texas. The urban community college in Texas routinely collects student data regarding enrollment, demographics, retention, competition, and student success rates. These data are stored in the software system managed by the institution's Office of Planning, Research, Effectiveness, and Development (OPRED). The data I received from OPRED were final course grades disaggregated by gender and ethnicity for students enrolled in the U.S. history online course in the fall and spring semesters only from the fall of 2007 through the spring of 2017. Data did not include student identifiers. For a .50 large effect size and a .80 power for $\alpha = .05$, a minimum of 48 participants in each of the two groups is recommended (Cohen, 1992). These data included the final course letter grade, gender, ethnicity, semester, and year for the 10,478 students who took the online history course between 2007 and 2017 in the form of an Excel spreadsheet to download into SPSS for analysis.

Operationalization of Variables

I examined archival data to compare online student pass/fail rates for the group of students in the U.S. history online course using hardcopy textbooks from 2007-2012 with the students' pass/fail rates for the different group of students in the U.S. history online course after the implementation of the online textbook from 2012-2017. The dependent variable of student success defined as a final course grade of C or better was the

dependent variable measured by percentage of C or better grades. The independent variable was the implementation of the online textbook. Data were disaggregated by gender and ethnicity to investigate if they influenced the effects of the implementation of the online textbook on student success.

Table 1

Operationalization of Variables

Description	Variable	Type
Dependent	Pass/Fail	Ordinal
Independent	Hardcopy/Online	Categorical
Independent	Gender	Categorical
Independent	Ethnicity	Categorical

Note. Student success was operationalized as successful (Pass) for a final grade of A, B, C while not successful (Fail) were categorized as a final grade of D or F. Student success was also disaggregated by gender and ethnicity. The two categorical levels of OER are defined as without a free embedded textbook and with an online textbook.

Data Analysis Plan

IBM SPSS software was used to download the archival data from Excel and to complete the statistical analysis of the Mann-Whitney U test for RQ1 and the chi-square test for RQ2 and RQ3 for this causal-comparative quantitative approach. The Mann-Whitney U test was chosen to align with RQ1 with the ordinal dependent data collected to determine the differences between two groups (Laerd Statistics, 2019). The chi-square test was used to investigate if there was an association between categorical variables (Laerd Statistics, 2019). The sample population of the archival data was provided by the

urban community college in Texas' office of planning, research, effectiveness, and development. The total number of students enrolled in the online course in the duration of data will be collected was 10,478. I requested data did not include student identifiers. These data included the final course letter grade, gender, ethnicity, semester, and year for the 10,478 students that took the online history course between 2007 and 2017 in the form of an Excel spreadsheet to download into SPSS for analysis. After screening the data, all W grades were removed leaving only A, B, C, D, and F grades resulting in a total of 9,115 grades.

To examine the difference in student success between Group 1 and Group 2, the dependent variable for RQ1 were final course grades and the dependent variable for RQ2 and RQ3 were passing rates. Data was collected by requesting all individual student final course grades by gender and ethnicity for fall and spring semesters only from the fall of 2007 through the spring of 2012 and all individual student final course grades by gender and ethnicity from the fall of 2012 through the spring of 2017. Student success rates by gender and ethnicity prior to the fall of 2012 were Group 1 and student success rates by gender and ethnicity after the fall 2012 were Group 2.

Threats to Validity

Creswell (2009) noted three types of threats to validity including internal threats, external threats, and threats to statistical conclusions. Identifying threats to validity in the development of the research design is essential to with student success measured as a C or better final course grade eliminating or minimizing the effects of these threats on the study and subsequent results, analysis, and conclusions.

External Validity

External threats to validity may arise when the researcher attempts to make generalized inferences across different populations beyond the scope of the study (Creswell, 2009). To counteract the possibility of this external threat, the researcher should not generalize results but should reproduce the study with varying populations and at different time periods.

Internal Validity

Internal threats to validity involve procedures or treatments that may interfere with the researcher's inferences about the effect on the population (Creswell, 2009). One type of internal threat is the passage of time over the course of the study and external events may impact student success beyond the application of the online textbook. The selection of the participants may impact internal validity. In this study, students enrolled in the online course and the online textbook was implemented ex post facto.

Statistical Conclusion Validity

Creswell (2009) noted that threats to statistical conclusions may occur when researchers make inferences beyond the data and appropriate statistical assumptions. Although this causal-comparative study investigated the difference in the success rate between Group 1 and Group 2, correlation between the implementation of the online textbook online may not prove causation. However, through descriptive analyses appropriate inferences may be made.

Ethical Procedures

Through the Walden University IRB process, archival quantitative data was requested from the urban community college in Texas. Because the urban community college in Texas routinely collects student data regarding enrollment, demographics, retention, competition, and student success rates. These data are stored within the software system managed by the institution's OPRED. The data I received from OPRED will be final grades for students enrolled in the U.S. history online course in the fall and spring semesters only from the fall of 2007 through the spring of 2017. Data did not include student identifiers. These data will only include enrollment numbers and student success rates in the form of an Excel spreadsheet. These data will be stored securely on a flash drive for the required minimum of five years in a fire-proof safe in my home residence and then destroyed after the five-year period. Any requests from outside researchers seeking to obtain these data will be denied ensuring confidentiality.

Summary

Chapter 3 included discussion of the research design and rationale, the methodology for the study, and threats to validity. The study was a causal-comparative quantitative approach utilizing archival data analyzed with SPSS through the Mann-Whitney U test for RQ1 and the chi-square test for RQ2 and RQ3. I examined the differences in student passing rates by gender and ethnicity between students in Group 1 who purchased a hardcopy textbook and those in Group 2 for whom the textbook was embedded in the online course at no additional cost in an online United State history course. Data collected reflected the total enrollment in the online U.S. history course to

passing rates, also disaggregated by gender and ethnicity, from those enrolled in the fall of 2007 through the spring of 2012 (Group 1) with passing rates from those enrolled in the fall of 2012 through the spring of 2017 (Group 2).

