Comparing Student Retention in On-Campus, Synchronous, and Asynchronous Online Credit Courses at California Community Colleges

by

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Comparing Student Retention in On-Campus, Synchronous, and Asynchronous

Online Credit Courses at California Community Colleges

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ABSTRACT

Online learning has become a reality for many students in postsecondary education. However, the dropout rates for online learners are proportionally higher than for on-campus learners. This quantitative study compared retention rates among California community college students with different racial/ethnic backgrounds, gender, and age to determine if the types of interactions, as provided in different instructional methods, play a role in achieving higher retention rates. The three instructional methods under investigation included synchronous online courses with the opportunity for immediate interactions, asynchronous online courses with the opportunity for delayed interactions, and on-campus classes with the traditional forms of interactions. The results of the analyses revealed that retention rates between on-campus and online students tended to be significantly larger for some racial/ethnic and age groups, as well as for male students in the asynchronous learning environment when compared with the synchronous online setting. Those students who have the opportunity to communicate promptly with instructors and peers are more likely to persist than those students who must wait for a response. Therefore, one strategy to help increase retention in online courses is to provide students with increased immediate interaction by promoting a strong sense of community through the Community of Inquiry (CoI).

Keywords: Retention Rates, Instructional Methods, Asynchronous Online, Synchronous Online, Ethnicity, Gender, Age Groups, CCC Confer, Blackboard Collaborate, California Community Colleges, Interaction, Community of Inquiry Model.
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CHAPTER 1—INTRODUCTION

While distance learning may seem to be a relatively new phenomenon, in reality students have been taking courses offered by instructors that are separated by time and place for close to 200 years. Most researchers have proposed that the advent of distance education coincided with the invention of new technologies such as the printing press, postal service, radio, television, and internet (Casey, 2008; Holmberg, 1995; Moore & Kearsley, 1996). However, scholars have categorized differently the phases of the development in distance education, as it responded to changes in technology (Heydenrych & Prinsloo, 2010). Schlosser and Anderson (1994) stated that the roots of distance education were more than 150 years old, while Moore and Kearsley (1996) referred to the origin of distance education in the United States as the beginnings of the correspondence courses offered in the early 20th century. One of the earliest examples of distance learning on record was designed by Sir Isaac Pitman, an English educator, in 1837 (Holmberg, 1995). He taught students how to write in shorthand through weekly lessons, which were sent to their home. These simple, practical lessons allowed anyone to gain valuable job skills, even if they lived remote from educational institutions (Casey, 2008). In 1873, Anna Ticknow presented educational opportunities to women in the United States through home study via correspondence courses (Nasseh, 1997). William Rainey Harper, who helped to establish both the University of Chicago and Bradley University, served as the first president of both institutions. He was influential in the early development of the system of community colleges in the United States and developed a correspondence program at Chautauqua, NY in 1885 (Ratcliff, 1986).
The evolution of distance education in the 20th century continued with live educational radio shows, which allowed students to experience immediacy and the voice of their instructors. Between 1918 and 1946, the Federal Communications Commission (FCC) would grant educational radio licenses to over 200 colleges (Flannery, 1995). Even though most radio courses were not college-level credit courses, Casey (2008) stated that “correspondence courses and instructional radio shows paved the way for distance learning opportunities through television technology” (p. 46). In 1934, the University of Iowa was the first university to utilize broadcast courses by television (Larreamendy-Joerns & Leinhardt, 2006).

By the 1960s, the Educational Broadband Service (EBS), formerly known as the Instructional Television Fixed Service (ITFS), created a band of 20 television channels available to be licensed by the FCC to local credit-granting educational institutions. It allowed educational institutions to deliver live or prerecorded instructional television courses and shows to multiple sites within school districts and to postsecondary and higher education campuses (Reisslein, Seeling, & Reisslein, 2005). A. M. Cohen and Brower (2008) noted that distance learning increased in the 1970s with new technologies, such as open-circuit television and reproducible media (e.g., cassette tapes, VHS tapes, laser disc). According to Casey (2008), “Distance education flourished in the U.S. for several reasons: (1) the great distances of citizens from educational institutions, both geographically and socioeconomically; (2) the thirst for education; and (3) the rapid advancement of technology” (p. 45).

With the emergence of the internet and the increased access to bandwidths from private homes to the internet, the delivery of distance education videos via web-streaming
has become more widespread and has replaced much of the delivery through ITFS/cable TV. The past two decades have witnessed the most rapid developments in distance education via the internet. Today, distance learning has evolved to online courses with multiple new delivery and instructional methods (e.g., web-based live meetings, virtual office hours, student blogs). Though debates surrounding issues related to distance education have not yet abated, more and more institutions, entrepreneurs, educators, and learners are embracing distance education with the aid of web-based information technologies. The development of distance learning via the internet coincided with the development of virtual campuses, particularly for-profit institutions, such as Capella University, Walden University, and the University of Phoenix. Viewed from various perspectives, online education brings many advantages to postsecondary and higher education (Kearsley, 2005). Online learning facilitates opportunities to engage students who traditionally would not be able to pursue postsecondary educational goals (Casey, 2008; Nasseh, 1997; Ratcliff, 1986), including students with disabilities, from rural areas, with children, serving in active military service abroad, and students who have full-time working schedules or who seek international collaborations (Casey, 2008; A. M. Cohen & Brower, 2008; Moore & Kearsley, 1996; Renes & Strange, 2011).

On February 27, 2012, the White House released *Education Blueprint: An Economy Built to Last.* In this document, President Obama called on governors to increase the state investment in postsecondary education. His vision includes that America once again will have the highest share of college graduates in the world by 2020. The Organization for Economic Cooperation and Development (OECD, 2011) published research that ranks the education systems of different Western countries. In 2011, the
United States ranked 12th in graduation rates among 36 developed nations. America’s dismal college-completion rates and the growing gap between the United States and other countries threaten to undermine American competitiveness in an increased global economy. The drop-out rate is one of the reasons why, in July of 2011, President Obama announced the *American Graduation Initiative*, calling for 5 million more college graduates by 2020, to help the United States lead the world again in educational attainment (Dervarics, 2012). Dervarics (2012) argued we will only be able to meet this challenge if we increase student retention in online education.

As Boggs (2008) pointed out:

Learning opportunities and services are now expected to be offered twenty-four hours a day, seven days a week. Distance learning technologies are erasing geographical boundaries, and competition for students is increasing. Community colleges are being asked to help bridge the “digital divide,” and prepare students to live in an increasingly global society and economy. (p. 18)

Community colleges are crucial to attaining President Obama’s goal of placing the United States once again at the forefront of the world with respect to collegiate attainment. They enroll more than half the undergraduate students in the country (McClenney, 2013). Moreover, not only do they produce workforce-related credentials and degrees in their own right but, by preparing hundreds of thousands of students to transfer, they play an important role in baccalaureate degree production as well.

Given the increasing evidence that internet information and communication technologies are transforming much of society, online education will be the defining transformative innovation for higher education in the 21st century (Moore & Kearsley,
Since online learners have access anytime and anywhere to formal and informal education of their choice provided by experts and peers, online education has radically altered the relationship of the learner to the teacher, to other learners, and to the content of the curriculum. Consequently, these new forms of relationships resulted in unprecedented new forms of interactions (Harasim, 1996).

Today, most online courses are primarily based on asynchronous Learning Management Systems (LMS) such as CampusCruiser LMS, Blackboard, WebCT, Moodle, and Sakai. The California Community College Chancellor’s Office (CCCCO, 2011) defines this method of instruction as Delayed Interaction (internet-based) and explains further that “the sessions are under the supervision of an instructor not available by line of sight using internet without the immediate involvement of the instructor” (Appendix A). Hereafter, this instructional method was called asynchronous in alignment with other research studies in the field. In asynchronous online courses, students can review course material and complete assignments when it is convenient, usually within given time limits. In asynchronous online courses, students read the materials, review multimedia content, complete projects, post on the discussion board, and take quizzes or tests. Other online learning resources that are used to support asynchronous learning include email, threaded online discussion boards, wikis, and blogs (H. Y. Hsu & Wang, 2011). Course management systems have been developed to support online interaction, allowing users to organize discussions, post and reply to messages, and upload and access multimedia learning modules.

In recent years, many instructors have attempted to emulate traditional instructional methods in the online learning environment through the use of interactive
online courses that allow two-way simultaneous interaction (Grant & Cheon, 2007; McBrien, Cheng, & Jones, 2009). Distance education\(^1\) with simultaneous interaction (CCCCO, 2013) offers opportunities for direct teacher-student contact. Hereafter, this instructional method was called synchronous in alignment with other research studies in the field. Shi and Morrow (2006) explained further that the instructor leads the learning and all learners are logged on simultaneously and communicate directly with each other. Synchronous software that is popular in educational settings, such as Centra, HorizonLive, Blackboard Collaborate/ElluminateLive (henceforth referred to as CCC Confer [California Community Colleges Confer]), Interwise, Adobe Connect, Webex, and Wimba share several interactive characteristics. They allow students and instructors to communicate verbally in real-time, exchange chat messages through typing, upload PowerPoint presentations, transmit live video, allow for live closed-captions, create web-based recordings, surf websites together and/or share applications (Appendix B).

For the fiscal year of 2011/2012, the majority of state governors proposed additional budget cuts to core services in higher education to meet the continued fiscal difficulties of their states (Welsh & Brewer, 2012). Most of the proposed cuts were beyond those already implemented and left educational systems with the colossal dilemma of offering effective education to an increased number of students with drastically reduced funds. As California community colleges (CCCs) are confronted with

\(^1\)The CCCCO (2013) *Data Element Dictionary* defines distance education (DE) as a mean of instruction in which the instructor and student are separated by distance and interact through the assistance of communication technology. Whether or not a course is to be considered as DE, the basic criterion established in the *Distance Education Guidelines* (2004) under Section 55205 needs to be applied (i.e., a DE course/section or session utilizes technology 51% or more of the time to deliver instruction during the course term). In determining the type of DE modality to assign to a course, the predominant mode of delivery, in terms of time spent, is then applied to course sections where multiple DE delivery modes, including Internet, television and videotape, are present.
rising numbers of students (Boggs, 2011; A. M. Cohen & Brower; 2008), institutional leaders are faced with greatly reduced budgets caused by the present economic crisis. In this context, A. M. Cohen and Brower (2008) found that “distance learning and technological infrastructures have been hailed as leading to potential cost reduction and great savings” (p. 173). Researchers found a variety of online education models that reduced the cost of education in a variety of institutional contexts (Chen, Lambert, & Guidry, 2010; Moore & Kearsley, 2011). The cost-saving factors included the reduction of concerns surrounding the use of campus-based facilities.

Twigg’s (2003) review showed one approach most favored by institutions of postsecondary and higher education: keeping student enrollments the same while reducing the instructional resources devoted to the course. Twigg described institutions that increased student enrollments with little or no change in course expenditures by increasing the section size. In some cases, one faculty member, who had traditionally taught one section, handled several sections simultaneously with the help of a course assistant. Additionally, technology-assisted activities such as online automated assessment of exercises, quizzes, and tests can reduce the amount of time that faculty spend on the management of assessment. Twigg went as far as to suggest that instructors can eliminate duplication efforts by sharing course materials, such as online tutorials, with other colleagues.

I. E. Allen and Seaman (2011) agreed that online education seems to be the preferred solution for cost-effective use of faculty time, especially among for-profit colleges and universities. I. E. Allen and Seaman’s research results demonstrated a notable percentage change for the private for-profit institutions (50.7% in 2009, 60.5% in
who reported that online education is critical to their long-term strategy. These percentages represented a far greater increase than seen in all other types of institutions. This trend makes it imperative for researchers to determine and verify effective approaches for students to participate in and benefit from online educational courses. Additional research, such as this study, is necessary to investigate which online instructional methods provide a quality education while decreasing costs and increasing accessibility to student populations.

Problem Statement

In July of 2011, President Obama announced the American Graduation Initiative, calling for 5 million more college graduates by 2020, to help the United States again lead the world in educational attainment (Thomas, 2010). According to I. E. Allen and Seaman (2007), all types of institutions claimed improved-student-access as their top reason for offering online courses and programs. Institutions that were the most engaged in online education are for-profit institutions. Increasing demand for well-educated workers in the private sector helped to fuel the steady rise of for-profit programs and enrollments in online degree programs (Adams & DeFleur, 2006). This upward trend is likely to continue because the demand for employees with a college degree is projected to rise significantly during the decade ahead, particularly in managerial, computer engineering, and accounting occupations (Carnevale, Smith, & Strohl, 2010).

Over the past decade, enrollment counts in online courses at colleges and universities around the United States have grown at a greater rate than overall higher education enrollment (I. E. Allen & Seaman, 2010). The number of students at degree-granting postsecondary and higher institutions taking at least one online course
increased by 21% from the fall of 2008 to the fall of 2009. Over that same 1-year period, total enrollment increased by only 1.2%. The nationwide political climate seems to accelerate the growth of online education. Thus, online learning has become a reality for many students in postsecondary and higher education. However, researchers have found higher dropout rates for distance education (10-20%) over traditional programs (Carr, 2000; Rovai & Downey, 2010). Rovai (2003) viewed retention or persistence as the behavior of continuing action despite the presence of obstacles and as an important measure of online program effectiveness in higher education. Reasons given for the high dropout percentage of distance learners include limited support and service of distance education, dissatisfaction with teaching methods, unfamiliarity with the technology, and students’ feelings of isolation. Many online students have experienced a sense of isolation, and researchers have warned that students’ sense of isolation can threaten their ability to learn (Angelino, Williams, & Natvig, 2007; Cornelius, Gordon, & Harris, 2011; Moore & Kearsley, 1996; Swan, 2001). According to Adams and DeFleur (2006), these arguments center on such issues as the degree of personal contact with instructors and the importance of interaction with other students.

Similarly, Summers, Waigandt, and Whittaker (2005) suggested that student satisfaction with their learning environment is an important measure of their approach to learning and their learning outcomes. According to S. R. Palmer and Holt (2009), student satisfaction applies equally to online students as it does to learners more generally. Within the next 10 years, more than 50% of postsecondary and higher education is expected to be delivered via online courses. However, 71% of American adults expressed hesitation to utilize online education (Young, 2011). If this trend continues,
online education will considerably deter educational accessibility to a large number of students. Therefore, it is imperative to identify and implement effective delivery methods in distance education that will increase student retention rates in CCC’s distance education courses.

Researchers identified several strategies for maintaining instructional quality in the online environment, including the importance of using a variety of instructional methods to appeal to various learning styles and building an interactive learning environment that includes group work, projects, portfolios, and weekly assignments (Paechter, Maier, & Macher, 2010; Rovai & Jordan, 2004; Swan, 2001). Many students like to move at their own pace and choose an asynchronous online course due to the fact that the interaction allows for delay. However, asynchronous communication seemed to lack the immediacy of interaction that today’s students have grown accustomed to through texting and social media (Baker, 2010).

Although asynchronous online courses increasingly display multi-media course designs, Ming and Baumer (2011) found that most asynchronous online courses included the use of text-based discussion forums to characterize online interaction facilitation. In online discussion forums, students are expected to respond to questions posted by their instructor, typically with two substantive responses to each of two discussion questions per week as a minimum for earning participation credit. In addition to participating in discussion forums, students are required to interact via other course components that are in written form (e.g., course content, test questions, instructors’ comments, and more). Therefore, students are required to comprehend course material mainly through the learning mode of reading. However, research showed that students enter community
colleges with an increased need for remediation (Barnes, 2010). In particular, a greater number of students enter college with limited reading and writing skills. According to the 2006 American College Testing (ACT) scores, just over half (51%) of high school graduates had the reading skills they need to succeed in college (Cole & Gonyea, 2010). Such data reinforced the suggestion that students with low reading and writing skills are predestined to fail in text-based asynchronous online courses. In contrast, the predominant mode of interaction in synchronous online environments might allow students to interact immediately, verbally, and visually with instructors and peers, as well as to review multiple times the recordings of synchronous online class sessions.

Further studies are necessary to determine: (a) if the immediate interactions play a role in achieving higher retention rates in synchronous online courses when compared with the delayed interactions in asynchronous online courses; and (b) if the immediate interactions in synchronous online courses allow students to reach retention rates similar to those in traditional on-campus classes.

**Purpose of the Study**

The purpose of this research was to examine the impact of increased online interactions in real-time via Internet-based Simultaneous Interaction, as provided by synchronous online courses on retention rates. This study carried out a three-way comparison of delivery modes for credit courses at 112 CCCs to determine if there was a difference in student retention among the delivery modes. Specifically, this quantitative study compared the effectiveness of synchronous and asynchronous distance courses with on-campus education by analyzing student retention rates, controlling for factors of ethnicity, gender, and age.
The existing literature on the widespread adaptation of digital technologies in postsecondary and higher education confirmed the need to better understand the impact of web-based learning technology on student’s educational engagement and learning outcomes (Narayan, Davis, & Gee, 2012; Robinson & Hullinger, 2008; Zhang, Zhao, Zhou, & Nunamaker, 2004). Garrison and Kanuka (2004) found evidence that students in online learning can achieve as well as, or better than, on-campus students on exams and can be satisfied with the online approach if given sufficient opportunities for interaction. Identifying and choosing such conditions that foster student success, specifically in the online college environment, has never been more important (Phelan, 2012). Zavarella and Ignash (2009) suggested benefits of a variety of instructional formats (asynchronous or synchronous) to meet students’ needs in an online learning environment. As the discussion on the asynchronous and synchronous online instructional methods among researchers continues, more data-driven assessments are needed to guide institutions, instructors, and students in their choices of instructional methods at postsecondary educational institutions. This research is among a limited number of studies, and the findings can be used to develop a set of recommendations for effective models of online delivery strategies that result in improved academic outcomes in online courses at community colleges.

This quantitative study utilized the institutional data that are available on the web-based CCCCO’s Data Mart (2011). Data Mart is an online tool, which allows users to identify variables of interest on one or multiple institutions and to download such data for analytic purposes. Queries can show student outcomes in enrollments and programs with demographic breakouts, if desired, by students’ ethnicity, gender, and age group.
(CCCO, 2011). The CCCCO Data Mart website offers the opportunity to download any retrieved results of each online inquiry as a Microsoft Excel or Word file. If the retrieved data are not saved as a Microsoft Excel or Word file on a computer hard drive, the online query results will expire after several minutes. Each semester, all community colleges submit their institutional data to the CCCCO, which collects data in five primary areas: students/headcounts, courses, student services, faculty/staff, and student outcomes. Student outcomes can be viewed under the following specifics with demographic breakouts (gender, age group, and ethnicity) by: basic skills cohort tracker, enrollment retention rates, grade distribution, program awards, and student progress and achievement rate (SPAR).

Since the findings are based on data from 112 CCCs that include urban multi-campus colleges, as well as rural small colleges, the recommendations are significant and can be generalized to improve retention rates not only at California’s community colleges but also at community colleges nationwide. The findings will ultimately shed light on how instructors, administrators, and policymakers can better assist students in postsecondary and higher education’s online courses.

**Research Questions and Hypotheses**

This study was designed to provide evidence that instructors can deliver remote presentations via two-way simultaneous interaction with effectiveness comparable to classroom delivery. This research will reveal if online students are able to duplicate retention rates of their on-campus colleagues in California’s community colleges. In summary, this study hypothesized that distance education with simultaneous interaction not only increased student-teacher contact but also improved student learning outcomes.
as measured by retention rates in California’s community colleges. In order to compare the student learning outcomes of online students (asynchronous and synchronous) with on-campus students at CCCs, the following research questions were addressed:

1. Is there a difference in retention rates by ethnicity in the various instructional methods?
2. Is there a difference in retention rates by gender in the various instructional methods?
3. Is there a difference in retention rates by age groups in the various instructional methods?

In summary, it was hypothesized that the data will reveal the following results: There will be no significant differences ($p < .05$) in retention rates overall and among gender, ethnicity, and age group categories for students in online classes taught in the synchronous online learning format as compared with the on-campus learning format.