Chapter 4 begins with a discussion of the data collection process followed by the results of the tests conducted in SPSS. The results are provided through tables and summarized with a descriptive explanation. A summary is provided to align the results with the research questions.

Chapter 4: Results

The purpose of this causal-comparative quantitative study was to determine the difference in student success between history course students who used a hardcopy textbook and students who used an online textbook at an urban community college in Texas while also investigating the influence of gender and ethnicity. I examined the differences in student success rates between the group of students enrolled in the U.S. history online course from 2007-2012 who had access to course materials by purchasing a hardcopy textbook (Group 1) and the group of students enrolled in the U.S. history online course from 2012-2017 who did not purchase the hardcopy textbook and instead had access to course materials through an online textbook (Group 2). These data were disaggregated by gender and ethnicity to investigate how gender and ethnicity may have influenced the effects of the implementation of the online textbook on student success.

The research questions and hypotheses that guided this study were:

RQ1: What is the difference in final course letter grades between online history students who used a hardcopy textbook and students who used an online textbook?

$H_0$1: There will be no statistical difference in the final course grades in the U.S. history online course between students who used a hardcopy textbook and students who used an online textbook.

H_a1: There will be a statistical difference in the final course grades in the U.S. history online course between students who used a hardcopy textbook and students who used an online textbook.

RQ2: What is the association between gender and students passing the online history course before and after the implementation of the online textbook?

$H_0$2: There will be no association between gender and students passing the online history course before and after the implementation of the online textbook.

H_a2: There will be an association between gender and students passing the online history course before and after the implementation of the online textbook.

RQ3: What is the association between ethnicity and students passing the online history course before and after the implementation of the online textbook?

$H_0$3: There will be no association between ethnicity and students passing the online history course before and after the implementation of the online textbook

H_a3: There will be an association between ethnicity and students passing the online history course before and after the implementation of the online textbook.

In this chapter, I present the results of determining the relationships between the use of an online textbook as compared to a hardcopy textbook and student success as disaggregated by gender and ethnicity. In addition to the above review of the purpose, research questions, and hypotheses, the following sections of the chapter cover data collection, treatment, and results. In the summary, the results of the analyses are aligned with the research questions.

Data Collection

The urban community college in Texas routinely collects student data regarding enrollment, demographics, retention, competition, and student success rates. These data are stored in the software system managed by the institution's OPRED. The data I received from OPRED were final course grades disaggregated by gender and ethnicity for students enrolled in the U.S. history online course in the fall and spring semesters only from the fall of 2007 through the spring of 2017. Data did not include student identifiers. These data included the final course letter grade, gender, ethnicity, semester, and year for the 10,478 students who took the online history course between 2007 and 2017 in the form of an Excel spreadsheet to download into SPSS for analysis.

The original number of participants was 10,478. Group 1 included 4,712 participants and Group 2 included a total of 5,766 participants. Data received from the urban community college in Texas included "W" grades that were not part of this study. After removal of 687 "W" grades from Group 1 and 676 "W" from Group 2, the remaining number of participants was 9,115. Of the 9,115 total participants, Group 1 consisted of 4,025 participants and Group 2 consisted of 5,090 participants. With the exclusion of 1,363 total participants who received "W" grades, the study did not use all the 10,478 participants that had been anticipated and noted in Chapter 3.

Descriptive statistics frequencies indicating the demographics of the total population by gender, ethnicity and final course grade are included in the next two tables. Table 2 represents the total population of 9,115 participants across both Group 1 and Group 2, with 3,690 male participants and 5,425 female participants. The total number of

female participants being 19% greater at 59.5% than the total number of male participants at 40.5% of the population.

Table 2

Demographics of Sample Population by Gender

		Frequency	Percent	Valid percent	Cumulative percent
Valid	M	3,690	40.5	40.5	40.5
	F	5,425	59.5	59.5	100.0
	Total	9,115	100.0	100.0	

Table 3 indicates the disaggregation of the total number of participants by ethnicity. The categories of ethnicity included: African American, Anglo, Asian, Hispanic, Not Reported, and Other. The category of Not Reported was provided in the data set received from the urban community college in Texas and could represent any one of the existing categories or these participants could identify with a category not represented. The category of Other was also included in the data set from the urban community college in Texas. These students identify with an ethnicity not represented in an existing category. The largest ethnicity represented at 31.1% of the participants identified themselves as Anglo with African Americans representing 23.2% of the participants. The number of Asian and Hispanic identifying participants were similar at 19.6% and 19.7% respectively. Participants choosing not to report their ethnicity represented 4.9% of the population, and only 1.4% chose the designation of Other.

Table 3

Demographics of Sample Population by Ethnicity

		Frequency	Percent	Valid percent	Cumulative percent
Valid	African American	2,118	23.2	23.2	23.2
	Anglo	2,836	31.1	31.1	54.3
	Asian	1,789	19.6	19.6	74.0
	Hispanic	1,795	19.7	19.7	93.7
	Not Reported	451	4.9	4.9	98.6
	Other	126	1.4	1.4	100.0
	Total	9,115	100.0	100.0	

Final course grades for all 9,115 participants across both groups were collected (Table 4). Students earning a final course grade of A represented 41.3% of the population with 23.4% of the population earning a final course grade of B. The next highest percentage of 16.5% were the students earning a final course grade of F. Students earning a C represented 13.6%, and 5.2% of students earned a D.

Table 4

Final Course Grades for the Total Sample Population

		Frequency	Percent	Valid percent	Cumulative percent
Valid	A	3,760	41.3	41.3	41.3
	B	2,132	23.4	23.4	64.6
	C	1,238	13.6	13.6	78.2
	D	478	5.2	5.2	83.5
	F	1,507	16.5	16.5	100.0
	Total	9,115	100.0	100.0	

Tables 5 and 6 indicate the number of participants in each group. Group 1 had 4,025 participants and Group 2 had more participants with a total of 5,090 students.

Table 5

Group 1 Total Participants

		GENDER	ETHNICITY	GRADE
N	Valid	4,025	4,025	4,025
	Missing	0	0	0

Table 6

Group 2 Total Participants

		GENDER	ETHNICITY	GRADE
N	Valid	5,090	5,090	5,090
	Missing	0	0	0

Disaggregating the participants in each group by gender, the majority of participants in Group 1 were female at 60.4% with 2,430 female students and the 1,595 male students represented 39.6% of the population. The ratio of female to make students in Group 2 was similar to Group 1. Most students in Group 2 were female at 58.8% with 2,995 female students. Group 2 had some total of 2,095 male students representing 41.2% of the population of Group 2. Groups were also disaggregated by ethnicity.

Table 7

Group 1 Disaggregated by Gender

		Frequency	Percent	Valid percent	Percent
Valid	M	1,595	39.6	39.6	39.6
	F	2,430	60.4	60.4	100.0
	Total	4,025	100.0	100.0	

Table 8

Group 2 Disaggregated by Gender

		Frequency	Percent	Valid percent	Percent
Valid	M	2,095	41.2	41.2	41.2
	F	2,995	58.8	58.8	100.0
	Total	5,090	100.0	100.0	

The largest ethnic percentage is also Anglo in Group 1 with 37.6% of the students and the second highest percentage of students at 21.5% in Group 1 identifying as African American. In Group 2, the identical order of high to low student ethnic percentages remained the same as in Group 1. However, in Group 2 the gaps between the number of Anglo, African American, and Hispanic students decreased. Anglo students represent

26% of the students in Group 2 with African Americans increasing from 21.5% to 24.6% of the population and Hispanic student increasing from 15.3% to 23.1% of the students in Group 2.

The student population identifying as Asian, Not Reported, and Other remained relatively consistent across both groups and within each group. The Asian population across both groups represented 19.6% of the population. Within Group 1, the percentage of Asian students was 19.8% and 19.5% in Group 2. Students Not Reporting their ethnicity across both groups represented 4.9% of the population. Within Group 1, 4.5% did not report their ethnicity and 5.3% did not report their ethnicity in Group 2. The smallest percentage of students across both groups and within both groups was those who identified as Other. Across both groups, 1.4% identified as Other with 1.3% in Group 1 and 1.4% in Group 2 (Tables 9 - 10).

Table 9

Group 1 Disaggregated by Ethnicity

		Frequency	Percent	Valid percent	Percent
Valid	African-American	864	21.5	21.5	21.5
	Anglo	1,513	37.6	37.6	59.1
	Asian	797	19.8	19.8	78.9
	Hispanic	617	15.3	15.3	94.2
	Not Reported	180	4.5	4.5	98.7
	Other	54	1.3	1.3	100.0
	Total	4,025	100.0	100.0	

Table 10

Group 2 Disaggregated by Ethnicity

		Frequency	Percent	Valid percent	Percent
Valid	African-American	1,254	24.6	24.6	24.6
	Anglo	1,323	26.0	26.0	50.6
	Asian	992	19.5	19.5	70.1
	Hispanic	1,178	23.1	23.1	93.3
	Not Reported	271	5.3	5.3	98.6
	Other	72	1.4	1.4	100.0
	Total	5,090	100.0	100.0	

The delineation of final course grades across both groups were determined to align with the delineation of final course grades within each group were also determined. Final course grades of an A represented 38.6% of the grades within Group 1 and 43.3% of the grades within Group 2. Group 1 had a larger percentage of final course grades of B with 25.1% whereas Group 2 had 22% of the final course grades of B. Group 1 also had a higher percentage of C grades with 15% as opposed to the 12.5% of C grades in Group 2. Group 1 had a higher percentage of D grades than Group 2 at 5.6% with Group 2 having 4.9% D grades. In Group 2, the percentage of F grades increased to 17.2% from 15.7% in Group 1 (see Figure 1 and additional breakdowns in Appendix).

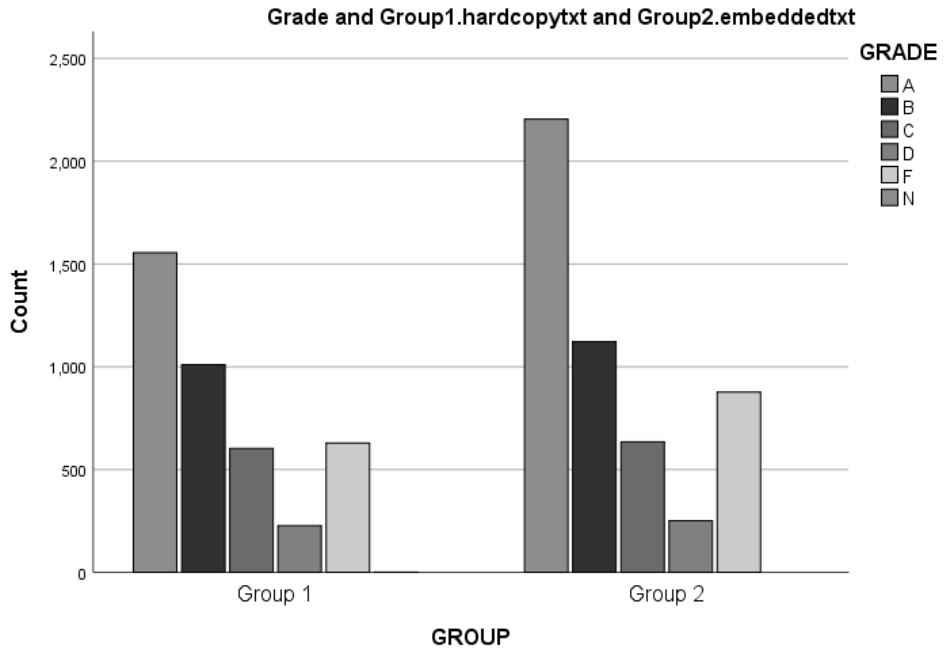

Figure 1. Bar chart of grade count for Group 1 and Group 2.