**Methodology**

This quantitative study compared student outcome data that were retrieved from the California Community College Chancellor Office’s (2011) *Data Mart*. The data comparison included groups of community college students who were taking a variety of on-campus and online credit courses. It was of particular interest to investigate student retention rates in a synchronous online format versus the rates of students taking online courses in an asynchronous online format and versus those studying in the on-campus format. Data were analyzed for fall semester 2011 by instructional method (on-campus, asynchronous, and synchronous), by gender, by age group, and by ethnicity (African American, Asian, Hispanic, Multi-Ethnic, and White).
Significance of the Study

This study is intended to inform community college leaders, those who guide online educational programs, and online instructors about the current status of best practices in online education. As a strategy to improve retention rates among community college online students, synchronous online teaching methods may serve as a valuable option for addressing the lack of immediate interaction in online courses (Enriquez, 2010). Therefore, this study is significant for educational leaders, who are facing high dropout rates among online students, as well as for designers and teachers of online courses in the community colleges who are seeking more effective online course designs to improve student learning as measured by retention rates.

This study is also significant for community college deans and associate deans who make decisions on course management in their departments. While access to college has been the major concern in recent decades, over the last years college completion has become increasingly a leading item on the national agenda (Belfield & Bailey, 2011). With many online instructional modalities in American higher education, it is imperative to identify the best instructional and pedagogical strategies. Many critics maintain that the quality of education via online study is inferior to classroom instruction and that the differences are considerable (Bullen, 2007). Other researchers claim the opposite and insist that knowledge acquired by online distance learning is equal to, or even superior to, that obtained in traditional settings (Kim & Bonk, 2006). Finding best practices in online education could prevent failing strategies from causing the apparent disparity between student retention rates in online courses versus face-to-face classes (Patterson & McFadden, 2009; Rovai & Downey, 2010).
This research is significant because, to date, there are no extensive empirical studies that have examined the impact of CCC Confer and if this educational contact tool has an impact on student retention rates at CCCs. Since 2001, community college online instructors in California have used CCC Confer as a vehicle for instructor-student and student-student contact in distance education. A grant from the CCCCO allows community colleges to employ this technology without any additional costs. Researchers suggested that interaction in a synchronous online environment resulted in increased learning (Khajavinia, 2007). However, these arguments are more theoretical than empirically supported (M. Allen et al., 2004). The existing studies assessed only a limited sample size across limited instructional environments in CCCs (Adams & DeFleur, 2006; Enriquez, 2010; Skylar, 2009). The results of Enriquez’s (2010) study on Electrical Engineering majors indicated that the online students \( n = 25 \) learned as effectively as the on-campus students \( n = 30 \). These are noteworthy findings. Nevertheless, the small sample size and specialization area of the students limits generalization to larger populations. Determining how to deliver a course that involves engagement of participants in an online course will be an important contribution.

The majority of college presidents pronounced the forecast that in the next 10 years over half of postsecondary and higher education courses will be delivered fully online (Parker, Lenhart, & Moore, 2011). In their opinion, online courses offered the same quality learning opportunities as the more traditional instructional learning modalities, such as on-campus courses. However, Young’s (2011) study illuminated concerns of delivering online education, as compared with traditional forms of teaching, and found that only 3 in 10 American adults \( 29\%, N = 2,142 \) who took an online course
were confident that the online course provided an equal educational value to one taken in a classroom. In their opinion, online education did not measure up to traditional teaching (Young, 2011). In a qualitative study, all participants \((n = 24)\) held a high opinion of their online degree and of the university (Hagan, 2013). However, the participants recognized that some people have a negative opinion of online degrees. They pointed out a need for strategies in dealing with encounters of the negative perceptions of online degrees. In the quest of achieving a more positive attitude towards online learning and online degrees, it is of vital importance to determine which of the online instructional methods (synchronous or asynchronous interaction) result in equal or higher student retention rates, as compared with traditional teaching and learning methods.

As distance education continues to expand, research in the field of online retention is becoming an important issue, as well as the need for determining factors that have an impact on students’ retention in an online course. More than half of postsecondary and higher education is expected to be delivered via online education within the next 10 years (Parker el al., 2011). However, retention rates have been significantly lower for online courses than for on-campus courses. Thus, it is vital to investigate data for a greater number of students in a greater variety of subject areas with more demographic diversity than has been done so far. Analysis of these factors could lead to the identification of effective and meaningful online teaching tools that will improve online learners’ retention rates. This study contributes to the growing knowledge base on the formation of online learning interaction and generates pedagogical implications for promoting adult learners’ active participation in online courses. The findings of this study will add useful knowledge in the practice and the understanding of
online learning to guide educational leaders in offering quality learning opportunities to all undergraduate students. Finally, recommendations from this study will inform instructors and course designers of online courses how to revise their instructional methods to enhance retention rates among online students at CCCs.

**Limitations**

This study had several limitations that should be considered when evaluating the findings and determining the extent to which the results are generalizable to other regions and other institutions of higher education. This study limited the research to studies of web-based instruction and eliminated the investigation of any other distance courses such as video- and audio-based telecourses. Additionally, only the effects of objective measures of student learning were examined. The effects of student or teacher perceptions of learning or course quality, student affect or emotional intelligence, and other qualitative type of effects were not included in this present research. This study did not attempt to equate for differences in curriculum materials, aspects of pedagogy, and learning time spent in each treatment condition (on-campus, asynchronous, and synchronous online learning).

The CCCCO’s (2011) *Data Mart* presents student outcome data without consideration of other variables besides ethnicity, gender, and age-groups. In his theory of transactional distance, Moore (1993) considered pivotal to attend to elements of course structure and opportunities for teacher-student interaction and student-student interaction. He also considered the variables of learning style, learner autonomy, and student motivation. Additionally, many community colleges serve a variety of students that ranges from full-time, degree seeking to part-timers and nondegree seeking; *Data Mart*...
does not match these categories with students’ positive retention rates. The retrieved data do not give specific information on students’ technology proficiency. Further, *Data Mart* does not distinguish between online courses that are taught by experienced or novice online instructors. All of these factors might influence students’ retention rates. However, these variables were outside the scope of this study and represent limitations to this study.

**Delimitations**

This study was limited to the comparison of student retention rates within the CCC system’s on-campus and distance education courses (synchronous and asynchronous) with data retrieved from the CCCCO (2011) *Data Mart*. Since the findings are based on data from 112 CCCs, including urban, multi-campus, rural and small institutions, the recommendations can be generalized to the state level and also bear important implications for community colleges nationwide. However, this study did not include data from other higher educational institutions inside or outside of California. Furthermore, the study excluded data on the experiences and satisfaction of students and instructors with the various instructional methods. The effective use of the specific synchronous online tools (e.g., chat, polling, web tour, application sharing, etc.), and how these tools may lead to major improvements in the instructional strategies, were not explored. It was beyond the scope of this study to examine the combination of online tools provided by the synchronous software and how various combinations related to specific interaction.

A broad range of factors (i.e., institution, technology, instructor, student, support system, course structure, and instructional design) can influence the quality of the
educational experience in online education. This study did not address any factors other than instructional modes of delivery, ethnicity, gender, and age groups.

The discussion of Virtual Classrooms, Social Networks, and MOOCs as a way of increased interaction and improved social presence in online education were beyond the scope of this study.

**Definition of Terms**

*California Community Colleges:* The Community Colleges of California System (CCCS) comprises 112 colleges that are organized into 72 college districts serving over 2.9 million students throughout the rural and urban areas of California. Originally, the community colleges derived from the school system, which used to be a K-14 system. At the beginning of the 20th century, Stanford’s President Jordan convinced legislation to pass responsibility of Grades 13 and 14 exclusively over to the community colleges in California. Between 1910 and 1960, nearly two community colleges opened each year (A. M. Cohen & Brower, 2008). Today, CCCS is the largest higher education system in the world, with the possible exception of China. The primary missions of the system are: (a) preparing students to transfer to 4-year universities; (b) workforce development and training; and (c) basic skills and remedial education. The CCCCO was established by legislation in 1967 and is the administrative branch charged with providing leadership, advocacy, and support for the system.

*California Community College Chancellor’s Office (CCCCO):* The CCCCO operates under the direction of the state chancellor who is guided by the Board of Governors. The state chancellor is appointed by the Governor of California. The Chancellor’s Office has nine divisions and each is led by a vice chancellor. The CCCCO
oversees matters pertaining to the California Community Colleges’ Board of Governors (BoG), the annual budget and legislative process, communications to the general public and media, and the internal operations of the system.

The CCCCO identifies different section categories of distance education (DE) based upon the method of instruction and not the tool such as ElluminateLive or Blackboard (Appendix B). Distance education in the CCC system is divided into several categories, which include (a) Internet-based Delayed Interaction (asynchronous), and (b) Internet-based Simultaneous Interaction (synchronous).

Asynchronous Online Courses: The CCCCO defines asynchronous instruction as a form of distance education that offers delayed interaction between participants. The sessions are under supervision of instructors who are not available by line of sight. Asynchronous instruction uses the internet without the immediate involvement of the instructor.

Asynchronous learning, also commonly called self-paced learning, is a student-centered teaching method that uses online learning resources to facilitate information sharing outside the constraints of time and place among a network of people. The learning in asynchronous courses is without synchronization between instructor and students. Students can review course material and complete assignments when it is convenient, usually within given time limits. In asynchronous online courses students read the materials, complete projects, post on the discussion board and take quizzes or tests. Other online learning resources used to support asynchronous learning include email, electronic mailing lists, threaded online discussion boards, wikis, and blogs. Course management systems such as CampusCruiser LMS, Blackboard, WebCT,
Moodle, and Sakai, have been developed to support online interaction, allowing users to organize discussions, post and reply to messages, and upload and access multimedia learning modules.

**CCC Confer/Blackboard Collaborate—A Tool in Distance Education: CCC**

CCC Confer/Blackboard Collaborate is a web conferencing program developed by Elluminate Inc. The company offered virtual rooms or vSpaces where virtual schools and businesses can hold classes and meetings (Appendix B). Elluminate Inc. was acquired by Blackboard Inc. Under the Modeling Effective Educational Technology Project (M.E.E.T. Project), a systemwide grant funds CCC Confer (n.d.), an e-conferencing and call-conferencing service that provides training, support, and toll-free access to e-conferencing for each of the CCC system colleges and their staff and faculty on a continuous basis. The CCC Confer project was launched in February 2001 to provide the CCC system with a viable means to meet and collaborate at a distance and uses the Blackboard Collaborate software. California Community Colleges Confer is headquartered at Palomar College in San Marcos, California.

Because CCC Confer is offered to all 112 colleges as a centrally hosted e-conferencing service, individual instructors and colleges use the service without cost. The project negotiates a systemwide contract with Blackboard Inc., the current e-conferencing vendor. Support (training, technical support, troubleshooting, web-based scheduling, and so forth) is provided by the staff of CCC Confer, with help from the Blackboard Inc. staff when required.

The use of e-conferencing, as provided by CCC Confer, is ADA Section 508 conformant (providing for accessible content to differently abled users) and can be
supplemented with captioning when requested. The project initially focused on virtual meetings and staff development programs, but instructional applications became a focus in 2004.

California Community Colleges Confer allows instructors to meet with their online students in real-time for synchronous sessions with immediate interaction that can function as office hours, lecture classes, test review sessions, and more. Instructors have the ability to display PowerPoint presentations and images, share applications, take web tours, and post real-time notes while receiving real-time feedback and questions from their students. Students and instructors can use voice communication using a microphone or telephone, whiteboard tools, text chats, and real-time survey polling. Additionally, online instructors are sharing their computer screen in real-time on the computer screens of students who are sitting miles away. Many online instructors employ CCC Confer/Blackboard Collaborate to fulfill the State’s requirements for student/teacher contact hours in an otherwise asynchronous online course. However, some community college instructors are using CCC Confer exclusively to deliver their courses online.

California Community Colleges Confer does not require the purchasing of any software, and equipment requirements are reduced to just a PC, an internet connection, and a telephone. To use Blackboard Collaborate, the user needs Java Web Start or Java SE by Sun Microsystems, which offers free downloads from its internet site. Blackboard Collaborate is designed to be used on all types of computers, providing they have Java installed. Blackboard Collaborate is also designed to work on internet connections that include cable/DSL and 28.8kbit/s or higher dialup connections. Since prerequisites are minimal, it has become a popular virtual tool in online education in CCCs. Every CCC
Confer session can be archived and the archives retain everything that happened during the meeting or live online class, which can include voice, chat, content, and closed captions. The recorded sessions are posted on the CCC Confer website allowing everything to be played back, verbatim. Even though CCC Confer is intended for student-teacher contact in real-time, the option of repeated reviewing of its recorded sessions provides opportunities for additional studying and may increase students’ learning outcomes.

*Data Mart:* In 2004, Assembly Bill 1417 authorized the CCCCO to design and implement a performance measurement system that contained performance indicators for the system and its colleges. Consequently, the CCCCO created the web-based *Data Mart* to answer the questions of administrators, educators, parents, students, state leaders, and professional organizations. Data queries are intended to offer a better understanding of one of the largest educational systems of postsecondary education in the world and to provide services in support of system-wide decision making and inquiry. *Data Mart* is a web-based database of the CCCCO used for gathering, reporting, storing, accessing, and analyzing data. The database is created by integrating disparate data from the 112 CCCs. Data are openly available on the CCCCO web page (2011), and users can manipulate, develop, and analyze data to any degree of complexity. Additionally, the webpage offers a glossary of terms (CCCO, 2013). The primary use for the *Data Mart* is as an institutional intelligence application that provides information about students, courses, student services, outcomes, faculty, staff, administrators, educators, parents, students, state leaders, and professional organizations. *Data Mart* is aimed at supplying
information to a wide variety of users, and the easy-to-use interface and query explanations ensure that the data are easily accessed and processed.

*Data Submissions Timelines:* The CCCCO Management Information System (MIS) declares that all term-end files are due within 1 month after the end of each term, with the following exceptions:

1. Winter Quarter data are due at the same time as Spring Quarter data.
2. Districts with a fall due date in January are not required to submit until the first Monday in February.

*Distance Education:* According to the CCCCO (2004), distance education means instruction in which the instructor and student are separated by distance and interact through the assistance of communication technology. The basic criterion established in the *Guidelines* under Section 55205 needs to be applied to consider a course as distance education: a distance education course/section or session utilizes technology 51% or more of the time to deliver instruction during the course term (CCCO, 2004). In determining the type of distance education modality to assign to a course, the predominant mode of delivery, in terms of time spent, is then applied to course sections where multiple distance education delivery modes (e.g., internet, television, video tape, etc.) are present.

There are basically three types of online learning environments in community college courses: (a) distance education with delayed interaction (asynchronous, formally code 50); (b) distance education with simultaneous interaction (synchronous, formally codes 51 through 54); and (c) distance education with passive medium (e.g. audio cassette, VHS, codes 61 through 64). Each of the three types has advantages, as well as distinct disadvantages.
*Enrollment Count:* The count of students enrolled in a section of a course. It is not to be confused with student count, since students can be enrolled in more than one section. Students can also enroll multiple times in the same course.

*Online Interaction:* In addition to California Education Code (Title 5), § 55204, which defines Instructor Contact, locally established requirements applicable to online courses ensure that any portion of a course conducted through distance education includes regular, effective contact between instructor and student.

*Retention Rates:* The CCCO Management Information System reports the effective learning of students as retention rates. The CCCCO defines retention rate of all credit enrollments, the rate at which students completed courses and did not drop or withdraw from them as of census. In comparison, success rate of all credit enrollments is the rate at which students completed courses with a grade of A, B, C, or P.

*Synchronous Online Courses:* The CCCCO (2013) defines synchronous instruction as a form of distance education that offers a two-way simultaneous interaction with video and audio bridge between instructors and students. The sessions are under supervision of the instructors. Synchronous instruction uses the internet with immediate opportunity for exchange between participants. Synchronous online courses use web conferencing products like ElluminateLive, Wimba Live Classroom, Adobe Acrobat Connect Professional and Saba Centra. In July 2010, Blackboard Inc. bought Wimba, Inc. and Elluminate, Inc. and renamed the synchronous online course software to Blackboard Collaborate.

*Taxonomy of Programs (TOP) Code:* As defined in the Data Element Dictionary of the CCCCO (2013), the Taxonomy of Programs (TOP) code is assigned which best
indicates the subject matter of the course. The TOP code assigned to a course is not to be linked to the TOP code of a particular program for CCCCO’s approval purposes.

**Organization of the Study**

Chapter 1 includes: (a) an introduction to the study; (b) the statement of the problem; (c) the purpose of the study; (d) the hypotheses and the research questions; (e) the methodology; (f) the significance of the study; (g) the limitations of the study; (h) the delimitations of the study; (i) the definition of terms; and (j) the organization of the study. Chapter 2 provides a review of the literature on validation of online versus on-campus students with a special focus on synchronous online learning. Chapter 3 includes a discussion of the methodology used in this study. In chapter 4, the results and analyses that emerged from the study are presented. Finally, chapter 5 includes a summary of the study and findings, conclusions, and implications, including recommendations for practice and further research based on the findings.
CHAPTER 2—REVIEW OF RELATED LITERATURE

Chapter 1 presented an overview of the dissertation, described the statement of the problem, the purpose and research questions, and discussed the significance the findings can offer for education research and practice. A brief review of literature was presented to illuminate the trends and issues related to increasing quality in distance education. Chapter 2 provides a more extensive examination of the literature by further exploring the background about online education. Specifically, the purposes of conducting the literature review were to: (a) examine the current research on online courses in the context of the challenges facing postsecondary education in the 21st century; (b) trace the effectiveness of synchronous online education in higher education; and (c) identify emerging strategies that link the online education efforts into a systems approach in developing improved retention rates. Questions that guided the analysis of research literature included: According to the research, which online instructional method suggests higher retention rates? Are there disparities in retention rates for students of different gender, ethnicity, and age in online education? This chapter also briefly addresses challenges in teaching online across disciplines and educational sectors, as well as gaps in the literature.

This literature review begins with a brief background and overview of the existing studies on synchronous online courses, their effectiveness, and the role of interaction and social presence in online courses of postsecondary education. Then, it moves to a discussion of the retention rates in online courses and incorporation of student demographics (gender, ethnicity, and age) and concludes with a focused review of the literature on the Model of Community of Inquiry, the Transactional Distance theory in
distance education and concludes with the new trends in promoting interaction in online courses. This review of the literature was focused on synchronous and asynchronous online instructional methods published since 2000 to identify existing practices in content delivery, methods of delivery, and outcomes in online education.

**Background**

One of the results of globalization seems to be that the world continues to shrink and the demands require educational opportunities to be available regardless of time and place (Singh & Han, 2005). According to the I. E. Allen and Seaman (2011), 6.1 million students in the United States were taking at least one online course during the fall 2010 term. In comparison with the 1.6 million online students in 2002, this is a 400% increase in students taking at least one online class during a semester, which far exceeds the less than 1% growth of the overall higher education student population. Thirty-one percent of all higher education students now take at least one course online (I. E. Allen & Seaman, 2011). Nationally, online students are overwhelmingly undergraduates, matching their proportion among the overall on-campus student body in U.S. higher education (Harper, 2008). Although the growth rate of online enrollments has moderated somewhat, the body of research continues to point to student interaction as an essential component of online learning, and the increase in the level of interactivity directly correlates with a higher level of student satisfaction and performance (Bolliger, 2004; Erichsen & Bolliger, 2011).

In this context, it is of utmost importance to build online learning models that will maximize the effectiveness of online experiences for both the instructors and students alike. However, researchers investigating distance education disagree widely on
fundamental aspects and on the effectiveness of online classes. Many disadvantages of online course delivery systems can be eliminated by using technologies that are more elaborate and use more advanced system and course architecture (Wuensch, Aziz, Ozan, Kishore, & Tabrizi, 2008). According to Enriquez (2010), most existing studies have used small sample sizes, focused on one particular technology that was administered to a specific group of students. The conclusions that can be drawn from such studies are limited and seem to add to the disagreements.