Treatment

I examined archival data to compare online student success rates on a grading scale, in the form of individual student grades with A, B, C, D and F final course grades, for the group of students in the U.S. history online course using hardcopy textbooks from 2007-2012 with the online students success rates on a grading scale, in the form of individual student grades with A, B, C, D and F final course grades, for the different group of students in the U.S. history online course after the implementation of the online textbook from 2012-2017. The dependent variable of student success defined as a final course grade for RQ1. The independent variable was the implementation of the online textbook. For RQ 2 and RQ3, data were also disaggregated by gender and ethnicity and converted to passing rates to investigate if these variables influenced student success.

Results of the Statistical Analysis

Assumptions for both the Mann-Whitney U test and the chi-square test for association were tested prior to beginning the analysis. Each analysis is presented separately below.

Research Question 1: Mann-Whitney U Test

RQ1: What is the difference in final course letter grades between online history students who used a hardcopy textbook and students who used an online textbook?

For the first research question, the following assumptions for the Mann-Whitney U test were met: (a) the dependent variable of final course grades is measured at the ordinal level, (b) the independent variable consists of two categorical, independent groups which were Group 1 and Group 2, and (c) the two groups were not normally distributed resulting in two distributions with similar but not identical shapes as identified through the legacy procedure to generate a population pyramid in SPSS (Laerd Statistics, 2019). An analysis to compare means was run in SPSS to generate the output of the resulting population pyramid in figure 2. The population pyramid indicates the number of A, B, C, D, and F final course grades between Group 1 and Group 2 to investigate if the shape of the two groups is similar. A visual inspection of the graph shows that the two groups are similar in shape although not identical. Laerd Statistics indicates that it is unlikely that two groups would be identical. However, if the test resulted in the two groups having different shapes, the Mann-Whitney U test would only be able to be used to compare mean ranks. Because the test indicated that Group 1 and Group 2 have similar

shapes, the Mann-Whitney U test can be used to compare the medians of the final course grades for the two groups.

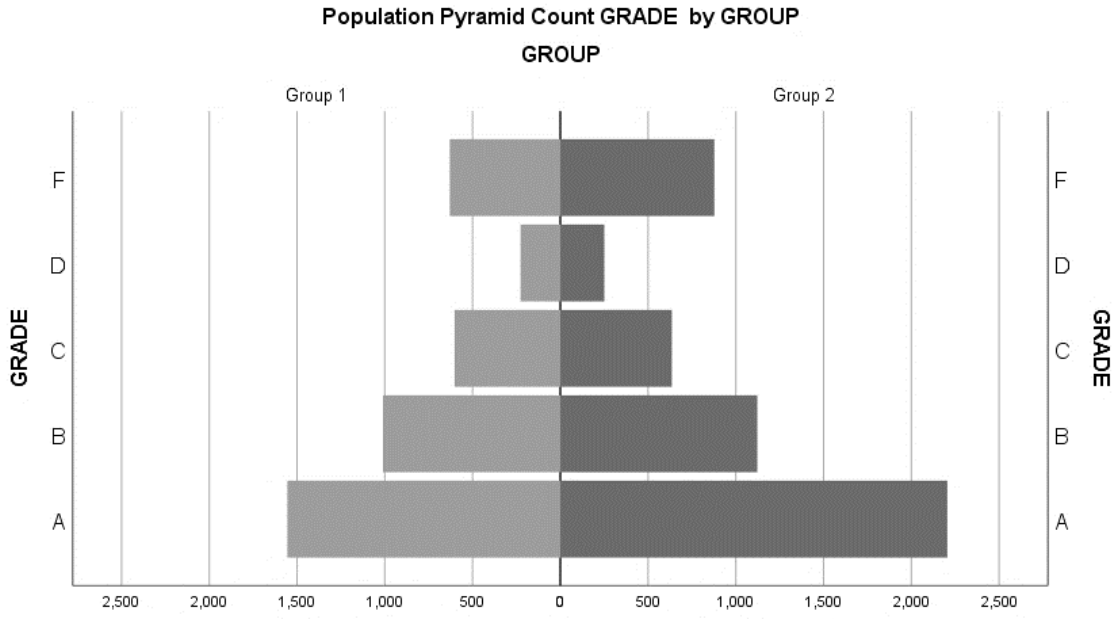

Figure 2. Population pyramid count grade by group.

With the four assumptions met for the Mann-Whitney U test, data were coded in the Excel file for final course grades and for the two groups (Group 1 and Group 2). The Excel data sheet was downloaded into SPSS where the variables were assigned values. The dependent variable of final course grades was given the values: 1 = A, 2 = B, 3 = C, 4 = D, and 5 = F. The independent variable Group 1 was given a value of 1 and Group 2 was given a value of 2. Because the dependent variable was ordinal, and the test was run on SPSS25, the legacy procedure was used in SPSS. The Mann-Whitney U test for the descriptive statistical two independent sample test with the dependent variable of final course grades as the test variable and Group 1 and Group 2 as the grouping variable was run.

Table 11

Mann-Whitney U Test Statistics[a]

	GRADE
Mann-Whitney U	9923261.500
Wilcoxon W	22879856.500
Z	-2.692
Asymp. Sig. (2-tailed)	.007

[a] Grouping Variable: GROUP

The Mann-Whitney U test (Table 11) indicated the *U* statistic (*U* = 9923261) and the statistical significance level (*p* = .007) includes the asymptotic significance (Asymp. Sig.) level (2-tailed). The output did not include the exact significance level because of the large size of the two groups (Laerd Statistics, 2019). The Asymp. Sig. level or *p*-value will be the deciding factor on whether to keep the null hypotheses of the first research question or to accept the alternate hypotheses of the first research question.

RQ1: What is the difference in final course letter grades between online history students who used a hardcopy textbook and students who used an online textbook?

$H_0$1: There will be no statistical difference in the final course grades in the U.S. history online course between students who used a hardcopy textbook and students who used an online textbook.

H_a1: There will be a statistical difference in the final course grades in the U.S. history online course between students who used a hardcopy textbook and students who used an online textbook.