Liu, Kalk, Kinney, and Orr (2010) reviewed a total of 143 papers on the use of Web 2.02 in higher education from 2007 to 2009. They argued that the existing studies on web tools in higher education need to be classified into two categories, the nonresearch-based and the research-based studies. They found that the majority of articles and papers on online educational technologies are nonresearch-based and are limited to describing proposed projects, potential application of specific technologies, a specific application of one technological tool or method or a general discussion of tools and methods. The research-based articles and papers presented research questions, methods, results, and discussions associated with some form of data collection. Liu et al. (2010) found that 72 papers showed the characteristics of a research-based article. However, only seven articles qualified as research-based papers in the category of virtual environments. The great majority of papers examining virtual environments, such as synchronous and asynchronous online learning, are summaries of personal experiences and/or proposals for frameworks and preliminary studies. As Liu et al. has suggested, the

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2Web 2.0 refers to websites that allow users to interact and collaborate with each other through blogs, wikis, podcasts, virtual environments, and social networks.
vast majority of papers and articles are nonresearch-based, lack depth of research techniques, and cannot be considered as rigorous research papers (Enriquez, 2010; Gossens, Jefferies, & Bullen, 2008; Skylar, 2009). Since Garrett (2004) reported that several online distance education courses failed to meet quality standards set by researchers and institutions, there is a compelling need to pursue more rigorous research on the effectiveness of the various educational technologies and methods in online education. This study focused on the examination of synchronous online education, its effect on students’ retention rates and how it compares with asynchronous online courses and traditional on-campus courses in higher education.

**Asynchronous and Synchronous Online Courses**

Today, in the United States, within the online virtual model, the concept of the classroom, where students meet and interact with the instructor and peers, does not exist as it does in the traditional face-to-face classroom. However, new forms of meeting and interaction are emerging. Online courses are moving away from being text-centered and lecture-based, while increasingly incorporating greater interactivity, visualization, collaboration, and technology sophistication to motivate learners and promote learning (Bonk & Zhang, 2006). Online instructors have many tools to consider when offering online courses: blogs, wikis, chat rooms, discussion boards, and interactive web environments, to name a few (McGee & Diaz, 2007). The selection of applications for instructional purposes becomes a more complicated task as the number of instructional tools available continues to grow. Instructors and students need to learn the function of the application, consider the instructional requirements, and reflect the pedagogical purpose. They also need to learn how to use the software. Many researchers agree on the
importance of adequate training and technical support for successful implementation of synchronous online learning (Cornelius, 2011; Valaitis, Akhtar-Danesh, Eva, Levinson, & Wainman, 2007).

In synchronous online learning environments participants can share knowledge and learning in real-time and have immediate access to the instructor to ask questions and receive answers. This type of online course requires a specific date and time for participants to meet in the virtual classroom. However, the sessions can be recorded and archived for later and repeated review (Enriquez, 2010; Skylar, 2009). Synchronous online sessions are also called web-based training, Webinar, virtual meeting or web conferencing (Stephens & Mottet, 2008). In contrast, asynchronous online learning models use course management systems that are mainly text-based (e.g., e-mail, chat rooms, discussion boards) and still represent the majority of online education systems (Wuensch et al., 2008). The advantage of the asynchronous approach is that class members can contribute whenever they have useful input; thus, participation is time independent and group members are freed from temporal constraints (Means, Toyama, Murphy, Bakia, & Jones, 2010). Likewise, group members can contribute wherever they have access to a networked computer; thus, group members are freed from geographic constraints, and participation is place independent (Cobb, 2009). A supplemental advantage is the avoidance of some undesirable classroom behaviors, such as discussion domination by a few and contribution interruption (Morse, 2003). Finally, because of the post-and-response nature of computer-mediated communications, multiple threads of a discussion can be pursued simultaneously, without detracting from the general flow of the discussion (Donath, 2002; Rovai, 2001).
Liu, Kalk, Kinney, Orr, and Reid (2009) studied peer-reviewed conference proceedings papers of four major international conferences and gave a snapshot of the status and trends in online learning environments from 2007 to 2008. The conferences included the eLearning Conference of the Instructional Technology Council (eLearning), the Association for the Advancement of Computing in Education (EdMedia), the Society for Information Technology and Teacher Education (SITE), and the Association for Educational Communications and Technology (AECT). The purpose of the study was to identify how Web 2.0 technologies are used in college-level instruction and to examine research evidence that Web 2.0 technologies can enhance teaching and learning in online courses. It is salient that only 11 of the 257 conference proceedings reviewed focused on virtual learning environments allowing interaction in real-time, while 128 articles were relevant to other online instructional Web 2.0 tools (blogs, wikis, and podcasts). After multiple searches, few peer-reviewed journal resources on synchronous online education appear, and few studies compared the effectiveness of synchronous online delivery with on-campus and asynchronous online methods. The fact remains that empirical research in web-based real-time instruction is lacking. The following paragraphs offer an overview of the existing studies focusing on synchronous online learning, teaching, and tutoring. The weight of evidence that can be gathered from the literature points overwhelmingly to the conclusion that teaching and studying at a distance, especially methods using interactive electronic telecommunications media, are effective, when effectiveness is

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1Virtual learning environments include a wide range of online product tools. It can refer to the virtual classroom of a synchronous online session such as EluminateLive, CCC Confer, Blackboard Collaborate, or Adobe Connect. It can also refer to a more game-like interactive platform such as SecondLife.
measured by learning achievement, by the attitudes of students and teachers, and by cost-effectiveness (Moore, Thompson, Quigley, Clark, & Goff, 1990). Cavus and Ibrahim (2007) found that students \((n = 58)\) using a standard collaborative online learning tool had approximately similar success rates as those using traditional methods of learning. Organizations continue to develop and use technology to train and to share information. A study by Stephens and Mottet (2008) focused specifically on how trainers and trainees interact in the mediated Web conference training context. This 2x2 experimental study tested the effects of trainer-controlled and trainee-controlled interactivity on instructional outcomes that benefit trainers and trainees. It was hypothesized that trainer and trainee-initiated and controlled interactivity would enhance trainee learning (H1) and satisfaction with the Web conference training program (H2). These hypotheses were not supported. It was also hypothesized that trainer-controlled interactivity would enhance trainee perceptions of the trainer’s credibility (H3). This hypothesis was supported with the caring dimension of credibility being most impacted when trainers allowed their trainees to interact with one another.

Enriquez’s (2010) study concentrated on two courses at a small community college in the Bay area that included the combined number of 25 online students and 30 on-campus students. All students were Electrical Engineering majors during 2008 and 2009. Enriquez used the virtual classroom space to develop a dual mode of delivery to reach students simultaneously online (via CCC Confer) and in the classroom. He assigned identical homework, exams, projects, and other course requirements to both groups of students, establishing equivalency of content and rigor in both the online and on-campus formats. Enriquez demonstrated that the creation of virtual classroom space
through the use of a synchronous learning environment (CCC Confer) reduced what Moore and Kearsley (1996) termed as transactional distance, which refers to the theory of cognitive space between instructors and learners in an educational setting. The synchronous environment, according to Enriquez, improved the quality of the educational experiences of the electrical engineering students in an online introductory electrical engineering course (circuit analysis). The analysis and conclusion of the study demonstrated that an online engineering course can be as effective as the traditional on-campus format. For this comparison, Enriquez defined retention rate as the percentage of students who did not withdraw from the class, and hence received a grade of either A, B, C, D, or F. Success rates were defined as the percentage of students who received a passing grade (A, B, or C). The retention rates were almost the same, with four students dropping from each group. The success rate of 80.0% was identical for the two groups. In summary, there were no statistically significant differences in any outcomes between the online and on-campus groups. These results indicated that the online students learned as effectively as the on-campus students. These are noteworthy findings. Nevertheless, the small sample size, and specialization area of the students, limits generalization to a larger populations.

S. O. Zimmerman, Tashner, Pacifici, and Greene (2002) examined, in a qualitative study, the perception of students and instructors of the instructional strategies implemented in courses delivered through the medium of real-time audio-video teleconferencing via the North Carolina Information Highway (NCIH) versus traditional on-campus courses. In 2002, synchronous online instruction, such as the two-way interactive video instruction investigated in this study, was in its early implementation.
Most instructors interviewed felt that the quality of their instruction depended upon factors outside of the instructor’s control, such as bandwidth allotted for transmission via the internet, skills of the technician assigned to the course, and the learning needs of the population.

Offir, Lev, and Bezalel (2008) conducted a mixed method study that presented different variables and their influences on the students’ achievements and their satisfaction in a synchronous versus asynchronous learning environment. Fifty-nine students were selected from a pool of 160 students who were enrolled in the course Introduction to Computers. The observations of and interviews with 13 students helped clarify the information that was obtained using quantitative research tools (Analysis of Variance and MANOVA). The correlations among subjects who experienced the synchronous intervention were generally higher than among those who experienced the asynchronous intervention. The correlation was higher among those learning via synchronous teaching than among those studying via asynchronous teaching in 9 out of the 10 calculated correlations.

The selection of applications for instructional purposes can be a complicated task as the number of technologies available grows. A few studies investigated the perspective of online teachers and their degree of satisfaction with the synchronous online delivery method. Khajavinia (2007) conducted instructor surveys, interviews, and focus groups with five instructors who had various degrees of experience with synchronous web-conferencing. All instructors were positive about the experience both for themselves and for their students, and all intended to continue using the synchronous instructional method in their online courses.
Other studies tried to determine if synchronous online teaching strategies align with good traditional instructional principles. Shi and Morrow (2006) investigated 23 instructors who used synchronous online applications in their online courses for a minimum of two semesters. The instructors were surveyed to determine which tools proved effective in accomplishing specific instructional tasks and how the identification of tool-specific practices inside the synchronous classroom can be linked to specific principles in Chickering and Gamson’s (1999) Model of Good Undergraduate Education. Three self-reporting web-based questionnaires, along with e-mail information exchanges with the instructors, provided data for the study. The first questionnaire, administered in December 2004 (the beginning of the M.E.E.T. project), had a response rate of 83%. This initial instrument served to collect preliminary ideas from participants regarding strategies for addressing Chickering and Gamson’s seven principles of good undergraduate education. The second questionnaire, administered in November 2005 as a follow-up, achieved a response rate of 71%. The final questionnaire listed all dominant ideas for each of the seven principles and asked participants to assess the merit of each idea by rating them on a scale of 1 to 7 based on their effectiveness in addressing the corresponding principle. The final survey had a response rate of 67%. Results from this study indicate that using e-conferencing tools for synchronous online instruction is effective and improves student learning. Results also point to the development of common techniques for using specific practices and e-conferencing tools to reinforce good instructional principles. Although these efforts provide some insights, they fall short of indicating that the use of a variety of rich synchronous e-conferencing tools has a direct relationship to good teaching practice or to student retention.
Another question around synchronous learning is how best to coordinate interaction of the participants. Synchronous distance courses require the development of new rules for participation in response to the new learning environments. A qualitative study by Suggs, Myers, and Dennen (2010) investigated the impact of synchronous course environment on participation structure and turn-taking practices. They argued that most people need to consciously learn turn-taking rules in technology-mediated environments. The findings confirmed what Sacks, Schegloff, and Jefferson (1974) had established: turn-taking rules in the traditional face-to-face settings are still relevant in computer-mediated communications.

Synchronous online methods have not only been utilized in the field of instruction but also in other support services, such as tutoring. Recent increase in demand for help with editing/revising academic papers has prompted the Opportunity Programs (OP) of New York University (NYU) to develop an online writing tutorial where the tutor and student interact synchronously. Bandi-Rao (2009) examined the effectiveness of synchronous online writing tutorials compared with the effectiveness of the face-to-face writing tutorials among 50 freshman students in the OP at NYU. The OP’s writing tutorials are offered to underrepresented and disadvantaged students who need to improve their college-level writing skills as organization of content, coherence, grammar, punctuation, and style. Based on the SAT verbal scores, there were no significant differences between the mean scores of the synchronous online students and the face-to-face students. Bandi-Rao concluded that synchronous writing tutorials can be as effective as face-to-face tutorials if implemented aptly.
Research related to online instruction has focused mainly on areas taught via instructional television, CD-ROMs, digital video and online learning systems like WebCT and Blackboard. To date, research focusing on interactive synchronous web-based video-conferencing tools is limited and in its infancy (Enriquez, 2010; Skylar, 2009). The existing studies on interactive synchronous web-based conferencing courses incorporated limited sample sizes and often are more descriptions of experiences rather than research-based (Liu et al., 2009). Continued studies with a rigorous methodology are necessary to understand the effectiveness of synchronous instructional tools in online education.

Students’ Perception of Synchronous Online Learning

Several studies have investigated students’ perception of synchronous and asynchronous tools, their preferences, challenges, and suggestions. Since the 1950s, researchers have suggested that students’ satisfaction with the college environment and classrooms influences the development of students toward the attainment of educational goals (Kuh, Kinzie, Schuh, & Whitt, 2010; Kuh, Pace, & Vesper, 1997; Nora, Cabrera, Hagedorn, & Pascarella, 1996; Pace, 1984; Pace & Stern, 1958).

Cornelius (2011) found that most teachers who facilitate learning in a synchronous online environment—using web conferencing tools such as ElluminateLive, Wimba, Adobe Connect, or DimDim—have limited personal experience as learners in these environments. In contrast, it is noted that the majority of millennial students are found to be not only digital natives but digital experts (Bennett, Maton, & Kervin, 2008;
Students described as *millennials* are accustomed to technologies and generally demonstrate a technological literacy characterized by being *digital natives* or *digital experts* (Howe & Strauss, 2009; Jung & McMahon, 2012; Prensky, 2001; Simpson, 2013).

As Prensky (2001) noted:

Today’s students, K-12 through college, represent the first generations to grow up with this new technology. They spent their entire lives surrounded by and using computers, video games, digital music players, video cams, cell phones, and all the other toys and tools of the digital age. Today’s average college grads have spent less than 5,000 hours of their lives reading, but over 10,000 hours playing video games (not to mention 20,000 hours watching TV). Computer games, e-mail, internet, cell phones and instant messaging are integral parts of their lives.

(As Prensky, 2001, p. 1)

However, students view technologies and computers as tools relevant for immediate benefits and personal lifestyle rather than as learning and productivity tools (Prensky, 2001). Further, students need to develop more refined information literacy within the digital world to assess the validity of information and the reliability of the sources (Bennett et al., 2008). In general, students seem to value the convenience and flexibility that virtual conferencing offers to its participants and the opportunities to expand on “traditional” distance learning sessions (Bandi-Rao, 2009; Cornelius, 2011; Grant & Cheon, 2007; Wuensch et al., 2008). Bandi-Rao (2009) found that student

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1Millennials are people reaching young adulthood around the year 2000. Howe and Strauss (2009) use 1982 as the millennials’ starting birth year and 2004 as the last birth year. Several alternative names have been used such as Generation We, Global Generation, Generation Next, and the Net Generation.
ratings of their satisfaction of the effectiveness of synchronous online or face-to-face writing tutorial services showed no significant differences in the mean scores. This finding dismissed previously-held assumptions that students are less inclined to work with an online tutor. Additionally, students rated online courses as being greatly superior to face-to-face courses in terms of allowing the student to self-pace (Wuensch et al., 2008).

Cornelius (2011) discussed the technological issues and issues associated with engagement in a virtual classroom to gain an insight into learners’ experiences in a virtual classroom. Most respondents agreed or strongly agreed that ElluminateLive was easy to learn and to master. In Khajavinia’s (2007) study, participants noted very few problems with specific features of the synchronous classroom in ElluminateLive. Grant and Cheon (2007) identified video and audio quality as critical success factors for virtual classrooms.

Students expressed that the opportunity to read body language and facial gestures, such as a smile, was missing in synchronous online communication (McBrien et al., 2009). Many students identified the lack of visual clues as one of the weaknesses of synchronous online learning. Although web cameras can add facial expressions to the synchronous instructional platform, the tool has its limitations. Presently, only six cameras can be activated, and some students found the multiple video windows too confusing when there were too many simultaneous interactions (Shi & Morrow, 2006). Cornelius (2011) argued that web cameras could increase the opportunity for visual communication but cautioned that the value of using web cameras deserves further investigation.
Interaction in Online Courses

The body of research on distance education points to participants’ interaction as an essential component of online learning and is considered to be a critical factor in the quality of online learning (Hrastinski, 2009; Kruger-Ross & Waters, 2013; Wilson & Stacey, 2004). Interaction is the defining factor in transactional distance between students and instructors in online environments (Moore, 1993). Several researchers have suggested that one of the greatest challenges for each mode of distance education is how to best engage students in discussions with the instructor and with each other (Angelino et al., 2007). According to Wuensch et al. (2008), 1,601 U.S. students responded in a survey that face-to-face classes facilitated better communication with the instructor, provided better evaluation of their learning, and led to greater overall understanding of the course material. Moore and Kearsley (2011) pointed out that online learning environments permit a full range of interactive methodologies. However, they found that when courses are adapted to the online environment, instructors need to pay more attention to the instructional design of their courses, which can improve the quality, quantity, and patterns of communication that take place in the online medium.

According to Moore and Kearsley (1996), the more positive interactions students have with peers and instructors, the less they experience transactional distance between them. Interaction in online learning environments was found to have a positive relationship with students’ higher-order thinking (Garrison, Anderson, & Archer, 2010). In Webb, Jones, Barker, and van Schaik’s (2004) study, students’ participation in asynchronous online discussions was positively associated with successful learning outcomes. Conversely, the findings of Beaudoin (2002) suggest that fully engaged,
highly participatory online learners tend to perform strongly in graded assignments, but that minimal online participation does not compromise grades. In fact, he found that some low-visibility students are dedicating more time to reflection and processing of course material, which results in better grades than students participating at an average level. At the heart of the discussion are the quality and quantity of the interaction and the sense of engagement and learning, achieved through the effective integration of internet communication technology (Garrison & Kanuka, 2004).

Baker (2010) found that the increase in the level of interactivity directly correlates with a higher level of student satisfaction and performance. In fact, student-instructor interactions enhance student retention, self-motivation, and pass rates (Swan, 2001). Swan’s (2001) analysis of variance indicated that student-teacher interaction was strongly related to student satisfaction and perceived learning. These results showed that it may not be possible to “automate” teaching and learning online. The study found that some critical level of interactivity needs to be maintained in online courses to secure positive student retention rates.

To investigate the impact that interactions have on students, Ishtaiwa and Abulibdeh (2012) focused on various types of interaction that included student-instructor, student-content, and student-student interactions. Participants expressed that asynchronous technologies helped them to enhance their interaction with the instructor and the content but not necessarily with their peers. A variety of problems affecting student achievement were identified, including lack of immediate responses, heavy workload, guidelines from instructors, inadequacy of involvement, and deficiency of student commitment. Most participants preferred blogs over any other asynchronous
learning tool. In this context, the investigation of online education in the United States by I. E. Allen and Seaman (2011) confirmed that the only dimension among those interviewed, where online was seen as inferior to face-to-face instruction, was in the area of student-to-student interactions.

Other researchers focused on the frequency of interactions in an online course and the impact on student success. Offir et al. (2008) uncovered that the interaction level between the students and the teacher and among the students was a significant factor in determining the effectiveness of the instructional method in an online course. However, students with higher-level thinking abilities were able to overcome the low level of interactions in asynchronous learning. According to their conclusion, the distance education framework required a greater independent learning ability than the regular courses, mainly because it lacked full interaction between the students and the teachers.

The integration of social tools such as blogs and personalized tools into the curriculum can foster collaborations and interactions among students and assist knowledge building (J. Hsu, 2007; H. Y. Hsu & Wang, 2009). According to Khajavinia (2007), many educators use asynchronous computer-mediated communication (CMC), such as e-mail and discussion boards, to address student isolation. But these asynchronous methods are not sufficient in many cases. Lack of immediacy makes it difficult for students to connect quickly with each other or their instructors.

To better understand the impact of interactivity between instructor-student, Skylar (2009) compared the effect of the increased engagements on student learning and satisfaction in web-conferencing and how it compared with asynchronous online environments. It was the researcher’s intention to: (a) identify students’ preference in
taking a class using synchronous web conferencing lectures or asynchronous text-based
lectures; (b) define students’ level of understanding of the course materials under the two
conditions; and (c) compare performances among students accessing content presented in
a synchronous or in an asynchronous learning format. The setup of the study included an
alternating treatment design with 44 graduate students, in which each student had the
learning experience of asynchronous text-based lectures via Web-CT and synchronous
web conferencing lectures via ElluminateLive during the fall semester of 2006. The
instruments used in this study included a pretest, posttest, student satisfaction survey, and
a pre/post computer literacy survey. Results showed that students’ performance was
slightly improved when provided with synchronous web conferencing lectures versus
only asynchronous text-based lectures. However, neither condition showed statistical
significance to indicate that one condition was more effective than the other.
Nevertheless, 68% (30 students) of the students indicated that they would rather take an
online course that uses synchronous web-conferencing lectures than an online
asynchronous text-based lecture course.