The output indicated a *p*-value of .007. Because $p = .007$ is less than $p = .05$, the null hypothesis that there was no difference between the means was rejected and the alternate hypotheses was accepted that there was a statistically significant difference in final course grades of A, B, C, D, and F for students in Group 2 as compared to the final course grades of students in Group 1.

Research Question 2: Chi-Square

There were two assumptions met for using the chi-square test for association to investigate the second research question. The first assumption was that the variables should be measured at the ordinal or nominal levels. The second assumption was that the variables should consist of two or more categorical, independent groups. Gender included male and female groups. The chi-square test for association was run for the total number in both Group 1 and Group 2 who received passing grades (A, B, C) for a N = 7,130 to investigate the second and third research questions.

RQ2: What is the association between gender and students passing the online history course before and after the implementation of the online textbook?

$H_0$2: There will be no association between gender and students passing the online history course before and after the implementation of the online textbook.

H_a2: There will be an association between gender and students passing the online history course before and after the implementation of the online textbook.

Data were analyzed in SPSS using descriptive statistics with crosstabs for the chi-square test for association. Phi and Cramer's V test was selected to measure the strength of the association between the variables.

Table 12

Symmetric Measures by Gender

		Value	Approximate significance
Nominal by nominal	Phi	-.017	.158
	Cramer's V	.017	.158
N of valid cases		7,130	

Table 13

Crosstabulation of Pass Measures by Gender

		GROUP		
		Group 1	Group 2	Total
Male	Count	1,236	1,611	2,847
	% within GENDER	43.4%	56.6%	100.0%
	% within GROUP	39.0%	40.7%	39.9%
	% of Total	17.3%	22.6%	39.9%
Female	Count	1,932	2,351	4,283
	% within GENDER	45.1%	54.9%	100.0%
	% within GROUP	61.0%	59.3%	60.1%
	% of Total	27.1%	33.0%	60.1%
Total	Count	3,168	3,962	7,130
	% within GENDER	44.4%	55.6%	100.0%
	% within GROUP	100.0%	100.0%	100.0%
	% of Total	44.4%	55.6%	100.0%

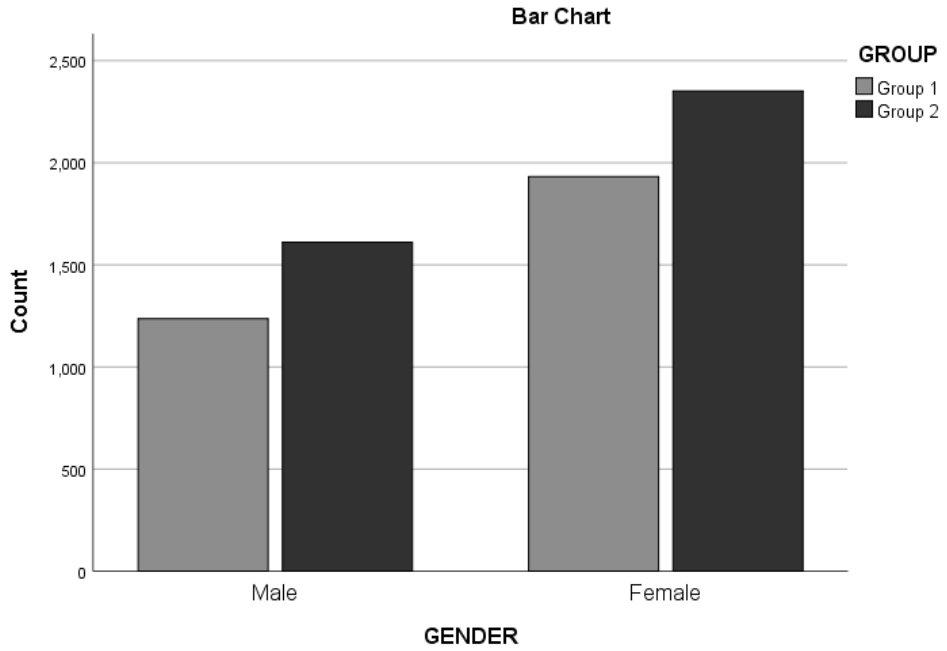

Figure 3. Bar graph for gender.

The chi-square for gender and group was not significant as shown in symmetric measures in Table 12 and crosstabulations in Table 13. Figure 3 illustrates the results in a visual bar graph. There was no significant difference between those in Group 1 who passed the course using the hardcopy textbook and those in Group 2 who passed the course using the embedded online textbook for males and females. The null hypothesis was accepted that there was no association between gender and students passing the online history course before and after the implementation of the online textbook.

Research Question 3: Chi-Square

There were two assumptions met for using the chi-square test for association to investigate the second research question. The first assumption was that the variables should be measured at the ordinal or nominal levels. The second assumption was that the

variables should consist of two or more categorical, independent groups. Ethnicity included African American, Anglo, Asian, Hispanic, Not Reported, and Other groups. The chi-square test for association was run for both Group 1 and Group 2 to investigate the third research question. As with RQ2, the total number who received passing grades (A, B, C) was 7,130.

RQ3: What is the association between ethnicity and students passing the online history course before and after the implementation of the online textbook?

$H_0$3: There will be no association between ethnicity and students passing the online history course before and after the implementation of the online textbook

H_a3: There will be an association between ethnicity and students passing the online history course before and after the implementation of the online textbook.

Data were analyzed in SPSS using descriptive statistics with crosstabs for the chi-square test for association. Phi and Cramer's V test was selected to measure the strength of the association between the variables.