In the field of education, emotions were found to affect students’ cognitive
learning. Consequently, emotional intelligence has been discussed as one of the main
factors to promote personal intellectual growth (J. Cohen, 2006; Goetz, Frenzel, Pekrun,
Hall, & Lüdtke, 2007). The human resources management and organization behavior
literature indicates that emotional capability of a person has an impact on learning
capabilities and performance (Akgün, Keskin, Byrne, & Aren, 2007; Law, Wong, Huang,
& Li, 2008; Zeidner, Matthews, & Roberts, 2009). Han and Johnson (2012) considered
students’ interaction in an emotional dimension as well as a cognitive dimension. The
purpose of their study was to investigate the relationship between students’ emotional intelligence and their interactions in both synchronous and asynchronous online learning environments. They found the study of emotions to be under-explored in understanding students’ interactions in online learning. Their study intended to bring awareness to the relationships among emotional intelligence, social bond and interactions as emotional and social learning to the field of online education. The researchers did not find statistically significant correlations between the emotional intelligence variable and social bond variable. Further analysis revealed that students who had higher emotional intelligence had a greater degree of social bond in online learning. But online learners’ motivation to interact was based on the type of interaction in synchronous sessions rather than their emotional attachment needs to peers and instructors. In other words, if emotional intelligence is a critical competency for understanding student learning experiences, then students’ emotional intelligence might be one of the areas to be investigated to better understand students’ online learning.

The great majority of respondents (91.6%) in the Khajavinia (2007) study felt that synchronous online interactions with their classmates and/or the instructor were effective, and 83.3 % of students stated that they almost always felt more connected when using the synchronous software. The interactions seemed to have stimulated effective learning environments and increased the sense of community among students. Most of the interactions were considered to be academic in nature rather than social or technical. In addition, the observers reported evidence of instructor-learner, learner-learner, and learner-content interactions, as well as learner-interface interactions.
The selection of technologies and media has a direct influence on learning. Wagner (2006) associated the creation of course designs encouraging compelling interactions as an attribute of quality in online education. She recommended that digital course designs be crafted to accommodate creative interactions, a variable that needs to be exploited, managed, and leveraged in online learning. Swan (2001) listed 10 concepts to support effective design of web-based instruction. These are: (a) instructors acting as facilitators; (b) use of variety of presentation styles; (c) multiple exercises; (d) hands-on problems; (e) learner control pacing; (f) frequent testing; (g) clear and immediate feedback; (h) consistent layout; (i) clear navigation; and (j) available help screens.

As Reynolds and Constantine (2007) pointed out, social isolation as persuasive feelings of loneliness, dissatisfaction, and heightened levels of interpersonal distress results in withdrawal from the learning environment. Additionally, negative online learning experiences (e.g., sense of isolation) tend to engrain themselves permanently in the minds of students (Renes & Strange, 2011). The authors suggested a series of remedies including welcome e-mails or posts and instructors’ enthusiasm, which create a sense of online community, instructional immediacy, and conveying a personal interest in students.

The Community of Inquiry Model

The Community of Inquiry (CoI) model is useful for understanding forms of interactions in an online environment to avoid a sense of isolation among students. Garrison, Anderson, and Archer (1999) developed the notion that effective online teaching and learning is the function of three types of presence: (a) Social Presence, the ability of learners to project themselves socially and emotionally; (b) Cognitive Presence,
the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse (Garrison, Anderson, & Archer, 2001); and (c) Teaching Presence, the design, facilitation, and direction of cognitive social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes. They labeled the different forms of presence as the Community of Inquiry (CoI). Several researchers confirmed the model of presence in e-learning that is based on Garrison, Anderson, and Garrison’s (2003) CoI model (Arbaugh & Hwang, 2006; Garrison, Cleveland-Innes, & Fung, 2010; Jézégou, 2012; Shea & Bidjerano, 2009).

Clegg, Hudson, and Mitchell (2005) argued that the very basis of thinking is rooted in dialogue, drawing on a socially constructed context to endow ideas with meaning. Cornelius (2011) found that web conferencing tools supported increased interaction within a community of learners and instructors during the Teaching Qualification in Further Education (TQFE) conference delivered at the University of Aberdeen, England. Arbaugh and Hwang (2006) viewed the interaction processes in three dimensions of the CoI model: socio-cognitive presence, socio-affective presence, and pedagogical presence. Garrison, Cleveland-Innis, et al. (2010) explored and tested the causal relationships among the three presences in the CoI framework in the research and practice of online and blended learning contexts. With the development of a survey instrument based on the CoI framework, it was possible to test the causal relationships between Teaching and Social Presence and their perceived influence on Cognitive Presence. They found that Teaching Presence is perceived to influence Social Presence to a significant degree. High performing e-learning groups actively create social, cognitive, and teaching presence (Garrison & Kanuka, 2004). The CoI model in a quantitative study with over 2,000 U.S.
college students by Shea and Bidjerano (2009) outlines the behaviors and processes required to enable knowledge construction in asynchronous online environments or blended courses through the development of various forms of “presence.” Students in blended courses tended to provide higher ratings of Teaching Presence, Social Presence, and Cognitive Presence than their counterparts in fully online asynchronous courses. This is an important finding suggesting that the face-to-face components contribute to the salience of instructional, social, and cognitive dimensions of blended courses, creating a more effective Community of Inquiry.

Fostering a sense of community is critically important, especially in an online environment where students often do not get the opportunity to meet face-to-face with other students or the instructor (Oztok & Brett, 2011). Research has shown that distance education courses are often more successful when they develop communities (Barab & Duffy, 2000; Stacey, Smith, & Barty, 2004), as well as encourage high levels of online social presence among students (T. Anderson, 2005).

One of the first models addressing social presence in online education is the model of interaction as transaction established by Michael G. Moore (1990). He established four different perspectives on interaction research. These four perspectives include: (a) interaction as transaction; (b) interaction as outcome; (c) interaction as social presence; and (d) interaction as experience. His focus on the relationships between and among three interaction categories (student, teacher, and content) have shaped much of the current understanding of interaction in distance and online learning environments. In his view, interactions are transactions between teacher and learner, learner and learner, and learner and content. The concept of transaction is derived from the research of
Dewey (1933) who found the separation of instructors from students leads to special patterns of behaviors, to a psychological distance of communication, and to a space of potential misunderstandings, which needs to be bridged. Moore (1993) stated that it is the psychological and communications space which constitutes the transactional distance.

Several researchers share the observation that course formats with higher quality of teaching, social, and cognitive dimensions produce somewhat superior outcomes (Means et al., 2010). Hitherto, the community of researchers has not investigated the effects of ethnicity, gender, or age group on the CoI.

Social Presence

Another concept of interaction considers interaction as evidence of social presence in online learning; the desire to psychologically transcend distances and establish interpersonal connections as a notion of social presence in online education is viewed as the means of realizing connectedness in an educational online environment (Garrison et al., 2001). One of the first researchers who argued that learning is a social activity was Berge (1995). He found that social interaction can occur among people using any mediating technologies (e.g., phones, fax, mail, internet, and other). Thus, interaction among learners or instructor can be independent of geography. Shea and Bidjerano (2009) determined that the online students’ levels of Cognitive Presence can be affected, based on their reports of their instructors’ skills in fostering Teaching Presence and their own abilities to establish a sense of Social Presence. A general finding of the body of research into social presence and learning is that when information is presented in a way that increases social presence, it is better remembered by learners, and the learning process is considered more engaging (Homer, Plass, & Blake, 2008).
When learners come together to solve a problem, the practice of inquiry requires transactions between learners (Dewey & Bentley, 1949). Learners express their differences, their similarities and their distinct points of view. They then collectively adjust, negotiate, and interact with one another to define the problem, create possible solutions, choose and test a solution, and then finally formulate a conclusion on the results of the experiment. Such transactions show that they are engaged in contradictory collaboration. In the context of e-learning, these interactions generate socio-cognitive presence in the digital space of communication despite the geographical distance between learners (Spagnolli & Gamberini, 2005).

Jézégou (2012) found certain forms of social presence in the digital space of e-learning can engage learners’ collaboration which fosters the emergence and the development of an online CoI and, therefore, the individual and collective construction of knowledge. This is important as “students with stronger sense of community tend to possess greater perceived levels of cognitive learning” (Rovai, 2002, p. 330). Jézégou’s research was limited to forms of verbal interactions supported by synchronous and asynchronous tools.

The initial classification of teaching presence proposed by Garrison et al. (2001) consisted of three characteristics—design and administration, facilitating discourse, and direct instruction. During the beginnings of online course offerings, Berge (2008) categorized four major functions of online instruction. He included a technical support role of online instructors. In recent years, the need for providing technical assistance to students decreased as users became more experienced and as the tools of online learning became more intuitive and omnipresent.
Darby and Gilmour (2009) described the phenomenon of experience in the context of what he called the Experience Economy, where participants increasingly seek out experiences that engage them in personal and memorable ways. Online courses with rich immersive and engaging sensory experiences offer new compelling possibilities for learning design in online education.

There is little research on the relationship between community cohesion and synchronous online learning, as well as other variables (e.g., ethnicity, age groups, gender and retention rates) potentially associated with the development of a learning community in an online course. The development of community cohesion in synchronous online courses is beyond the scope of this study.

**Student Demographics in Online Courses**

Online learners consistently demonstrate higher dropout rates than their on-campus peers (Chyung, 2001; Diaz, 2002; Frankola, 2001; Park & Choi, 2009; Rovai, 2003) and many online instructors face serious challenges to attract and retain diverse learners in online courses (Bonk & Zhang, 2006). A few researchers have started to discuss the differences between different types of online students, including student demographics, performance differences, and learning styles (Ice, Gibson, Boston, & Becher, 2011). Much of the growth in online environments is attributed to nontraditional students—those who attend part-time, are employed in full-time jobs, have delayed postsecondary enrollment, are financially independent, have dependents, are single parents, and may not have attained a high school diploma (Boston & Ice, 2011).
Ethnicity

Race and ethnic backgrounds could be one of the most important demographics that are shaping the way that the educational systems work (Hodgkinson, 2001; Orfield, Frankenberg, & Lee, 2003; Orfield & Lee, 2006). An analysis by Nora and Cabrera (1996) revealed that differences in the effects of different ethnic groups were important in explaining persistence decisions.

Case studies have shown that teachers, regardless of race, ethnicity, and gender, with appropriate multicultural training, have the ability to master the challenges of diversity in the classrooms (Banks, 2001; Sleeter, 2001; Villegas & Lucas, 2002). Our society is becoming more multicultural every day. The demographic projections of Hodgkinson (2002) indicated an increasing divergence between the demographics of students and teachers. By 2020, the homogeneity (White, middle class, female) of classroom teachers will reach 95%, while the economic, ethnic, racial, religious, and social class diversity of the student population will increase nationally, to over 50%.

According to Brown (2004), this cultural incongruity is further exacerbated by the limited cross-cultural knowledge and interaction experiences of both teachers with students and students with peers. She addressed the “cultural deficits” by infusing technology into teacher education courses at the University of Kentucky. She found that the role of technology not only helped future teachers in overcoming resistance to multicultural tenets but also provided them with the skills to bridge cultural divides and to broaden cultural knowledge and experiences.

Ke and Kwak (2013) found the cultural issues in an online learning environment related to inequities arising from dominant cultural values embodied in teaching materials.
and methods and to the potential miscommunication among participants during online interactions arising from cultural difference. After concluding a 13-year quasi-experimental study with nearly 3,200 students (2,525 took the course in the traditional face-to-face format and 659 took it online) who took American Government classes and other upper-level political science courses, Botsch and Botsch (2012) reexamined their original conclusions and noted changes that have occurred in online education. The data included a wide range of information regarding GPA, major, age, gender, ethnicity, parents’ education, and perceived course difficulty. Comparing their former and more recent research results, they found significantly fewer minority students enrolled in the online classes than in the traditional classes. They concluded that online students in the fall semester of 2010 had a significantly higher GPA, were more likely to be White, to read newspapers more frequently, and were a little older.

Colorado and Eberle (2010) found that Black and Hispanic students perform more poorly than White students in online courses. However, they argued the pattern was due in part to the fact that Black and Hispanic students tend to perform more poorly in college overall, which the researchers attribute to the poor quality of the primary and secondary schooling of these disadvantaged groups. More studies are needed to approach the retention and completion issue in online instructional methods and to disaggregate the data by race and ethnicity in order to better analyze retention outcomes, to consider curriculum implications, and to increase opportunities for students to reach their personal academic goals.
Gender

When reviewing gender-related studies, some researchers have found that the effects of the variable of gender are inconclusive with regard to student success in synchronous and asynchronous online education (Astleitner & Steinberg, 2005; Yukselturk & Bulut, 2007). In a mixed-method study by Wang, Sierra, and Folger (2003), female participants in synchronous sessions demonstrated eagerness to continue socializing and to remain connected. In contrast, male participants initiated more task-related thoughts and ideas and did not stay too long once the session was over. Other researchers have found that women perform significantly better than men (Chyung, 2007; Gunn, McSporran, Macleod, & French, 2003). Although online visibility between male and female students was not significantly different, female students scored significantly higher on the final exam than did male students (Chyung, 2007).

In another study examining gender differences in student success outcomes in online education, Rovai and Baker (2005) concluded that female students not only posted more messages but also developed a stronger sense of community and a greater level of perceived learning than male students did during an online class. For females, the most significant positive effect on college persistence came from mentoring experiences in the form of nonclassroom interactions with faculty (Nora & Cabrera, 1996). Caspi, Chajut, and Saporta (2008) found that men \((n = 593)\) over-proportionally spoke in the face-to-face classroom, whereas women \((n = 775)\) over-proportionally posted messages in the web-based conference and avoided participation in classroom discussions more than men. Such results suggested that women prefer written communication more than men do and that women prefer written communication over spoken communication.
McSporran and Young (2001) concluded that the women were more motivated, more adept at communicating online, and more effective in scheduling their learning. In contrast, male participants accessed fewer course website pages and fewer discussion forum posts. They also had poorer time management skills and tended to be overconfident in terms of their ability to complete learning tasks and assignments.

These findings regarding student demographics are worthy of online instructors’ attention because it may imply that more effectively tailored online instruction or a Universal Design for Learning (UDL) in online education (Rose, Harbour, Johnston, Daley, & Abarbanell, 2006) is required for the specific target groups of learners.

**Age Groups**

The number of studies on online interactions across age groups is still limited, though prior research has indicated that learners’ age is a potential predictor of their online learning success (Ke & Kwak, 2013). The convenience, flexibility, and self-pacing of distance-education courses or programs are especially suitable to older adults (Yukselturk & Bulut, 2007) because distance education allows adults to continue their education without having to disrupt their employment or family obligations (Moore & Kearsley, 1996). Earlier profiles of the distance learner can be traced to correspondence courses or home study where most learners were adults with occupational, social, and family commitments (MacKenzie, 1968). The Distance Education and Training Council (DETC), formerly known as the National Home Study Council (NHSC), founded in 1926, has collected information about its students and created the demographic profiles for home study students. The average age of a home study student was 34 years (Lambert & Fowler, 1989). Home study students were also
described as self-motivated, goal-oriented, and disciplined self-starters (Keegan, 1988). On average, Botsch and Botsch (2012) found that web-based students were 2.6 years older than students who enrolled in the face-to-face classes. Wojciechowski and Palmer (2005) examined various student characteristics to determine the relationship to success in an online undergraduate business course at a community college. Their study \((n = 179)\) demonstrated that older students are more likely to complete online courses than their younger counterparts. Findings from this study also show that the older the student the higher the grade in the course. This was true for both the overall population \((r = .157; p = .036)\), and those receiving a C or above \((r = .395; p = .000)\). Conversely, the younger the student is, the lower the grade in the course. Colorado and Eberle (2010) have argued that older students’ success in online learning may be due to age-related increases in levels of experience, critical thinking, and metacognitive self-regulation, each of which may contribute to success in online coursework. Older adult students in an online course tend to be more motivated and self-directed—two critical learner characteristics required by the online learning environment (Dabbagh, 2007).

According to Dede (2005), younger and more tech-savvy learners who belong to Generations X and Y began to enter college at the start of the 21st century. Online instructors need to design online courses with special focus on how different generations learn in the emerging technology environments of online courses. The emergence of millennial learners might influence various aspects of higher education including the choice of instructional methods in online education. In summary, students who were mature enough to self-regulate their learning through self-discipline knew what they wanted in an online course, controlled their learning environment, were aware of their
responsibilities, and could control their learning through self-discipline. Consequently, they were more active in their learning process and thus more successful students (Yukselturk & Bulut, 2007).

**Examining Retention in Online Learning**

Several theories and theoretical frameworks have been proposed to explain why students drop out in the traditional postsecondary education setting. In particular, Tinto’s (1993) student integration model and Bean and Metzner’s (1985) student attrition model have guided student retention research studies. Tinto claimed that attrition is related to interactions between a student and his/her educational environment during the student’s stay in a program. He indicated that social integration and academic integration produced stronger student commitment to their institutions and increased students’ persistence. However, educators who desire to study the persistence of nontraditional students, who have different characteristics and circumstances from traditional students, have found that Tinto’s model has limited applicability (Rovai, 2003). Tinto (1982) himself indicated that it was necessary to modify his model when used with nontraditional students.

Research in student retention has been conducted for decades but formerly dealt strictly with a traditional postsecondary setting. Tinto’s (1975, 1982, 1993, 1997) research explored how the experiences of the classrooms matter, especially as they may shape academic integration, and how it comes, over time, to shape student retention. Among those who persist, students who report higher levels of contact with peers and faculty also demonstrate higher levels of learning gain over the course of their stay in college (Endo & Harpel, 1982; Tinto, 2006). Astin (1993) agreed and found that the most significant impact on academic outcomes is due to the relationship one has with peers.
The most prominent models in the retention and persistence literature, Tinto (1993) and Bean and Metzner (1985), showed that student characteristics such as age, gender, ethnicity, and learning style should be considered while investigating learning programs. The variables consistently cited as causes for dropout with traditional on-campus courses include pre-entry attributes such as gender, high school GPA, race, and socioeconomic status (Peltier, Laden, & Matranga, 1999). These studies and models were developed to explain traditional learning environments.

As distance education continues to expand, research in the field of retention is becoming an important issue, as well as the need for determining factors that have an impact on students in an online course. Studies showed that the failed retention rate for online college and university undergraduates ranges from 20% to 50% and that online course administrators believe the failed retention rate for online courses to be 10% to 20% higher than for traditional classroom environments (Diaz, 2002; Frankola, 2001). Online learners cited student engagement, motivation, and environment as the cause of failure to complete courses (Herbert, 2006). Boston, Ice, and Burgess (2012) assessed student retention in online learning environments among degree-seeking undergraduate students \( n = 20,569 \) who completed at least one course at the American Public University System (APUS) in 2007. A notable finding from the study was that the consistency of activity was a predictor of continued student persistence.

In an extensive survey conducted by the Babson Survey Research Group (I. E. Allen & Seaman, 2010), the data did not reveal the particular reasons why students drop out of an online course. Therefore, I. E. Allen and Seaman (2010) were not able to determine if the unsuccessful retention of students reflects the nature of the courses or the
circumstances of the students involving work, family, or other obligations. Due to the
difference in the characteristics of students, I. E. Allen and Seaman found the direct
comparison of retention rates between online and face-to-face problematic. In the same
survey, investigators asked chief academic officers if the retention of students represents
a greater problem in online courses than in on-campus courses. The majority (59%) of
respondents remained neutral, while 28% of respondents agreed, and 13% disagreed.

I. E. Allen and Seaman (2011) included in their summary retention data from the
aggregated semester-to-semester retention rates for more than 50 institutions that had
distance learning programs. These institutions ranged from community colleges to Ph.D.
granting institutions. For all institutions, the mean semester-to-semester program
retention rates ranged from a minimum of 52% to a maximum of 98%. For junior and
community colleges only, the semester-to-semester program retention rate ranged from a
minimum of 60% to a maximum of 95%.

As of today, there is no consensus on the theoretical framework that provides the
best model for researchers examining student retention in online courses. Tallent-
Runnels et al. (2006) found that there is no consistency in terminology or theories
regarding online learning and teaching. Others claim that the newer theoretical
frameworks are not yet theories but simply models of pedagogic approaches (Cook,
2002).