Table 14

Symmetric Measures of Ethnicity

		Value	Approximate significance
Nominal by nominal	Phi	.140	.000
	Cramer's V	.140	.000
N of valid cases		7,130	

Table 15

Crosstabulations of Pass by Ethnicity

		GROUP		
		Group 1	Group 2	Total
African American	Count	627	924	1,551
	% within ETHNICITY	40.4%	59.6%	100.0%
	% within GROUP	19.8%	23.3%	21.8%
	% of Total	8.8%	13.0%	21.8%
Anglo	Count	1,197	1,038	2,235
	% within ETHNICITY	53.6%	46.4%	100.0%
	% within GROUP	37.8%	26.2%	31.3%
	% of Total	16.8%	14.6%	31.3%
Asian	Count	709	872	1,581
	% within ETHNICITY	44.8%	55.2%	100.0%
	% within GROUP	22.4%	22.0%	22.2%
	% of Total	9.9%	12.2%	22.2%
Hispanic	Count	448	838	1,286
	% within ETHNICITY	34.8%	65.2%	100.0%
	% within GROUP	14.1%	21.2%	18.0%
	% of Total	6.3%	11.8%	18.0%
Other	Count	147	227	374
	% within ETHNICITY	39.3%	60.7%	100.0%
	% within GROUP	4.6%	5.7%	5.2%
	% of Total	2.1%	3.2%	5.2%
Not Reported	Count	40	63	103
	% within ETHNICITY	38.8%	61.2%	100.0%
	% within GROUP	1.3%	1.6%	1.4%
	% of Total	0.6%	0.9%	1.4%
Total	Count	3,168	3,962	7,130
	% within ETHNICITY	44.4%	55.6%	100.0%
	% within GROUP	100.0%	100.0%	100.0%
	% of Total	44.4%	55.6%	100.0%

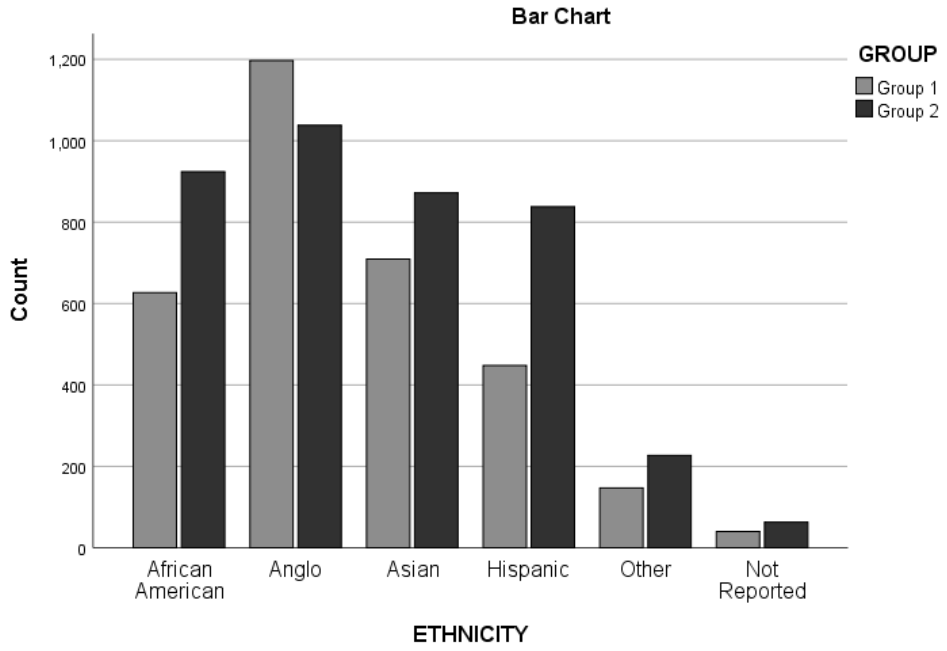

Figure 4. Bar graph by ethnicity.

The chi-square for ethnicity in general and group was significant ($p < .05$) as shown in Table 14. As shown in the crosstabulation Table 15 percentages for pass rate, the only ethnic group of participants that had a higher pass rate for the group using the hardcopy book was Anglo. The bar graph (Figure 4) visually illustrates this.

All the other ethnicities except Anglo all had a higher pass rates when using the online course materials. As there was a significant association between ethnicity and the students passing the online history course after the implementation of the online textbook, the alternative hypothesis was accepted.

Summary

In RQ1, I asked: What is the difference in final course letter grades between online history students who used a hardcopy textbook and students who used an online

textbook? To answer this first research question and to test the null hypothesis that there would be no statistical difference in the final course grades in the U.S. history online course, I conducted a Mann-Whitney U test to compare final course grades between Group 1 and Group 2. The results of the Mann-Whitney U test indicated a statistically significant difference in the final course grades between Group 1 and Group 2 with an increase in student success in Group 2. Therefore, the null hypothesis that there was no statistical difference in the final course grades is rejected and the alternate hypothesis was accepted that there was a statistically significant difference in final course grades for students in Group 2 as compared to the final course grades of students in Group 1.

For RQ2, I asked: what is the association between gender and students passing the online history course before and after the implementation of the online textbook? To answer the second research question and to test the null hypothesis that there would be no statistical difference in the pass rates by gender in the U.S. history online course with the online textbook as compared to the hardcopy textbook, I conducted a chi-square test for association to compare pass rates by gender between Group 1 and Group 2. The results indicated that there was not a significant association in pass rates between the two groups. Therefore, the null hypothesis was accepted that there was no association between gender and students passing the online history course before and after the implementation of the online textbook.

In RQ3, I asked: what is the association between ethnicity and students passing the online history course before and after the implementation of the online textbook? To answer the third research question and to test the null hypothesis that there would be no

statistical difference in the pass rates by ethnicity in the U.S. history online course with the online textbook as compared to the hardcopy textbook, I conducted a chi-square test for association to compare the pass rates by ethnicity between Group 1 and Group 2. The results indicated there was a significant association between ethnicity and the students passing the online history course after the implementation of the online textbook, the alternative hypothesis was accepted.

In Chapter 5, I discuss of the implications of the Mann-Whitney U test and chi-square test for association results for each of the three research questions, the limitations of the research, and how the findings filled a gap in the literature. I will discuss the nature of this study as well as possible opportunities for future researchers to build upon my research.

Chapter 5: Summary, Recommendations, and Conclusions

The purpose of this causal-comparative quantitative study was to determine the difference in student success between history course students who used a hardcopy textbook and students who used an online textbook at an urban community college in Texas while also investigating the influence of gender and ethnicity. I examined the differences in student success rates between the group of students enrolled in the U.S. history online course from 2007-2012 who had access to course materials by purchasing a hardcopy textbook (Group 1) and the group of students enrolled in the U.S. history online course from 2012-2017 who did not purchase the hardcopy textbook and instead had access to course materials through an online textbook (Group 2). These data were disaggregated by gender and ethnicity to investigate how gender and ethnicity may have influenced the effects of the implementation of the online textbook on student success.

The key findings of the research to test how a hardcopy textbook versus an online textbook influence student success indicated that there was a significant statistical difference ($p = .007$) in final course grades between Group 1 and Group 2 with an increase in student success in Group 2. As a result of these findings, the null hypothesis for RQ1 that there would be no statistical difference in the final course grades was rejected and the alternate hypothesis that there would be a statistically significant difference in final course grades for students in Group 2 as compared to the final course grades of students in Group 1 was accepted.

The key findings to test association between gender and students passing the online history course before and after the implementation of the online textbook indicated

that there was no statistical difference between the two gender groups, and therefore the null hypothesis was accepted.

The key findings to test association between ethnicity and students passing the online history course before and after the implementation of the online textbook indicated that there was a statistical difference in ethnicity in general between the two groups, and therefore the alternate hypothesis was accepted.

Interpretation of the Findings

In this section, I discuss how the key findings supported accepting or rejecting the null and alternate hypotheses for RQ1, RQ2, and RQ3 as well as extending knowledge about online student success measured by final course grades in a course that provided an online textbook as compared to the course that used a traditional hardcopy textbook by comparing the results of the study to the literature discussed in Chapter 2. The results of the study were also compared to the perspective of scaffolding theory, which focused on student success by providing students with support to reach their educational abilities. The findings from this study contributed to the knowledge gap in online learning and student success by exploring the influence of providing an online textbook as compared to a traditional hardcopy textbook.

Findings Related to the Literature

In this study I investigated the relationships between student success in an online U.S. history course and providing students with an online textbook as compared to a hardcopy textbook. Data were disaggregated to investigate if gender and ethnicity influenced student success between Group 1 and Group 2. Secondary data collected were

final course grades for 9,115 students (7,130 of whom had passing grades) in the one course over a 10-year period.

The results of this study indicated a statistically significant difference in student success in Group 2 with the online textbook as compared to Group 1, with Group 2 having increased student success rates. The findings of this study extended knowledge regarding online student success and the use of OER. Studies regarding the use of OER resulted in varying outcomes for student success with the majority of results indicating that OER does not impact student success (Feldstein et al., 2012; Hilton et al., 2013; Hilton & Laman, 2012; Hilton et al., 2014; Wiley et al., 2012). Several studies investigating the relationships between OER and student success took place at the secondary school level (Robinson et al., 2014; Wiley et al., 2012). Robison et al. (2014) indicated positive but varying results across disciplines whereas Wiley et al. (2012) found no difference in standardized testing scores between student using OER and those using traditional textbooks. Although the Atchley et al. (2013) study showed increased student success in online course as opposed to face-to-face courses, they did comment that previous studies had indicated the opposite results. Grewe and Davis (2017) could not conclude that OER in the online courses resulted in increased student success. Winitzky-Stephens and Pickavance (2017) investigated the impact of OER on student success rates and the results indicated that OER had no effect on course grade with OER as compared to traditional textbooks. Fischer et al. (2015), Hilton et al. (2013), and Croteau (2017) all concluded that there was not a significant difference in student success between groups using OER as compared to traditional textbooks at the college level.

However, the results of this present study support the results of the Hilton and Laman (2012) study where students using an online textbook as compared to a traditional textbook scored higher on final exams and had higher GPA's. Colvard et al. (2018) also found that the use of OER at the college level increased final course grades while decreasing drop/fail/withdrawal rates for students who were Pell grant receiving, part-time students, and non-White students.

The influence of gender on passing rates in Group 1 as compared to Group 2 in RQ2 in this present study was not significant. The findings extended knowledge regarding OER, student success, and gender. Kupczynski et al. (2014) investigated the relationship between gender and academic success online. That study compared final course grades in an online course, gender, and overall GPAs with the results indicating that there were differences in student success by gender for students with lower overall GPAs. Lowes et al. (2016) investigated gender differences in online courses at the high school level as they related to behavior and performance. The results of that study indicated that students who were more active in the online courses, regardless of gender, received higher course grades. Although course activity was a predictor of student success in general, it was a larger predictor of student success for males than females. Finally, Anthony (2012) investigated the influences of online course design and participation between genders. Anthony's results indicated that there was not a significant difference in participation between genders.

In regard to RQ3 and the influence of ethnicity on passing rates in Group 1 as compared to Group 2, passing rates increased for students in Group 2 using the online

textbook. Anglo students in Group 1 who used the hardcopy textbook had higher success rates with 37% passing than all other ethnicities with 19.8% of African American students and 14.1% of Hispanic earning passing grades. However, in Group 2, 23.3% of African American and 21.2% of Hispanic students earned passing grades, increasing their passing rates with the online textbook (See Table 15). The findings of this present study extended knowledge regarding OER, student success, and ethnicity. Previous literature indicated that ethnicity was not a factor in student success in online courses (Amro et al., 2015). Colvard et al. (2018) studied the impact of OER in the form of OpenStax textbooks on student success as measured by final course grades and drop/fail/withdrawal rates and found increased student success for non-White students with the use of OER. Salvo et al. (2019) explored common themes for online course completion and success as well as barriers to success by African American males although it was not focused on OER as a tool for success.