There are many researchers who consider the question of which theory is
applicable to online education and its many facets reason for great discussions. Ally
(2004, 2009) debated if theories, such as the cognitivist, constructivist, or connectivist
theories, from traditional face-to-face educational environments can be applied to online learning environments. He noticed a shift toward constructive online learning, in which learners are given the opportunity to construct their own meaning from the information presented during the online sessions. Others have developed completely new theories for the new world of online education, while other researchers keep arguing that those are mere models or teaching pedagogical strategies rather than true theories (T. Anderson & Dron, 2010).

Several researchers tested theories that were developed for traditional learning in the on-line environment. For example, Collins, Jeffery, and Berge (2008) recognized that instructors are facing issues of changed roles in online education. In their opinion, Mason’s (1991) and Berge’s (1995) cluster role theory can be applied to the mediated virtual classroom. While Mason defined three main role clusters for faculty (Organization, Social, and Intellectual), Berge expanded faculty cluster roles to a more comprehensive model that includes pedagogical, managerial, social, and technical tasks.

Suggs et al. (2010) found that the turn-taking rules discussed by Sacks et al. (1974) were still relevant within the audio portion of a synchronous class. They argued that the ability to engage in clear communication, regardless of medium, becomes a precondition for learning. They concluded that Vygotsky’s (1962, 1978) theory of social interaction as the basic foundation for learning still holds true for technology-mediated learning environments.

Moore (1993) described the importance of interaction and its influence on the learning process in distance education in a model called the Transactional Distance, the distance created between the teacher and the students during the lesson, which potentially
increases in distance education. The term *Transactional Distance* refers to a shared action among the environment, the individuals and the behavioral patterns in a particular situation. The physical distance in distance education, according to Moore, results in gaps in communication and a psychological void with a potential for misunderstandings between the teachers’ and the students’ behaviors.

In summary, it seems that two decades of discussion have not yet provided a distinct path to one theory that is applicable to all types of online learning and teaching. Since it took three centuries to establish well-grounded theories for face-to-face instruction, it is not surprising to find a lack of consensus about online learning theories.

**New Trends of Instructional Methods in Virtual Classrooms**

Online learning has inspired a number of technology companies to invest in numerous teaching and learning tools. Each year companies release many new educational technologies, and it is difficult for institutions, faculty, and administration to know what is best for their learners and their institutions (Liu et al., 2010). Below is a brief summary of some of the most recent innovations in online education technology.

**Game-Like Virtual Classrooms**

Edwards, Domínguez, and Rico (2008) discussed a virtual technology called SLOODLE (Simulation Linked Object Oriented Dynamic Learning Environment), which integrates the multi-user virtual environment of Second Life® with the Moodle® learning-management system. Inventors of SLOODLE intended to replace traditional learning habits with new interactive learning methods (video games, cellular phones, digital photography and more) in a virtual environment that reflects the popular multi-media culture of a 21st century society. This tool offers learners the chance to
design a tailor-made representative of oneself (avatar) for the virtual learning environment. The avatar serves as a virtual role-play tool to motivate students in virtual all-encompassing simulation exercises. In multiuser virtual environment (MUVE), interfaces participants’ avatars interact with computer-based agents and digital artifacts in virtual contexts.

The initial stages of studies on shared virtual environments are characterized by advances in internet games and work in virtual reality (Dede, 2005). Educational institutions such as Harvard and Columbia Universities have embraced this new virtual learning tool, and academic applications of SLOODLE learners take on professional roles in virtual business or language learning scenarios.

Second Life® offers an opportunity for instant interaction between participants and offers endless possibilities to interact and immerse in subjects by practicing language, exploring inter-cultural contexts, and simulating science knowledge (Collins et al., 2008). Second Life® is the most commonly used tool in virtual classrooms, allowing participants to interact with each other while putting the curriculum in a context of a simulated virtual environment. They found many applications in diverse fields, including simulated accident scenarios in health and safety education, scenario delivery for auditing work in accounting, utilizing problem-based learning (PBL) concepts in engineering education, practice in a virtual classroom for future teachers, a virtual gallery for art students, special needs students engaging in role-play to interact in a virtual classroom of science, technology, engineering and math (STEM), and integrated role-play for a theatre/literature class.
The young generation is born into a world that is saturated with technology and stimulation. They access digital information more frequently than traditional text. Television, internet, and video games are ubiquitous. The lower reading scores and comprehension abilities of recent college students have been linked to this phenomenon (Beebe, Burgess, Carroll, & Charlens, 2009; Williams, Ari, & Santamaria, 2011). H. Y. Hsu and Wang (2009) investigated whether students' reading level will improve if given the opportunity to use digital text in the form of a blogging tool. The results showed that the e-writing tool improved student learning motivation and retention rate.

Since 2009, there has been a noticeable increase in the number of articles examining the use of social networks in higher education settings. To date, a limited number of studies in this field have been completed, and most papers that addressed social networks presented proposals for frameworks or preliminary studies. A study by Gossens et al. (2008) compared technology use by university students, including Web 2.0 applications and compared the academic and nonacademic use of these tools. The social networking tools (e.g., MySpace, Facebook, Tweeter, and texting) ranked highly for academic use. The goal of incorporating social tools such as blogs, tweets, texts, and Facebook into curriculum is to foster collaboration among students and to build knowledge (H. Y. Hsu & Wang, 2009; Veletsianos & Navarrete, 2012). Articles examining social network use in learning settings have drawn on the literature in social learning.
Massive Open Online Courses (MOOCs)

The newest addition to the higher education instructional methods is a development known by the acronym MOOCs, which stands for Massive Open Online Courses. To date, there are scarce numbers of empirical studies on MOOCs (Schrire & Levy, 2012). Massive Open Online Courses are generally offered as noncredit classes, taught by well-known professors, free of cost, on platforms provided by specific companies, and accessible to anyone in the world (deWaard et al., 2011). Entrepreneurial Silicon Valley companies, notably Coursera and Udacity, have developed these types of courses. Other institutions such as the Massachusetts Institute of Technology (MIT) and Harvard University have established their version of MOOC, named edX. For fall semester of 2012, Stanford unveiled Class2Go with two courses. The MOOC platform Coursera has 33 university partners and has attracted more than 1.6 million “Courserians.” The articles in TIME magazine, “Reinventing College” (Ripley, 2012), and in the New York Times, “The Year of the MOOC” (Pappano, 2012), explore the emerging world of MOOCs. Some community colleges are also exploring MOOCs, as discussed by Whissemore (2012) in the Community College Times.

In July of 2013, San Jose State University decided to discontinue a project aimed at developing credit-bearing online courses with the MOOC company Udacity, a Silicon Valley-based company. San Jose State decided not to offer any courses with Udacity for the fall semester of 2013. On September 3, 2013, MOOC Princeton Professor Mitchell Duneier, who reached more than 40,000 students through his noncredit course, “Introduction to Sociology,” announced to the Chronicle of Higher Education that he will
no longer teach his class out of concerns that it could undermine funding for public higher education.

The discussion of Virtual Classrooms, Social Networks, and MOOCs as a way of increased interaction and improved social presence in online education is beyond the scope of this study.

**Conclusion**

Within the next 10 years, more than 50% of higher education is expected to be delivered via online courses (Parker et al., 2011). However, 71% of American adults expressed hesitation to utilize online education (Young, 2011). If this trend continues, online education might dishearten rather than encourage many potential students from entering higher education. Therefore, it is imperative to identify and implement effective delivery methods in distance education that will increase student retention rates in CCC’s distance education courses.

The literature reviewed for this study documents the variation in scope, content, and approaches used in online education. Evaluation of existing synchronous online courses indicates that the interface in a synchronous online environment promotes increased interaction and learning. However, these arguments are more theoretical than empirically supported (M. Allen et al., 2004). By studying the combination of online tools provided by the synchronous software, specifically as it relates to identifiable learning/teaching objectives, researchers can improve the instructional value of online implementation. The existing studies assessed only a limited sample size across limited instructional environments in CCCs (Enriquez, 2010; Skylar, 2009). Further exploration
of this powerful tool set is necessary, and targeted research into the effective use of synchronous tools may lead to major improvements in the delivery of online education.

As distance education, especially online education, continues to expand, the need for determining and maintaining quality in the process of designing, developing, and delivering online education is becoming an important issue. The existing literature affirms the importance for institutions to conduct ongoing research on topics related to student retention in online courses. The present study seeks to analyze relationships among student retention rates in synchronous, asynchronous, and classroom instruction and the variables of ethnicity, gender, and age groups. The findings will have implications for curriculum design and development. While this section discussed the literature concerned with synchronous online education in all its contexts as compared with asynchronous online and on-campus instruction, the next section will address the methodology of the study.
CHAPTER 3—METHODOLOGY

The previous chapter reviewed the literature to examine the effectiveness of instructional methods (on-campus, asynchronous, and synchronous online) and identify gaps in understanding as it relates to retention rates. Given the need for better understanding of retention outcomes for asynchronous and synchronous instructional methods, a quantitative approach was selected for this study. This chapter will describe the methodology and procedures used to conduct this study, which includes: (a) the purpose and research design of the study; (b) the research questions; (c) the sampling and data collection; (d) the data analysis; (e) the discussion and conclusions; (f) the limitations; (g) the summary; and (h) all information pertinent to the data analysis procedures in relation to the research questions.

The main focus of this study was to investigate whether there is a difference in mean institutional retention rates among California community college (CCC) students by the following institutional characteristics: (a) instructional method (on-campus, asynchronous, and synchronous online courses); (b) ethnicity (African American, Asian, Hispanic, Multi-Ethnic, and White students); (c) gender (female and male); and (d) age groups (18-24 years, 25-29 years, 30-34 years, 35-39 years, 40-49 years, and 50+ years old). The study’s findings on student outcomes will shed light on the impact of increased online student-teacher, student-student, and student-content interaction in synchronous online courses and how it compares to the interaction in on-campus and asynchronous courses.
Purpose of the Study

The purpose of this quantitative study is to measure the effectiveness of three instructional methods (asynchronous, synchronous, and on-campus) used at California’s 112 community colleges. Student retention rates were compared together with the validating factors of ethnicity, gender, and age. This research is among a limited number of studies focused on the comparison of instructional methods in community colleges (McBrien et al., 2009). The findings of this study can be used to develop a set of recommendations for effective models of online delivery strategies that result in improved academic outcomes in CCCs. Since the findings are based on data from 112 CCCs, including urban, multi-campus, rural, and small institutions, the recommendations can be generalized to the state level and also bear important implications for community colleges nationwide.

Research Design

This comparative, nonexperimental study will investigate the relationship among instructional methods, ethnicity, gender, and age and their effect on student outcomes in credit courses at CCCs. At the time of the study, the data were analyzed retrospectively, and consequently this research is considered an ex post facto (after the fact) design. Several multivariate procedures were used to analyze the data, including analysis of variance, factorial analysis of variance, and multiple linear regression.

Epistemology

During the era of Enlightenment, the emancipation of the human consciousness from an immature state of ignorance, superstition, and error had led to the philosophical orientation of positivism. One of the main representatives of the positivist’s paradigm in
the early 19th century was the philosopher and founding-sociologist Auguste Comte. He argued that society operates according to its own laws, much as the physical world operates according to gravity and other laws of nature (Lenzer, 1975). Positivists believed that the only authentic knowledge is that which allows for positive verification by measurements. The tenants of positivists assumed that objectivity was a characteristic that resided in the individual scientist and that it is the scientists’ responsibility to put aside their biases and beliefs (L. Cohen, Manion, & Morrison, 2011).

In the last 50 years, a new set of epistemic discourses like post-positivism (Reed, 2008) and critical realism (Patomaki & Wight, 2000) have emerged to fill the void left by the implosion of the positivist philosophy of science. One of the first thinkers to criticize logical positivism was Sir Karl Popper. He argued that the earlier views of social science failed to deliver on the promise for methods and theory, a general conclusion that is independent of the beliefs and social position of the scholars who conducted the research (Popper, 1963). Post-positivists like Popper believe that a reality exists, as positivists do, though they hold that it can be known only imperfectly and probabilistically (Floden, 2009). Post-positivists believe that what is accepted as real depends on the theoretical or cultural framework in which the investigator is located. Consequently, there are multiple realities and not one ultimate or absolute reality (Creswell, 2009). Phillips and Burbules (2000) wrote, “What is obvious to one person may not be obvious to another” (p. 14). In their opinion, any perception of reality is influenced by the background knowledge, experiences, theories, and assumptions of the observer. Post-positivism is an amendment to positivism that recognizes these and other critiques against logical positivism.
According to Fleetwood (2005), much of the current ontological discussion is characterized by ambiguity, which makes it difficult to get to the bottom of philosophical claims about reality and, of course, to locate the source of any ontological errors in such claims. Fleetwood uses a critical realist perspective to highlight the ambiguity and error encouraged by a socially constructed ontology. The key stance adopted in this study is guided upon a critical realism paradigm as articulated primarily by Roy Bhaskar in a number of works. The tenets of critical realism propose that there is a reality independent of our thinking that science can study and measure (Bhaskar, 1998; House, 1991). The critical realist holds a belief that an independent reality can exist but that it does not commit one to the view that absolute knowledge of the way it works is possible (Scott, 2005). The critical realist recognizes that all observations are fallible, have error, and that all theory is revisable (Bhaskar & Hartwig, 2010). In other words, the critical realist is critical of the researcher’s ability to know reality with certainty (Clegg, 2005). Where the positivist believes that the goal of science was to uncover the truth, the critical realist believes that the goal of research is to hold steadfastly to the goal of understanding reality (Ayers, 2011). Because all measurement is fallible, the critical realist emphasizes the importance of multiple measures and observations, each of which may possess different types of errors, to seek a warranted assertion for a better understanding of reality. The critical realist believes that all observations are theory-laden and that scientists are inherently biased by their cultural experiences and world views. The objectivity of the researcher can be only achieved within the context of a broader argumentative community of truth-seekers who criticize each other’s work and who conduct numerous measurements. Thus, objectivity is not the characteristic of an individual; it is inherently
a social occurrence. According to Houghton (2008), whether one embraces a positivist or any other epistemology had little practical effect upon one’s empirical findings. In this study, critical realism provided a coherent framework for online instructional research that was based on the understanding of causal mechanisms among variables. With the ontology view in mind, this research study was an attempt to contribute transformative research in the instructional methods of online education in CCCs. Egbo (2005) explored the idea of using critical realism as a philosophical foundation for transformative research in educational administration.

The focus of this study was to investigate in a quantitative manner student outcomes (retention rates) in the CCCs and the validating factor of human interaction in three instructional methods (on-campus, asynchronous, and synchronous courses). The variables of ethnicity, gender, and age were taken into account to investigate if these were contributing key factors that influenced student outcomes in the various instructional methods. Because this study explored the idea of using critical realism as a philosophical foundation for transformative research in online instructional methods, the potential recommendations for a change in online course design at California’s community colleges would involve critical reflection, probing, and questioning by multiple researchers. Finally, the findings could lead to some realignment of perspectives which should, in turn, act as a mediating force to social praxis.

**Theoretical Framework**

For close to 40 years, extant research on 2-year colleges suggests that the social integration of students is a determinant of successful student outcomes (Bean & Metzner, 1985; Cabrera, Nora, & Castañeda, 1993; Johnson, Bjorkland, & Krotee, 1984; Martin,
One of the first researchers to develop a theoretical framework that recognized the importance of student interaction with their academic and social environment was Vincent Tinto (1975) in a publication entitled “Dropout from Higher Education: A Theoretical Synthesis of Recent Research.” Tinto explained the processes of interaction between the individual and the institution that led individuals to drop out from the institutions for various reasons. Tinto’s theory has been widely quoted and reviewed over the past 37 years as evident in over 3,000 citations and numerous reports, conference proceedings, and other works focusing on his model of student departure. Others agreed with Tinto and found similarly the more academically and socially involved individuals (i.e., the more students interact with other students and faculty) the more likely they are to persist in college (Astin, 1984; Bean & Metzner, 1985; Pascarella & Terenzini, 1980). Although it has not been applied to the online setting, Tinto’s theory of increased interaction as a predicting factor of students’ persistence might hold true for students in an online learning environment.

Astin (1984) presented a student development theory based on student involvement, which refers to the quantity and quality of the physical and psychological energy students invest in their college experience. He focused primarily on student
outcomes and how they are affected by college environments (e.g., institutional policies, associations with peers, support programs, facilities, and faculty). Astin found that the single most powerful source of influence on the undergraduate students’ learning and development is the amount of interaction among peers. Institutions have the potential to early detect students’ persistence by focusing on different types of information that includes the precollege characteristics of the student, the environmental “contingencies” of attendance (e.g., whether the student lives on campus or at home, financial aid, work status, etc.), and the characteristics of the college that the student attends (Astin & Oseguera, 2005, p. 120). Astin’s understanding of student persistence, including his focus on interaction among peers, might inform researchers, as well as practitioners, of student retention in online courses. This study attempted to provide a conceptual and empirical understanding of the ways in which the practices of interaction in online instructional methods, particularly in asynchronous and synchronous online courses, impact student retention.

**Theories Related to Online Learning**

The persistence theories of Astin, Bean, Metzner, Pascarella, Terenzini, and Tinto were developed at a time when no form of online education existed in higher education. Recent research examined some of the issues surrounding student retention in online learning environments. For example, S. R. Palmer and Holt (2009) found student satisfaction with their learning environment to be an important measure of their approach to learning and their learning outcomes. In their opinion, this applies equally to online students as it does to learners generally. After several years of testing a new theory, T. Anderson (2008) developed a model applicable to an online setting in higher
education. In his theory of e-learning that he named *Community of Inquiry* (Figure 1), he identified six forms of interactions that illustrate the two human actors (learners and teachers) and their interaction with each other, the content, and the interface. The interaction can take place within a community of learning using a variety of online-based asynchronous and synchronous online interaction (e.g. video, audio, computer conferencing, chats, and virtual world).

*Figure 1. The Community of Inquiry model. From The Theory and Practice of Online Learning: Towards a Theory of Online Learning, by T. Anderson, 2004, Athabasca University, Edmonton, Canada: AU Press, p. 61. Reprinted with permission.*
The first form of interaction is *student-student* communication that encourages collaborative learning (e.g., peer tutoring) and facilitates the development of multiple perspectives. The second form is the student's interaction with the content. In the traditional classroom, this was limited to library studies and reading of textbooks. In the online environment, the *student-content interaction* is expanded to virtual labs, online computer-assisted learning tutorials (Camtasia and YouTube videos), online help facilities (e.g., chat), and the use of an adaptive interface (e.g., automatic voice recognition system and automatic web site links) that adjusts to user skill, needs, or interests. The *student-teacher interaction* is supported by a large variety of formats that include asynchronous and synchronous interaction in text, as well as audio and video communications. T. Anderson recognized that teachers are often overwhelmed by the volume of student communications, and students often have unrealistic expectations of receiving prompt responses from faculty. New emerging best practices urge educators to employ less teacher-centric communications in an online course than in the traditional classroom (T. Anderson, 2008; Clark, 2002; Fortune, Shifflett, & Sibley, 2006). The fourth form of interaction is the *teacher-content* dealings that focuses on the teachers’ creation of course content and requires continuous monitoring, construct, and updating of course content. The *teacher-teacher* interaction may include professional development and knowledge exchange within the scholarly community of teachers. The *content-content* form of interaction takes into account that content is programmed to interact with other automated information sources to constantly refresh itself. In this context, T. Anderson offers the example of a weather tutorial that may take its data from a current meteorological server.
In summary, T. Anderson (2004) suggested that the various forms of interactions can be substituted for each other depending on costs, content, learning objectives, convenience, technology, and time availability. In his opinion, the substitutions did not decrease the quality of e-learning that results. The use of T. Anderson’s Model of Online Learning as a theoretical framework for this study of instructional methods (asynchronous, synchronous, and on-campus) in CCCs was not an attempt to test the model in its entirety but to utilize parts of the model for a better conceptualized understanding of the online learning world in higher education at CCCs. T. Anderson’s Model of Online Learning guided the researcher to vital explanation of and answers to the research questions and hypotheses as presented in the following section.

One of the core theories of distance education is Michael Graham Moore’s (1993) Theory of Transactional Distance that provided the broad framework of the pedagogy of distance education and allowed for this study’s questions and hypotheses. Moore defined transactional distance as the distance in understanding between teacher and learner due to the separation of teachers from learners. He found that there is transactional distance as soon as the separation of teacher and learner is sufficiently significant that the special pedagogical strategies and technique, as well as special patterns of behaviors, can be identified as distinguishing characteristics (Moore, 1972).

Moore (1993) defined transactional distance as “the psychological and communication space” between the learner and the teacher: “It is this psychological and communication space that is the transactional distance” (p. 22). The term does not refer to the geographical distance between the teacher and the learner but to the development of a transaction; in other words, the development of a particular form of interaction between
teacher and learner because of their geographical separation (Giossos, Koutsouba, Lionarakis, & Skavantzos, 2012). Moore recognized that any kind of separation between learners and instructors leads to a special psychological and communication space that need to be crossed (Gorsky & Caspi, 2005). The transactional distance might transpire to a lesser degree in a large lecture course on-campus or to a higher degree in a teleconferencing course. Nevertheless, transactional distance might occur as soon as there is a need of crossing a space of potential miscommunications between learners and instructors (Giossos et al., 2012). In order to overcome this distance, special organizational and teaching strategies that fall into two categories were essential. These categories were structure, which involved elements of course design and organization, and dialog, which involved the interplay of words, ideas, and actions between teachers and learners (Shannon, 2002). According to Moore (2007), dialogue was synonymous with interaction and requires a positive two-way communication between participants. The transactional theory took into consideration the effects of the media type on the transactional distance among participants in an online course and focused on the interactions between the participants (Giossos et al., 2012). Developers of online courses must attend to both elements of course structure and opportunities for teacher-student interaction and student-student interaction. The purpose of the present study was the theoretical processing of the fundamental concept of “transactional distance” in synchronous and asynchronous online interaction, as well as the incorporation of the theory into the epistemological framework of critical realism.
Research Questions and Hypotheses

The following research questions and hypotheses were employed in this study of comparing student learning outcomes of online students (asynchronous and synchronous) and on-campus students at California’s Community Colleges:

RQ1: Are there significant differences in retention rates (percentages) at the 112 California community colleges for African American, Asian, Hispanic, Multi-Ethnic or White students by instructional method?

Null Hypotheses 1: Retention rates will not differ by ethnicity among students by instructional method.

Alternative Hypotheses 1: Retention rates will differ by ethnicity and by instructional method among students.

RQ2: Is the effect of being a student in an on-campus, asynchronous, or synchronous course different for female or male students?

Null Hypotheses 2: There is no interaction between gender and instructional method on student retention rates by instructional method.

Alternative Hypotheses 2: There is an interaction between gender and instructional method on student retention rates.

RQ3: Is the effect of being a student in an on-campus, asynchronous, or synchronous course different for the various age groups of students (18-24 years, 25-29 years, 30-34 years, 35-39 years, 40-49 years, and 50+ years old)?

Null Hypotheses 3: There is no interaction between age groups and instructional method on student retention rates.
Alternative Hypotheses 3: There is an interaction between age groups and instructional method on student retention rates.

Data Collection

This study uses quantitative analysis to determine whether the instructional methods influence student outcome data based upon ethnicity, gender, and age. Since the data are publically available through Data Mart (CCCCO, 2011), the result values are reproducible if they are obtained according to the same quantitative procedures and statistical analyses. Data from this study were derived from the California Community Colleges’ Chancellor Office’s Management Information Systems (COMIS) also known as Data Mart. The Data Mart is an online tool, which allows users to identify variables of interest on one or multiple institutions and to download such data for analytic purposes. Data for this study are aggregated and are accessible to the public without any limitations or restrictions. The CCCCO (2011) recorded the information in such a manner that subjects cannot be identified, directly or through identifiers linked to any data points. Consequently, this study has no probability of harming or discomforting any student in the CCCs. The San Diego State University Institutional Review Board (IRB) approved the research design and data collections for this study. This IRB approval can be found in Appendix C.

Each semester, all community colleges submit their institutional data to the CCCCO, which collects data in five primary areas: students/headcounts, courses, student services, faculty/staff, and student outcomes. Student outcomes can be viewed under the following specifics with demographic breakouts (gender, age group, and ethnicity) by: basic skills cohort tracker, enrollment retention rates, grade distribution, program awards,
and student progress and achievement rate (SPAR). According to the State Chancellor Office’s submission timeline (CCCCO, n.d.), the term-end files from all community colleges in California are due within 1 month after the end of each term, with the following exceptions: (a) Winter Quarter data are due at the same time as Spring Quarter data; and (b) districts with a fall due date in January are not required to submit until the first Monday in February. The Data Element Dictionary (Appendix A) provides a description of the System Office Management Information System and the technical specifications for the data to be collected and reported to the state.

Given that the focus of this study was to investigate whether there were any differences in students’ retention rates by instructional method, ethnicity, gender, and age, the institutional population examined in this study was delimited to credit courses at CCCs. There were 112 community colleges in California offering on-campus credit courses that accrued 3,649,754 student enrollment counts during the fall semester of 2011. In comparison, 103 CCCs offered credit online courses via the asynchronous method demonstrating 362,367 student enrollment counts, and 15 CCCs provided credit online courses via the synchronous method showed 38,399 student enrollment counts.

The ethnic groups included in this study consisted of African American, Asian, Hispanic, Multi-Ethnic, and White students. Retention rate data were computed for each institution using fall 2011 data from African American (non-Hispanic), Asian, Multi-Ethnic, and White credit students in on-campus, asynchronous, and synchronous courses. The CCCCO (2011) defines retention rates of all credit enrollments as the rate at which students completed courses and did not drop or withdraw from them. The retention rate refers to course retention rather than semester retention.
The sample consisted of 258 aggregated data points that represents 3,438,254 overall CCC’s student enrollment counts that resulted in positive retention rates during fall semester of 2011. On-campus students represented 90.9% \((n = 90\) data points or \(n = 3,125.548\) students), while asynchronous online students embodied 8.2% \((n = 84\) data points or \(n = 281,702\) students), and synchronous online students included 0.9% \((n = 84\) data points or \(n = 31,004\) students). State-wide retention rates in distance and nondistance courses were viewed under the lens of ethnicity. The factor of ethnicity had five levels: (a) African American; (b) Asian; (c) Hispanic; (d) Multi-Ethnic; and (e) White. During the fall semester of 2011, there were: 314,812 (9.16%) African American students; 22,250 (0.65%) Indian/Alaskan Native students; 568,833 (16.54%) Asian students; 1,472,273 (42.82%) Hispanic students; 130,088 (3.78%) Multi-Ethnic students; 23,434 (0.68%) Pacific Islander students; 1,256,025 (36.53%) White students; and 227,096 (6.6%) students with unknown ethnicity.

**Data Analysis Strategies**

A two-way factorial analysis of variance was conducted to determine the effect of instructional method, ethnicity, gender, and age groups on retention of credit students at the 112 CCCs. The outcome variable was measured as retention rates in percentages. The Office of California Community Colleges (CCCCO, 2011) defines retention rates of all credit enrollments, the rate at which students completed courses and did not drop or withdraw from them. Research questions 1 through 4 addressed retention rates. All research questions focused on differences in retention (DV1) rates in CCC institutions by instructional method (Factor A with 3 levels), ethnicity (Factor B with 5 levels), gender (Factor C with two levels), and age groups (Factor D with six levels). The factor of
Ethnicity had five levels: 1 = African American, 2 = Asian, 3 = Hispanic, 4 = Multi-Ethnic, and 5 = White.\textsuperscript{5} The factor of Instructional Method had three levels: 1 = On-campus, 2 = Asynchronous (internet-based), and 3 = Synchronous (internet-based). The factor level of gender had two levels: 1 = Female and 2 = Male. The factor level of age groups had six levels: 1 = 18-24 years, 2 = 25-29 years, 3 = 30-34 years, 4 = 35-39 years, 5 = 40-49 years, and 6 = 50+ years old.

Given that the data points were aggregated, the omnibus tests were calculated using both SPSS and hand calculations. The SPSS was used to compute the mean squares within and between groups; however, since the degrees of freedom error (DFE) and mean square error (MSE) are functions of the sample size (and the sample size in this case was aggregated scores), a modified sample size appropriate to the actual was used. This was an important approach to ensure that F values were not inflated (which would increase the likelihood of a Type 1 error).

These factorial procedures were selected given that the outcome variable was continuous while the independent variables (referred to as factors) were categorical, having at least two and up to six levels. Eta\textsuperscript{s} for instructional method, ethnicity, gender, and age groups were used to assess the effect sizes. As indicated by Green and Salkind (2011), eta square ($\eta^2$) is reported small (.01), medium (.06), and large (.14), respectively. The researcher reported results using 95% confidence intervals. Since the data were in aggregated form and the sample sizes were inflated, the effect sizes provided an even more robust measure of how large the differences in sample sizes actually were. The

\textsuperscript{5}Initial data screening led to the transformation of ethnicity by eliminating groups of Pacific Islander and American Indian/Alaskan that represented less than 1% of the retention rates in the fall semester of 2011.
SPSS does not report eta square for factorial ANOVA; instead it reports a partial eta square. As such, the researcher calculated eta square by hand.

The descriptive statistics tables displayed the mean percentage of retention rates achieved by African American, Asian, Hispanic, Multi-Ethnic, and White, or female and male students, or students belong to age groups of 18-24 years, 25-29 years, 30-34 years, 35-39 years, 40-49 years, and 50+ years old students in on-campus, asynchronous, or synchronous courses. The standard deviation showed a comparison of the scores of the various groups and revealed the group with the largest spread of scores and the groups with the most closely related scores. Based upon a review of the histogram, it was determined that the distribution was normal. Further, the Levene’s test revealed if results were significant, illustrating that the data violated or did not violate the assumption of homogeneity of variance. Interaction of factors was further analyzed by creating line plots that demonstrated the significance relationships of interactions between factors, meaning the chart was ordinal or disordinal. The data points (illustrated on the charts by the small circles) represented the mean values for each group. Whenever significant group differences were identified, it was appropriate to conduct follow-up posthoc tests in order to determine where specific differences lay. Bonferroni posthoc tests were conducted to determine which student groups were significantly different in retention rates when considering instructional method. Tables displayed the results of the Bonferroni posthoc test for highest retention rates attained among students in the different type of instructional methods with consideration of ethnicity, gender, or age groups. The mean differences for every possible paired combination of Instructional Method and
factor was computed using at the .01 confidence level. Any occurrences of differences approaching the 95% confidence level are identified in Chapter 4.

**Methodological Limitations**

The general limitations of this study were presented in chapter 1 and are worth reviewing. The methodological limitations of this study included the fact that the sample size of each category was limited to data that are available on the web-based *Data Mart* of the CCCCO (2011). The sample sizes of the different formats were notably different, and this might be considered as another limitation to this study. The total number of student enrollment counts in the population of on-campus courses was 3,649,754 students in the fall semester of 2011. The comparison group included significantly fewer students and consisted of a sample of students who took distance education courses in the asynchronous (362,367) and synchronous (38,399) interaction formats at the community colleges during the same semesters. The reason for the lower number of enrollment counts in synchronous online courses is that synchronous online teaching has become popular among online instructors only in recent years (Shi & Morrow, 2006). Instructors, as well as students, need time to familiarize themselves with new instructional tools and to develop best practices in light of new approaches to teaching and learning that will become more commonplace throughout postsecondary systems. Therefore, the sample size of available data on synchronous online retention rates is limited to more recent years (2008 to present).

The CCCCO’s (2011) *Data Mart* does not give any detailed information about the consistency of the data collection and about the way data are reported to the CCCCO. The data collection practices might vary from district to district or college to college due...
to the fact that different institutions employ a variety of different software applications. For example, the San Diego Community College District created their own ISIS system to accommodate special needs for data collection and report generation for the District. Other districts and colleges purchased software applications from a variety of vendors (e.g., Hobsons, Banner, Datatel, and others). In addition, enrollment and registration forms vary among the CCCs on how they request information from students about their ethnicity and reports on ethnicity might vary among the 112 community colleges in California. In summary, variations in reporting forms and formats may yield some inconsistencies, which represented another limitation to this study. Additionally, the available data do not include success rates or any student demographics beyond age, gender, and ethnicity that might influence the retention rates of community college students in California.

**Conclusion**

Findings from this study provided insight into the retention of California’s community college students as it relates to their ethnicity, gender, age, and their learning environment. The results of the two-way ANOVA analyses exposed the student groups that demonstrated better performances as measured by retention rates when taking a course with one particular instructional method. The results from the data analyses revealed whether students would benefit from an instructional format that offers increased opportunity to interact immediately with the instructor and peers or would persist in a format with delayed interaction. While this section discussed the methods used in this study, the next section will address the study’s data analyses.
CHAPTER 4—FINDINGS

The purpose of this study was to better understand the retention rates of online students with different ethnic, gender, and age backgrounds in the community college. Specifically, this study focused on California community colleges (CCCs), identifying the instructional methods that were in place to assist students to succeed in their credit courses. The goal of the study was to provide data for the CCCs in the area of the retention rates of online students. The literature review identified study findings from prior research and provided examples of research that have been established in the CCCs. The outcomes of the research will assist the CCCO and local administrators in the development of online teaching methods.

In order to meet the needs of the various types of students who prefer to attend courses via distance learning, either for convenience, preference of learning style, cost-saving, and so forth, Boston, Ice, and Gibson (2011) found that higher education administrators must find ways to implement successful online educational opportunities for students. Data regarding positive student retention in each instructional method used at CCCs can provide insight to administrators attempting to build more successful distance education programming, while appropriately supporting students and faculty. Data-driven decisions will result in more appropriate structures of distance education programs. It is important to provide both faculty and administrators with additional data that leads to the implementation of positive changes in distance learning policies and procedures based on the information about successful online instructional methods. This data-driven decision process is imperative because many of the extrinsic and institutional inhibitors of retention can be directly affected by college administrators with the
implementation of distance learning policies and procedures. Thus, administrators need additional data on instructional methods in distance education for a better understanding of students’ motivators and barriers for retention. With that in mind, a plan was developed to collect and analyze data from the CCCCO’s (2011) Data Mart, the system’s web-based database, so that the student retention at CCCs in asynchronous and synchronous online courses can be compared with retention rates in on-campus courses.

There is much discussion on the effectiveness of online classes and the various instructional methods that are used to deliver education through distance learning. Technology has much evolved during the past decades, and the community of researchers disagrees widely on fundamental aspects of online education’s effectiveness. Most existing studies used small sample sizes or focused on one particular treatment that was administered to only a small group of online students (Adams & DeFleur, 2006; Enriquez, 2010; Skylar, 2009). The conclusions that can be drawn from such studies are limited. Continued research is necessary to understand the effectiveness of synchronous instructional tools in online education. This study is an attempt to contribute constructively to the findings of existing studies on synchronous online tools as they compare with traditional, as well as asynchronous, online tools.

**General Statewide Findings**

To provide a general context from which to view college-level outcomes for synchronous, asynchronous, and on-campus learning, basic descriptives from the CCCCO’s (2011) Data Mart are presented. These data were collected and analyzed in March of 2012. Results revealed that students in an asynchronous credit online courses showed a statewide retention rate of 77.70% \((N = 363,338)\) during the fall semester of
2011. In comparison, 34,430 students who enrolled in a synchronous credit online course during the same semester had a noticeably higher retention rate of 80.69%. Out of 4,074,018 on-campus students, 3,456,881 students stayed enrolled, demonstrating a retention rate of 84.85% (Table 1).

Table 1

<table>
<thead>
<tr>
<th>Semester</th>
<th>On-Campus</th>
<th>Asynchronous</th>
<th>Synchronous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2008</td>
<td>83.73</td>
<td>76.57</td>
<td>78.89</td>
</tr>
<tr>
<td>Fall 2009</td>
<td>84.73</td>
<td>78.06</td>
<td>80.91</td>
</tr>
<tr>
<td>Fall 2010</td>
<td>84.68</td>
<td>77.31</td>
<td>80.75</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>85.85</td>
<td>77.70</td>
<td>80.69</td>
</tr>
</tbody>
</table>

Note. From *Management Information Systems Data Mart: Outcome, Retention/Success Rate*, by the California Community Colleges Chancellor’s Office (CCCCO), 2011, retrieved from http://datamart.cccco.edu/Outcomes/Course_Ret_Success.aspx

Table 1 includes the following instructional methods of credit courses (all TOP codes\(^6\)) and shows the retention rates over time from fall semester 2008 to fall semester 2011: (a) On-campus courses; (b) Distance education, internet-based with simultaneous interaction (synchronous courses); and (c) Distance education, internet-based with delayed interaction (asynchronous courses).

The data from several semesters (fall semester 2008 to fall semester 2011) reveal that synchronous learning has improved from 2008 to 2009 and remained fairly constant over time. In the fall semester of 2008, the retention rate of synchronous online students

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\(^6\)As defined in the *Data Element Dictionary* (document CB03) of the CCCCCO (2012), the Taxonomy of Programs (TOP) code is assigned which best indicates the subject matter of the course. The TOP code assigned to a course is not to be linked to the TOP code of a particular program for Chancellor’s Office approval purposes.
was 78.89%, while 1 year later the retention rates improved to 80.91%. This might be an indication that instructors and students were becoming increasingly accustomed to the synchronous learning/teaching method, and consequently more students completed their courses. Preliminary findings of this investigation showed that the retention rates of CCC students via Simultaneous Interaction (such as CCC Confer) resulted in the retention rate of 80.69% in the fall semester of 2011. This is not only a noticeably higher retention rate than the asynchronous online instructional method (77.70%).

**First Research Question**

The first research question to be answered was to identify whether there is a difference in retention rates by ethnicity in the various instructional methods in CCCs. The sample consisted of 215 aggregated data points that represent 3,438,254 CCC students who reached positive retention rates during the fall semester of 2011; 90.9% of them were on-campus students \( (n = 3,125,548 \text{ students}) \), 8.2% were asynchronous online students \( (n = 281,702 \text{ students}) \), and 0.9% were synchronous online students \( (n = 31,004 \text{ students}) \). Statewide retention rates in distance and nondistance courses were viewed under the lens of ethnicity. During the fall semester of 2011, there were: 314,812 (9.16%) African American students; 22,250 (0.65%) Indian/Alaskan Natives students; 568,833 (16.54%) Asian students; 1,472,273 (42.82%) Hispanic students; 130,088 (3.78%) Multi-Ethnic students; 23,434 (0.68%) Pacific Islander students; 1,256,025 (36.53%) White students; and 227,096 (6.6%) students with unknown ethnic background. Ethnic student groups that represented less than 1% of the total student population were dropped from this study. Consequently, the factor of ethnicity had five levels: 1 = African American; 2 = Asian; 3 = Hispanic; 4 = Multi-Ethnic; and 5 = White.
Two-way factorial analysis of variance (ANOVA) was employed in this study to examine research question 1. This question focused on differences in retention (DV) rates in California’s community college institutions by instructional method (Factor A with 3 levels) and ethnicity (Factor B with 5 levels). This 3x5 factorial procedure was selected given that the outcome variable was continuous, while the independent variables (referred to as factors) were categorical, having three or five levels. Eta square was used to assess the effect sizes. As indicated by Green and Salkind (2011), eta square ($\eta^2$) is reported small (.01), medium (.06), and large (.14), respectively. The researcher reports results using 95% confidence intervals.

Findings to Research Question 1

A two-way factorial analysis of variance was conducted to determine the effect of Ethnicity and Instructional Method on retention rates of credit students at the 112 CCCs. The outcome variable was measured as retention rates in percentages. The Office of California Community Colleges (CCCO, 2011) defines retention rates of all credit enrollments, the rate at which students completed courses and did not drop or withdraw from them. The factor of ethnicity had five levels: 1 = African American; 2 = Asian; 3 = Hispanic; 4 = Multi-Ethnic; and 5 = White\(^7\). The factor of Instructional Method had three levels: 1 = On-campus; 2 = Asynchronous (internet-based); and 3 = Synchronous (internet-based).