Palacios and Wood's (2016) study, conducted across the California community college system, determined the relationship between male students of varying ethnicities and online learning. They noted that current literature indicated that Asian, Anglo, African American, and Hispanic male students were more likely to be successful when learning face-to-face; however, there was no clear indication in their study of success trends for these male students in the online modality except for African American men. They recommended that consideration be taken in the presentation of online materials and types of interaction when promoting online learning to varying ethnicities.

Kaupp (2012) noted that there was not much current literature focusing on online courses and the achievement gap between White and Latino students as seen in on-campus classes. Kaupp investigated the influence of online instruction and the achievement gap between Latino and White students. Those results indicated that online Latino student outcomes were 9% lower than their counterparts in face-to-face courses; therefore, the achievement gap between Latino students and White students increased in the online modality. The results of the Wolfle (2012) study indicated that there were no statistically significant relationships between developmental status and age or ethnicity in regard to student success and persistence.

While this present study did not compare results across ethnicity and gender, Cotton et al. (2016) investigated the student success rates for varying ethnic and gender groups in higher education. Cotton et al. commented that students from ethnic minorities and males had lower success rates than White students and female students. Jost et al. (2016) investigated the influence of age, gender, and ethnicity on student success. The Jost et al. results indicated that age and ethnicity influenced final course grades although the differences in final course grades between age and ethnicity disappeared when controlled by the cumulative GPA.

In summation, the findings from this present study extended the knowledge in current literature regarding online learning and student success by indicating a statistically significant increase in final course grades for students (notably for non-Anglo students) using the online textbook as compared to a traditional hardcopy textbook.

Findings Related to the Theoretical Framework

I expected my findings to confirm the value of Vygotsky's (1978) scaffolding approach in the community college adoption of the free online textbook material in a required online U.S. history course in a Texas community college system. Indeed, findings from my study indicated that there was a significant statistical difference in student success rates measured by final course grades in Group 2 using the online textbook as compared to Group 1 with students in Group 2 increasing their success rates. However, statistical tests comparing the association between gender and passing rates between Group 1 and Group 2 showed no significant statistical difference. Statistical tests comparing passing rates by ethnicity indicated increased success rates for African American, Hispanic, and Asian students in Group 2 using the online textbook whereas Anglo students accounted for the majority of final course grades of A in Group 1 who used the hardcopy. African American, Hispanic, and Asian students significantly increased their passing rates in Group 2 by using the online textbook as compared to Group 1 who used the hardcopy. Providing the online textbook as an application of scaffolding increased student learning from the student's current abilities to their learning potential. This brought theory to practice as doing so correlated with the increased student success rates in Group 2.

Limitations of the Study

This research was limited to a community college setting. One limitation of the study was that the students were not randomly assigned to either Group 1 or Group 2. Assignment to either group was based solely on when they self-selected the online U.S.

history course at the time of their community college enrollment. There also may be possible unknown variables that could affect the dependent variable in that different faculty taught the U.S. history course and student grades were not determined by standardized tests but by the evaluation of the individual instructors based on rubric guidelines. Threats to trustworthiness, validity, and reliability were addressed by collecting data that represented the typical population during only fall and spring semesters and by removing data that was outside the scope of the final course grades that were used as a measurement of student success for this study. Assumptions for both the Mann-Whitney U test and the chi-square tests were met to ensure the reliability of the results.

Recommendations

Future research could replicate this research at institutions of varying sizes and demographics as well as across different disciplines. Additional statistical tests could be run to investigate the influence of the combination of gender and ethnicity on pass/fail grades such as African American males in comparison to Hispanic males and Anglo males. Comparing final course grades between ethnicities and genders may also render more significant results between individual final course grades. Another recommendation would be to investigate the relationships between providing students with course materials that are free as was the online textbook as compared to providing students with course materials as part of their tuition. Further research might also investigate the influence of age on online student success.

Implications

Findings from this study suggest implications for positive social change, theory, and practice. This study offers evidence that providing an online textbook as compared to a hardcopy textbook increases student success. The findings of this research support positive social change in that increasing higher course grades could lead to more student completion of gateway courses, such as the U.S. history course in this study. That, in turn, could lead to further education, employment, and positive contributions as a member of society. Using a just-in-time learning or scaffolding concept (Vygotsky, 1978) by providing an online textbook for students resulted in higher final course grades for those students as compared to students using the previous hardcopy textbook. Bridging the gap between theory and practice, administrators and faculty in the field should investigate the adoption of free OER to provide students with course materials in online courses to support them with this scaffolding mechanism for them to reach their learning potential.

Conclusion

The results of this study indicted a statistically significant difference in student success in Group 2 as compared to Group 1 with Group 2 having increased student success rates. In regard to passing grades and gender, a chi-square test showed that there was no significant variance between passing rates of males and females between the two groups, and the null hypothesis was accepted. A chi-square test was conducted to compare the passing rates by ethnicity between Group 1 and Group 2. The results indicated that there was a higher percentage of African American, Asian, and Hispanic

students achieving passing rates in Group 2, the online textbook group, as compared to Group 1. Therefore, the null hypothesis that there was no difference in final course grades by ethnicity was rejected and the alternate hypothesis was accepted that there was a higher percentage of passing rates for students by ethnicity in Group 2 as compared to the students in Group 1. These results indicate that providing the online textbook as compared to the traditional hardcopy textbook increased student success rates for online learners, as well as increasing student success rates by ethnicity.

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Appendix: Tables

Table A1

Group 1 Final Course Grade

		Frequency	Percent	Valid percent	Cumulative percent
Valid	A	1,555	38.6	38.6	38.6
	B	1,010	25.1	25.1	63.7
	C	603	15.0	15.0	78.7
	D	227	5.6	5.6	84.3
	F	630	15.7	15.7	100.0
	Total	4,025	100.0	100.0	

Table A2

Group 2 Final Course Grade

		Frequency	Percent	Valid percent	Cumulative percent
Valid	A	2,205	43.3	43.3	43.3
	B	1,122	22.0	22.0	65.4
	C	635	12.5	12.5	77.8
	D	251	4.9	4.9	82.8
	F	877	17.2	17.2	100.0
	Total	5,090	100.0	100.0	