The Descriptive Statistics table (Table 2) displays the mean percentage of retention rates achieved by African American, Asian, Hispanic, Multi-Ethnic, and

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\(^7\)Initial data screening led to the alteration of ethnicity groups by eliminating the categories of Pacific Islander and American Indian/Alaskan, which represented less than 1% of the retention rates in fall semester of 2011.
Table 2

*Descriptive Statistics of Retention Rates by Ethnicity*

<table>
<thead>
<tr>
<th>Profile</th>
<th>$M$</th>
<th>$SD$</th>
<th>On-Campus</th>
<th>Asynchronous</th>
<th>Synchronous</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>76.14</td>
<td>2.26-5.15</td>
<td>80.70</td>
<td>70.70</td>
<td>76.71</td>
</tr>
<tr>
<td>Asian</td>
<td>84.08</td>
<td>2.11-3.51</td>
<td>88.12</td>
<td>81.34</td>
<td>82.50</td>
</tr>
<tr>
<td>Hispanic</td>
<td>80.25</td>
<td>1.73-2.19</td>
<td>85.54</td>
<td>76.50</td>
<td>78.33</td>
</tr>
<tr>
<td>Multi-Ethnic</td>
<td>80.41</td>
<td>2.29-5.90</td>
<td>84.60</td>
<td>76.90</td>
<td>79.43</td>
</tr>
<tr>
<td>White</td>
<td>83.83</td>
<td>1.53-1.78</td>
<td>87.83</td>
<td>80.96</td>
<td>82.41</td>
</tr>
</tbody>
</table>

White students in on-campus, asynchronous (delayed interaction, internet-based), or synchronous (simultaneous interaction, internet-based) courses. The standard deviation showed that when comparing the scores of the various groups, the African American students had the largest spread of scores ($SD = 5.45$) and the most closely related scores were found in the group of White students ($SD = 3.42$). Although the overall standard deviation was greater for the African American students ($SD = 5.15$), when the instructional method was considered, it was the students with Multi-Ethnic background studying in a synchronous online course that showed the greatest spread of scores ($SD = 5.90$).

Based upon a review of the histogram, it was determined that the distribution for each group was normal. Further, Levene’s Test was significant (see Appendix D), illustrating that the data violated the assumption of homogeneity of variance ($f = 4.731$, $p < .001$). As a result, the findings should be reviewed with caution.

Interaction of factors was further analyzed by creating a line plot, which demonstrates no interaction (Figure 2) between factors. The chart indicated an ordinal
Figure 2. Line plot of retention rates by ethnicity and instructional method. The data points (illustrated on this chart by the small circles) represent the mean values for each group. The line plot indicated that all ethnic groups had the highest retention rates in on-campus classes in comparison with asynchronous or synchronous online classes. However, all ethnic groups had a higher retention rate in synchronous online courses when compared with all ethnic groups in asynchronous online courses. The most significant improvement in retention rates can be observed in synchronous online courses among African American and Multi-Ethnic online students.
ANOVA results (Table 3) indicated a significant main effect for Instructional Method, $F = 150.52, p < .01, \eta^2 = .400$, and a significant main effect for Ethnicity, $F = 54.95, p < .01, \eta^2 = .292$. Interaction between Instructional Method and Ethnicity was statistically not significant, $F = 2.06, p = \text{n.s.}, \eta^2 = .022$. This result means that there was no interaction between the two main factors examined, ethnicity and instructional method. The results of the $\eta^2$ indicated that the main effects were large. The results of the $\eta^2$ indicated that the interaction between Instructional Methods and Ethnicity was large.

Table 3

Two-Way ANOVA Summary Table for Interaction and Main Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>$F$</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between treatments</td>
<td>4422.93*</td>
<td>14</td>
<td>315.92</td>
<td>38.34*</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>2480.64</td>
<td>2</td>
<td>1240.32</td>
<td>150.52*</td>
<td>.400</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>1811.41</td>
<td>4</td>
<td>452.85</td>
<td>54.95*</td>
<td>.292</td>
</tr>
<tr>
<td>Method x Ethnicity</td>
<td>136.16</td>
<td>8</td>
<td>17.02</td>
<td>2.06</td>
<td>.022</td>
</tr>
<tr>
<td>Within treatments</td>
<td>1773.16</td>
<td>200</td>
<td>8.24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .001 level.

Bonferroni post hoc tests were conducted to determine which ethnic groups were significantly different in retention rates when considering instructional method. Tables 4 through 6 show the results of the post hoc tests. The text below explains the results of the Bonferroni post hoc test for highest retention rates attained among students in different types of instructional methods with consideration of ethnicity. The mean differences for
each possible paired combination of Instructional Methods and Ethnicity were computed at the .01 confidence level. Differences approaching the 95% confidence level were identified on an individual basis.

**On-Campus Students**

The Bonferroni post hoc test (Table 4) exposed the following differences in retention rates among students with different ethnic background in on-campus courses: African American on-campus mean retention rates were significantly lower than that of Asian on-campus students, a difference of 7.43 points ($p < .001$). African American on-campus retention rates were also significantly lower than that of Hispanic on-campus students, representing a mean difference of 4.85 points ($p < .001$) and that of Multi-Ethnic on-campus students, representing a mean difference of 3.9 ($p < .01$). White on-campus students had higher retention rates than those reported by African American on-campus students, a mean difference of 7.14 points ($p < .001$). All differences were significant ($p < .001$ or $p = .004$). Asian on-campus mean retention rates were not significantly higher than that of Hispanic on-campus students, a difference of 2.58 points ($p = .185$) and that of White on-campus students, representing a mean difference of .291 ($p = 1.00$). Asian on-campus retention rates were significantly higher than that of Multi-Ethnic on-campus students, representing a mean difference of 3.51 points ($p < .01$). White on-campus students had higher retention rates than those reported by African American on-campus students, a mean difference of 7.14 points ($p < .001$). Some differences were significant ($p < .001$), while some were not significant ($p = .19$ or $p = 1.00$). Hispanic on-campus mean retention rates were not significantly higher than that of Multi-Ethnic on-campus students, a difference of .95 points ($p = 1.00$) and that
Table 4

*Bonferroni Post Hoc On-Campus by Ethnicity*

<table>
<thead>
<tr>
<th>Ethnicity (I)</th>
<th>Ethnicity (J)</th>
<th>Mean difference (I-J)</th>
<th>Std. error</th>
<th>Sig.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>Asian</td>
<td>-7.429*</td>
<td>1.087</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>-4.847*</td>
<td>1.087</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>-3.898*</td>
<td>1.087</td>
<td>.004</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>-7.139*</td>
<td>1.087</td>
<td>.000</td>
</tr>
<tr>
<td>Asian</td>
<td>African American</td>
<td>7.429*</td>
<td>1.087</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>2.583</td>
<td>1.087</td>
<td>.185</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>3.531*</td>
<td>1.087</td>
<td>.014</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>.291</td>
<td>1.087</td>
<td>1.000</td>
</tr>
<tr>
<td>Hispanic</td>
<td>African American</td>
<td>4.847*</td>
<td>1.087</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>-2.583</td>
<td>1.087</td>
<td>.185</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>.949</td>
<td>1.087</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>-2.292</td>
<td>1.087</td>
<td>.363</td>
</tr>
<tr>
<td>Multi-Ethnic</td>
<td>African American</td>
<td>3.898*</td>
<td>1.087</td>
<td>.004</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>-3.531*</td>
<td>1.087</td>
<td>.014</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>-.949</td>
<td>1.087</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>-3.241*</td>
<td>1.087</td>
<td>.032</td>
</tr>
<tr>
<td>White</td>
<td>African American</td>
<td>7.139*</td>
<td>1.087</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>-.291</td>
<td>1.087</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>2.292</td>
<td>1.087</td>
<td>.363</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>3.241*</td>
<td>1.087</td>
<td>.032</td>
</tr>
</tbody>
</table>

*Adjustment for the multiple comparisons: Bonferroni.
*Significant at the .05 level.

of White on-campus students, representing a mean difference of 2.29 (\( p = .36 \)). The differences were not significant (\( p = 1.000 \) or \( p = .36 \)). Multi-Ethnic on-campus retention rates were lower than that of White on-campus students, representing a mean difference of -3.24 points (\( p < .05 \)). The difference was approaching significance.

**Asynchronous Online Students**

The Bonferroni post hoc test (Table 5) exposed the following differences in retention rates among students with different ethnic background in asynchronous online courses: African American asynchronous mean retention rates were significantly lower
Table 5

Bonferroni Post Hoc Asynchronous Online Method by Ethnicity

<table>
<thead>
<tr>
<th>Ethnicity (I)</th>
<th>Ethnicity (J)</th>
<th>Mean difference (I-J)</th>
<th>Std. error</th>
<th>Sig. a</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>Asian</td>
<td>-10.648*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>-5.799*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>-6.200*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>-10.261*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td>Asian</td>
<td>African American</td>
<td>10.648*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>4.849*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>4.448*</td>
<td>1.125</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>.386</td>
<td>1.125</td>
<td>1.000</td>
</tr>
<tr>
<td>Hispanic</td>
<td>African American</td>
<td>5.799*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>-4.849*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>-401</td>
<td>1.125</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>-4.463*</td>
<td>1.125</td>
<td>.001</td>
</tr>
<tr>
<td>Multi-Ethnic</td>
<td>African American</td>
<td>6.200*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>-4.448*</td>
<td>1.125</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>.401</td>
<td>1.125</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>-4.061*</td>
<td>1.125</td>
<td>.004</td>
</tr>
<tr>
<td>White</td>
<td>African American</td>
<td>10.261*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>-3.86</td>
<td>1.125</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>4.463*</td>
<td>1.125</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>4.061*</td>
<td>1.125</td>
<td>.004</td>
</tr>
</tbody>
</table>

aAdjustment for the multiple comparisons: Bonferroni.

*Significant at the .05 level.

than that of Asian on-campus students, a difference of -10.65 points \((p < .001)\), as well as that of Hispanic asynchronous students, representing a mean difference of -5.80 \((p < .001)\). African American asynchronous retention rates were also significantly lower than those of Multi-Ethnic asynchronous students, representing a mean difference of -6.20 points \((p < .001)\), and those of White asynchronous students also had also lower retention rates, representing a mean difference of -10.26 points \((p < .001)\). All differences were significant \((p < .001)\). Asian asynchronous mean retention rates were significantly higher than that of Hispanic asynchronous students, a difference of 4.85 points \((p < .001)\). Asian
asynchronous retention rates were also significantly higher than those of Multi-Ethnic asynchronous students, representing a mean difference of 4.45 points \((p < .001)\). All differences were significant \((p < .001)\). Asian asynchronous mean retention rates were not significantly higher than that of White asynchronous students, representing a mean difference of .39 \((p = 1.00)\). Hispanic asynchronous mean retention rates were not significantly lower than that of Multi-Ethnic asynchronous students, a difference of -.401 points \((p = 1.000)\). Hispanic asynchronous mean retention rates were significantly lower those of White asynchronous students, a difference of -4.46 points \((p < .001)\). Multi-Ethnic asynchronous mean retention rates were significantly lower than that of White asynchronous students, a difference of -4.06 points \((p < .01)\). The difference was significant \((p = .004)\).

**Synchronous Online Students**

The Bonferroni post hoc test (Table 6) exposed the following differences in retention rates among students with different ethnic background in synchronous online courses: Synchronous African American synchronous mean retention rates were significantly lower than those of Asian synchronous students, a difference of -5.78 points \((p < .001)\) and that of White synchronous students, representing a mean difference of -5.70 \((p < .001)\). African American synchronous retention rates were not significantly lower than those of Hispanic synchronous students, representing a mean difference of -1.62 points \((p = 1.00)\) and that of Multi-Ethnic synchronous, representing a mean difference of -2.71 points \((p = .17)\). The differences were not significant \((p = 1.00\) and \(p = .17)\). Asian synchronous mean retention rates were significantly higher than those of Hispanic synchronous students, a difference of 4.16 points \((p < .01)\) and those of African
American synchronous students, representing a mean difference of 5.78 ($p < .001$). The differences were significant ($p = .07$ and $p < .001$). Asian synchronous retention rates were not significantly higher than those of White synchronous students, representing a mean difference of 0.09 points. The difference was not significant ($p = 1.00$) at the 95% confidence level. Hispanic synchronous mean retention rates were not significantly lower than those of Multi-Ethnic synchronous students, a difference of -1.09 points ($p < .05$). The difference was not significant ($p = 1.00$) at the 95% confidence level. Hispanic synchronous retention rates were significantly lower than those of White synchronous

### Table 6

*Bonferroni Post Hoc Synchronous Online Method by Ethnicity*

<table>
<thead>
<tr>
<th>Ethnicity (I)</th>
<th>Ethnicity (J)</th>
<th>Mean difference (I-J)</th>
<th>Std. error</th>
<th>Sig.$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>Asian</td>
<td>-5.782*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>-1.622</td>
<td>1.125</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>-2.716</td>
<td>1.125</td>
<td>.167</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>-5.696*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td>Asian</td>
<td>African American</td>
<td>5.782*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>4.160*</td>
<td>1.125</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>3.066</td>
<td>1.125</td>
<td>.070</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>.086</td>
<td>1.125</td>
<td>1.000</td>
</tr>
<tr>
<td>Hispanic</td>
<td>African American</td>
<td>1.622</td>
<td>1.125</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>4.160*</td>
<td>1.125</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>-1.094</td>
<td>1.125</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>-4.074*</td>
<td>1.125</td>
<td>.004</td>
</tr>
<tr>
<td>Multi-Ethnic</td>
<td>African American</td>
<td>2.716</td>
<td>1.125</td>
<td>.167</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>3.066</td>
<td>1.125</td>
<td>.070</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>1.094</td>
<td>1.125</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>-2.981</td>
<td>1.125</td>
<td>.087</td>
</tr>
<tr>
<td>White</td>
<td>African American</td>
<td>5.696*</td>
<td>1.125</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>-.086</td>
<td>1.125</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>4.074*</td>
<td>1.125</td>
<td>.004</td>
</tr>
<tr>
<td></td>
<td>Multi-Ethnic</td>
<td>2.981</td>
<td>1.125</td>
<td>.087</td>
</tr>
</tbody>
</table>

$^a$Adjustment for the multiple comparisons: Bonferroni.

$^*$Significant at the .05 level.
students, representing a mean difference of -4.07 points ($p < .01$). The difference was significant ($p = .004$). Multi-Ethnic synchronous retention rates were not significantly lower than those of White synchronous students, representing a mean difference of -2.98 points. The difference was not significant ($p = .087$) at the 95% confidence level.

**Second Research Question**

The second research question to be answered was to identify whether there is a difference in retention rates by gender in the various instructional methods in CCCs.

The sample consisted of 215 aggregated data points that represents 3,438,254 CCC students who reached positive retention rates during the fall semester of 2011; 90.9% of them were on-campus students ($n = 3,125.548$ student enrollment counts), 8.2% were asynchronous online students ($n = 281,702$ student enrollment counts), and 0.9% were synchronous online students ($n = 31,004$ student enrollment counts). Statewide retention rates in distance and nondistance courses were viewed under the lens of gender. During the fall semester of 2011, there were: 2,148,325 (52.9%) enrollment counts by female on-campus students; 1,876,842 (46.2%) enrollment counts by male students; and 37,108 (0.9%) enrollment counts by students with unknown gender. The unknown student group that represented less than 1% of the total student population was dropped from this study. Consequently, the factor of gender had two levels: 1 = female; and 2 = male.

Two-way factorial analysis of variance (ANOVA) was employed in this study to examine research question 2. This question focused on differences in retention (DV) rates in California’s community colleges institutions by instructional method (Factor A with 3 levels) and gender (Factor B with 2 levels). This 3x2 factorial procedure was
selected given that the outcome variable was continuous, while the independent variables (referred to as factors) were categorical, having three or two levels. Etas were used to assess the effect sizes. As indicated by Green and Salkind (2011), eta square ($\eta^2$) is reported small (.01), medium (.06), and large (.14), respectively. The researcher reports results using 95% confidence intervals.

**Findings to Research Question 2**

A two-way factorial analysis of variance was conducted to investigate retention rate differences in gender and instructional method categories among credit students at all CCCs during fall semester of 2011. The outcome variable was measured as retention rates in percentages. The CCCCO (2011) defines retention rates of all credit enrollments, the rate at which students completed courses and did not drop or withdraw from them. The factor of gender had two levels: 1 = female; and 2 = male. The factor of Instructional Method had three levels: 1 = On-campus; 2 = Asynchronous Online; and 3 = Synchronous Online.

The Descriptive Statistics table (Table 7) displays the mean percentage of retention rates achieved by female and male students in on-campus, asynchronous online, and synchronous online courses. The standard deviation showed that when comparing the scores of the two groups, male students had the largest spread of scores ($SD = 6.92$), with the most closely related scores being found in the group of female ($SD = 5.97$). Although the overall standard deviation was greater for the male students ($SD = 6.92$), when the instructional method was considered, it was the male students studying in an on-campus course that had the largest spread of scores ($SD = 6.74$) and male students
Table 7

*Descriptive Statistics of Retention Rates by Gender*

<table>
<thead>
<tr>
<th>Profile</th>
<th>$M$</th>
<th>$SD$</th>
<th>On-campus</th>
<th>Asynchronous</th>
<th>Synchronous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>80.43</td>
<td>3.42-6.16</td>
<td>84.43</td>
<td>78.11</td>
<td>78.75</td>
</tr>
<tr>
<td>Male</td>
<td>80.85</td>
<td>4.02-6.74</td>
<td>85.20</td>
<td>76.37</td>
<td>80.35</td>
</tr>
</tbody>
</table>

studying in an asynchronous online course that showed the smallest spread of scores ($SD = 4.02$).

Based upon a review of the histogram, it was determined that the distribution for each group was normal. Further, Levene’s Test was not significant (Appendix E), illustrating that the data did not violate the assumption of homogeneity of variance. As a result, the study failed to reject the null hypothesis.

Interaction of factors was further analyzed by creating a line plot, which demonstrates interaction (Figure 3) between factors. The chart indicated a disordinal relationship. The data points (illustrated on this chart by the small circles) represent the mean values for each group. The line plot indicated that both gender groups had the highest retention rates in on-campus classes in comparison with asynchronous or synchronous online classes. However, all female and male students had a higher retention rate in synchronous online courses when compared with all gender groups in asynchronous online courses. The lowest retention rates can be observed for male students in asynchronous online courses, while the most significant improvement in retention rates can be observed in synchronous online courses among male online students.
ANOVA results, presented in Table 8, showed a significant main effect for Instructional Method, $F = 36.93, p < .001, \eta^2 = .245$. There was not a significant main effect for Gender, $F = .078, p = \text{n.s.}, \eta^2 = .000$. Interaction between Instructional Method and Gender was statistically not significant, $F = 1.78, p = \text{n.s.}, \eta^2 = .012$. This result means that there was no interaction between the two main factors examined, these factors being Gender and Instructional Method. The results of the $\eta^2$ indicated that the main effect of Gender was small, and the main effect of Instructional Method was large. The
Table 8

Two-Way ANOVA Summary Table for Interaction and Main Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between treatments</td>
<td>2785.268</td>
<td>5</td>
<td>557</td>
<td>15.65*</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>2629.00</td>
<td>2</td>
<td>1314.501</td>
<td>36.93*</td>
<td>.245</td>
</tr>
<tr>
<td>Gender</td>
<td>2.78</td>
<td>1</td>
<td>2.78</td>
<td>.078</td>
<td>.000</td>
</tr>
<tr>
<td>Method x Gender</td>
<td>126.87</td>
<td>2</td>
<td>63.43</td>
<td>1.78</td>
<td>.012</td>
</tr>
<tr>
<td>Within treatments</td>
<td>35.58</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .001 level.

results of the partial $\eta^2$ indicated that the interaction between Instructional Method and Gender was small.

Bonferroni post hoc tests were conducted to determine which gender groups were significantly different in retention rates when considering instructional method (Table 9). The text below explains the results of the Bonferroni post hoc test for highest retention rates attained among students in different types of instructional methods with consideration of gender. The mean differences for every possible paired combination of Instructional Methods and Gender were computed at the .01 confidence level. Differences approaching the 95% confidence level were identified on an individual basis.

**Female Students**

The Bonferroni post hoc test (Table 9) revealed the following differences in retention rates among female students in on-campus, asynchronous, and synchronous online courses: Female on-campus mean retention rates were significantly higher than that of female asynchronous online students, a difference of 6.32 points ($p < .001$).
Table 9

**Bonferroni Post Hoc Gender by Instructional Method**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Instructional method (I)</th>
<th>Instructional method (J)</th>
<th>Mean difference (I-J)</th>
<th>Std. error</th>
<th>Sig.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>On-campus</td>
<td>Asynchronous</td>
<td>6.317*</td>
<td>1.227</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td></td>
<td>5.675*</td>
<td>1.227</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Asynchronous</td>
<td>On-campus</td>
<td>-6.317*</td>
<td>1.227</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>Synchronous</td>
<td>-0.642</td>
<td>1.227</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>On-campus</td>
<td>-5.675*</td>
<td>1.227</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Asynchronous</td>
<td>Asynchronous</td>
<td>0.642</td>
<td>1.227</td>
<td>1.000</td>
</tr>
<tr>
<td>Male</td>
<td>On-campus</td>
<td>Asynchronous</td>
<td>8.823*</td>
<td>1.188</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>Synchronous</td>
<td>4.849*</td>
<td>1.188</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Asynchronous</td>
<td>On-campus</td>
<td>-8.823*</td>
<td>1.188</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>Synchronous</td>
<td>-3.974*</td>
<td>1.227</td>
<td>.004</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>On-campus</td>
<td>-4.849*</td>
<td>1.188</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Asynchronous</td>
<td>Asynchronous</td>
<td>3.974*</td>
<td>1.227</td>
<td>.004</td>
</tr>
</tbody>
</table>

*Adjustment for the multiple comparisons: Bonferroni.

*Significant at the .05 level.

Female on-campus retention rates were also significantly higher than that of female synchronous students, representing a mean difference of 5.68 points ($p < .001$). Female asynchronous students had a lower retention rates than those reported by female synchronous online students, a mean difference of .64 points. This difference was not significant ($p = 1.00$).

**Male Students**

The Bonferroni post hoc test (Table 9) exposed the following differences in retention rates among male students in on-campus, asynchronous, and synchronous online courses: Male on-campus mean retention rates were significantly higher than that of male asynchronous online students, a difference of 8.82 points ($p < .001$), as well as that of
male synchronous online students, representing a mean difference of 4.85 ($p < .001$).

Male asynchronous retention rates were also significantly lower than those of male synchronous students, representing a mean difference of -3.97 points ($p < .01$).

However, the pairwise comparisons of female and male students in the each instructional method were not significant. Male on-campus students had a higher retention rate than female on-campus, a mean difference of .77 points ($p = .52$). Female asynchronous online students had a higher retention rate than male asynchronous online students, a mean difference of 1.74 points ($p = .16$). Male synchronous online students had a higher retention rate than female synchronous online students, a mean difference of 1.59 points ($p = .20$).

**Third Research Question**

The third research question to be answered was to identify whether there is a difference in retention rates by age groups in the various instructional methods in CCCs.

The sample consisted of 215 aggregated data points that represents 3,468,372 CCC student enrollment counts that represent positive retention rates of students during the fall semester of 2011; 90.41% of them were on-campus students ($n = 3,135,791$ student retention count), 8.13% were asynchronous online students ($n = 282,042$ student retention count), and 0.9% were synchronous online students ($n = 31,037$ student retention count). Statewide retention rates in distance (asynchronous and synchronous) and nondistance courses were viewed under the lens of age groups. During the fall semester of 2011, there were the following combined retention counts in the investigated instructional methods for the following age groups: 2,242,415 (64.7%) ages 18 to 24; 400,872 (11.6 %) ages 25 to 29; 215,170 (6.2%) ages 30 to 34; 136,167 (3.9%) ages 35 to
203,168 (5.9%) ages 40 to 49; and 147,780 (4.26%) ages 50 and older. Students who were younger than 18 years old and students with unknown age were dropped from this study. Consequently, the factor of age groups had six levels: 1 = 18 to 24 years old; 2 = 25 to 29 years old; 3 = 30 to 34 years old; 4 = 35 to 39 years old; 5 = 40 to 49 years old; and 6 = 50 years and older students.

Two-way factorial analysis of variance (ANOVA) was employed in this study to examine research question 2. The question focused on differences in retention (DV) rates in California’s community colleges institutions by instructional method (Factor A with 3 levels) and age groups (Factor B with 6 levels). This 3x6 factorial procedure was selected given that the outcome variable was continuous, while the independent variable (referred to as factor) of instructional methods was categorical, having three levels, and the independent variable of age groups was ordinal, having six levels. Etas were used to assess the effect sizes. As indicated by Green and Salkind (2011), partial eta square ($\eta^2$) is reported small (.01), medium (.06), and large (.14), respectively. The researcher reports results using 95% confidence intervals.

**Findings to Research Question 3**

A two-way factorial analysis of variance was conducted to determine the effect of age groups and instructional method on retention rates of credit students at all CCCs. The outcome variable was measured as retention rates in percentages. The CCCCO defines retention rates of all credit enrollments, the rate at which students completed courses and did not drop or withdraw from them. The factor of age groups had six levels: 1 = 18 to 24 years old; 2 = 25 to 29 years old; 3 = 30 to 34 years old; 4 = 35 to 39 years old; 5 = 40
to 49 years old; and 6 = 50 years and older students. The factor of Instructional Method had three levels: 1 = On-campus; 2 = Asynchronous (internet-based); and 3 = Synchronous (internet-based).

The Descriptive Statistics table (Table 10) displays the mean percentage of retention rates achieved by students aged 18 to 24, 25 to 29, 30 to 34, 35 to 39, 40 to 49, and 50 and older in on-campus, asynchronous, or synchronous online courses. The standard deviation showed that when comparing the scores of the various age groups, the 25 to 29 year old students had the largest spread of scores ($SD = 8.48$), with the most closely related scores being found in the group of 35 to 39 year old students ($SD = 5.31$) and the 40 to 49 year old students ($SD = 5.60$). The overall standard deviation was greater for the students ages 25 to 29 ($SD = 8.48$). When the instructional method was considered, it was the 25 to 29 year old students studying in an on-campus course that showed the greatest spread of scores ($SD = 11.02$), followed by the 35 to 39 years old students in a synchronous online course that showed a large spread of scores ($SD = 8.94$). The smallest spread of scores was found among the 35 to 39 year old on-campus students ($SD = 2.90$), followed by the 18 to 24 year old students in synchronous online courses ($SD = 3.03$).

Based upon a review of the histogram, it was determined that the distribution for each age group was normal. Further, Levene’s Test was significant (Appendix F), illustrating that the data violated the assumption of homogeneity of variance. As a result, the findings should be reviewed with caution.

---

*Initial data screening led to the alteration of age categories by eliminating groups of students that were younger than 18 years of age, as well as students with unknown age during fall semester of 2011.*
Table 10

*Descriptive Statistics of Retention Rates by Age Groups*

<table>
<thead>
<tr>
<th>Profile</th>
<th>$M$</th>
<th>$SD$</th>
<th>On-campus</th>
<th>Asynchronous</th>
<th>Synchronous</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 to 24</td>
<td>81.07</td>
<td>3.03-4.58</td>
<td>86.09</td>
<td>76.41</td>
<td>79.46</td>
</tr>
<tr>
<td>25 to 29</td>
<td>79.21</td>
<td>5.45-11.02</td>
<td>79.99</td>
<td>77.21</td>
<td>80.44</td>
</tr>
<tr>
<td>30 to 34</td>
<td>78.00</td>
<td>3.61-8.94</td>
<td>83.71</td>
<td>76.37</td>
<td>76.65</td>
</tr>
<tr>
<td>35 to 39</td>
<td>81.87</td>
<td>2.90-6.97</td>
<td>84.59</td>
<td>78.08</td>
<td>81.30</td>
</tr>
<tr>
<td>40 to 49</td>
<td>81.33</td>
<td>3.15-5.82</td>
<td>85.79</td>
<td>77.45</td>
<td>81.09</td>
</tr>
<tr>
<td>50+</td>
<td>81.14</td>
<td>2.62-8.77</td>
<td>86.55</td>
<td>78.81</td>
<td>78.06</td>
</tr>
</tbody>
</table>

Interaction of factors was further analyzed by creating a line plot, which demonstrates some interaction (Figure 4) between factors when on-campus retention rates were compared with asynchronous online retention rates. The chart indicated a disordinal relationship. However, when retention rates of asynchronous and synchronous online students were compared, the chart indicated an ordinal relationship, with the exception of online students 50+ years. The data points (illustrated on this chart by the small circles) represent the mean values for each group. The line plot indicated that all age groups had the highest retention rates in on-campus classes in comparison with asynchronous or synchronous online classes. However, most age groups had a higher retention rate in synchronous online courses when compared with most age groups in asynchronous online courses, except for students 30 to 34 years old and 50+ years old in synchronous online courses. When both online instructional methods were compared, the most significant improvements in retention rates were observed in synchronous online courses among 18 to 24 year old, 25 to 29 year old, 35 to 39 year old, and 40 to 49 year old students. In comparison, students 50+ years old are the only age group that showed lower retention
Figure 4. Line plot of retention rates by age groups and instructional method.

rates in synchronous online courses when compared with asynchronous online courses. The age group of 30 to 34 year old students demonstrated only small improvement in synchronous online courses versus asynchronous online courses.

ANOVA results (Table 11) indicated a significant main effect for instructional method, $F = 27.59, p < .001, \eta^2 = .193$, and a nonsignificant main effect for age groups, $F = 1.14, p = \text{n.s.}, \eta^2 = .020$. Interaction between Instructional Method and Age Groups was statistically not significant, $F = 1.24, p = \text{n.s.}, \eta^2 = .043$. This result means that there was interaction between one main factor examined, this factor being Instructional
Table 11

Two-Way ANOVA Summary Table for Interaction and Main Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between treatments Method</td>
<td>3300.685</td>
<td>17</td>
<td>194.158</td>
<td>5.52*</td>
<td></td>
</tr>
<tr>
<td>Age groups</td>
<td>201.920</td>
<td>5</td>
<td>40.384</td>
<td>1.14</td>
<td>.020</td>
</tr>
<tr>
<td>Method x Age Groups</td>
<td>434.602</td>
<td>10</td>
<td>43.460</td>
<td>1.24</td>
<td>.043</td>
</tr>
<tr>
<td>Within treatments</td>
<td>7455.929</td>
<td>240</td>
<td>31.066</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*R Squared = .307 (Adjusted R Squared = .258).

*Significant at the .001 level.

Method. The results of the partial $\eta^2$ indicated that the main effect of Instructional Method was large, and the main effect of Age Group was small. The results of the $\eta^2$ indicated that the interaction between Instructional Methods and Age Groups was small.

Bonferroni post hoc tests were conducted to determine which age groups were significantly different in retention rates when considering instructional method (Tables 12 through 17). The text below explains the results of the Bonferroni post hoc test for highest retention rates attained among students in different types of instructional methods with consideration of age groups. The mean differences for every possible paired combination of Instructional Methods and Age Groups were computed at the 95% .01 confidence level. Differences approaching the 95% confidence level were identified on an individual basis.
Students 18 to 24 Years Old

The Bonferroni post hoc test (Table 12) exposed the following differences in retention rates among students, 18 to 24 years old, in on-campus, asynchronous, and synchronous online courses: On-campus students, 18 to 24 years old, showed mean retention rates that were significantly higher than asynchronous online students, a difference of 9.68 points ($p < .001$) and higher than synchronous online students, a difference of 6.63 points ($p < .001$), while the mean difference of 3.05 points between asynchronous and synchronous students was not significant ($p = .018$).

Table 12

<table>
<thead>
<tr>
<th>Age group</th>
<th>Instructional method (I)</th>
<th>Instructional method (J)</th>
<th>Mean difference (I-J)</th>
<th>Std. error</th>
<th>Sig.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-24</td>
<td>On-campus</td>
<td>Asynchronous</td>
<td>9.682*</td>
<td>1.526</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Synchronous</td>
<td>6.628*</td>
<td>1.526</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Asynchronous</td>
<td>On-campus</td>
<td>-9.682*</td>
<td>1.526</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Synchronous</td>
<td>-3.053</td>
<td>1.609</td>
<td>.177</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>On-campus</td>
<td>-6.628*</td>
<td>1.526</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asynchronous</td>
<td>3.053</td>
<td>1.609</td>
<td>.177</td>
</tr>
</tbody>
</table>

*Adjustment for the multiple comparisons: Bonferroni.
*Significant at the .05 level.

Students 24 to 29 Years Old

The Bonferroni post hoc test (Table 13) showed the following differences in retention rates among students, 24 to 29 years old, in on-campus, asynchronous and synchronous online courses: Students 25 to 29 years old showed no significant mean differences in any of the three instructional methods. In this age group, on-campus students had a slightly higher retention rate than asynchronous students with a mean
Table 13

**Bonferroni Post Hoc—Age Groups (25 to 29 Years Old) by Instructional Method**

<table>
<thead>
<tr>
<th>Age group</th>
<th>Instructional method (I)</th>
<th>Instructional method (J)</th>
<th>Mean difference (I-J)</th>
<th>Std. error</th>
<th>Sig.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-29</td>
<td>On-campus</td>
<td>Asynchronous</td>
<td>2.770</td>
<td>2.275</td>
<td>.674</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>On-campus</td>
<td>-4.58</td>
<td>2.275</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>Synchronous</td>
<td>-2.770</td>
<td>2.275</td>
<td>.674</td>
</tr>
<tr>
<td></td>
<td>On-campus</td>
<td>Asynchronous</td>
<td>.458</td>
<td>2.275</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>Asynchronous</td>
<td>3.228</td>
<td>2.275</td>
<td>.472</td>
</tr>
</tbody>
</table>

*Adjustment for the multiple comparisons: Bonferroni.

difference of 2.77 points ($p = .674$ or $p = n.s.$), and synchronous online students had a little higher retention rate than on-campus students. The mean difference was .49 points ($p = 1.00$ or $p = n.s.$). The retention rates in asynchronous were lower than in synchronous online courses with a mean difference of 3.23 points ($p = .472$ or $p = n.s.$)

**Students 30 to 34 Years Old**

The Bonferroni post hoc test (Table 14) demonstrated the following differences in retention rates among students, 30 to 34 years old, in on-campus, asynchronous and synchronous online courses: The instructional method made a difference for students, age 30 to 34 years old. On-campus students in this age group demonstrated a mean difference of 7.34 points ($p = .027$) in comparison with asynchronous students and a mean difference of 7.07 points ($p = .039$). Both differences were approaching significance at the 95% confidence level. There was no significant mean difference between asynchronous and synchronous students in this age group ($p = 1.00$ or $p = n.s.$).
Table 14

*Bonferroni Post Hoc—Age Groups (30 to 34 Years Old) by Instructional Method*

<table>
<thead>
<tr>
<th>Age group</th>
<th>Instructional method (I)</th>
<th>Instructional method (J)</th>
<th>Mean difference (I-J)</th>
<th>Std. error</th>
<th>Sig.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-34</td>
<td>On-campus</td>
<td>Asynchronous</td>
<td>7.344*</td>
<td>2.787</td>
<td>.027</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td></td>
<td>7.070*</td>
<td>2.829</td>
<td>.039</td>
</tr>
<tr>
<td></td>
<td>Asynchronous</td>
<td>On-campus</td>
<td>-7.344*</td>
<td>2.787</td>
<td>.027</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td></td>
<td>-.274</td>
<td>2.327</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>Asynchronous</td>
<td>-7.070*</td>
<td>2.829</td>
<td>.039</td>
</tr>
</tbody>
</table>

*Adjustment for the multiple comparisons: Bonferroni.*

*Significant at the .05 level.

**Students 35 to 39 Years Old**

The Bonferroni post hoc test (Table 15) revealed the following differences in retention rates among students, 35 to 39 years old, in on-campus, asynchronous, and synchronous online courses: There was a mean difference, that was approaching significance, between on-campus students, 35 to 39 years old, and asynchronous online students with a mean difference of 6.51 points ($p = .008$ or $p < .05$). The mean difference between on-campus and synchronous students in this age group was not significant with 3.29 points ($p = .32$ or $p = n.s.$). Synchronous online students had no significantly higher retention rate than asynchronous online students with 3.22 points ($p = .45$ or $p = n.s.$).

**Students 40 to 49 Years Old**

The Bonferroni post hoc test (Table 16) exposed the following differences in retention rates among students, 40 to 49 years old, in on-campus, asynchronous, and synchronous online courses: In the age group of 40 to 49 year old students, on-campus students had a significantly higher retention rate than those reported by asynchronous
Table 15

*Bonferroni Post Hoc—Age Groups (35 to 39 Years Old) by Instructional Method*

<table>
<thead>
<tr>
<th>Age group</th>
<th>Instructional method (I)</th>
<th>Instructional method (J)</th>
<th>Mean difference (I-J)</th>
<th>Std. error</th>
<th>Sig.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-39</td>
<td>On-campus</td>
<td>Asynchronous</td>
<td>6.507*</td>
<td>2.133</td>
<td>.008</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>3.286</td>
<td></td>
<td>2.029</td>
<td>.320</td>
</tr>
<tr>
<td>35-39</td>
<td>Asynchronous</td>
<td>On-campus</td>
<td>-6.507*</td>
<td>2.133</td>
<td>.008</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>-3.221</td>
<td></td>
<td>2.283</td>
<td>.479</td>
</tr>
<tr>
<td>35-39</td>
<td>Synchronous</td>
<td>Asynchronous</td>
<td>-3.286</td>
<td>2.029</td>
<td>.320</td>
</tr>
<tr>
<td></td>
<td>Asynchronous</td>
<td>3.221</td>
<td></td>
<td>2.283</td>
<td>.479</td>
</tr>
</tbody>
</table>

*a Adjustment for the multiple comparisons: Bonferroni.
*Significant at the .05 level.

Table 16

*Bonferroni Post Hoc—Age Groups (40 to 45 Years Old) by Instructional Method*

<table>
<thead>
<tr>
<th>Age group</th>
<th>Instructional method (I)</th>
<th>Instructional method (J)</th>
<th>Mean difference (I-J)</th>
<th>Std. error</th>
<th>Sig.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-49</td>
<td>On-campus</td>
<td>Asynchronous</td>
<td>8.336*</td>
<td>2.231</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>4.694</td>
<td></td>
<td>2.275</td>
<td>.121</td>
</tr>
<tr>
<td>40-49</td>
<td>Asynchronous</td>
<td>On-campus</td>
<td>-8.336*</td>
<td>2.231</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>-3.641</td>
<td></td>
<td>2.231</td>
<td>.312</td>
</tr>
<tr>
<td>40-49</td>
<td>Synchronous</td>
<td>On-campus</td>
<td>-4.694</td>
<td>2.275</td>
<td>.121</td>
</tr>
<tr>
<td></td>
<td>Asynchronous</td>
<td>3.641</td>
<td></td>
<td>2.231</td>
<td>.312</td>
</tr>
</tbody>
</table>

*a Adjustment for the multiple comparisons: Bonferroni.
*Significant at the .05 level.
students, a mean difference of 8.34 points \((p < .001)\). The difference between on-campus and synchronous students was not significant with 4.70 points \((p = .12 \text{ or } p = \text{n.s.})\), as well as the mean difference between asynchronous and synchronous students with 3.64 points \((p = .312 \text{ or } p = \text{n.s.})\).

**Students 50 Years Old and Older**

The Bonferroni post hoc test (Table 17) exposed the following differences in retention rates among students, 50 years old and older, in on-campus, asynchronous, and synchronous online courses: The instructional method matters for students in the age group 50 years and older. On-campus students had a higher mean difference in retention rates of 7.73 points \((p < .01)\) than asynchronous students and a higher retention rate than synchronous online students with 8.49 points \((p < .001)\). With .76 points there was no significant mean difference between asynchronous and synchronous students \((p = 1.00 \text{ or } p = \text{n.s.})\) in this age group.

Table 17

<table>
<thead>
<tr>
<th>50+ Years Old</th>
<th>Instructional Method (I)</th>
<th>Instructional Method (J)</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-campus</td>
<td>Asynchronous</td>
<td>7.732(^*)</td>
<td>2.275</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>8.488(^*)</td>
<td>2.275</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>Asynchronous</td>
<td>On-campus</td>
<td>-7.732(^*)</td>
<td>2.275</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>.756</td>
<td>2.275</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Synchronous</td>
<td>On-campus</td>
<td>-8.488(^*)</td>
<td>2.275</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asynchronous</td>
<td>-.756</td>
<td>2.275</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\)Adjustment for the multiple comparisons: Bonferroni.

\(*\)Significant at the .05 level.
Summary

Chapter 4 provided a report of findings found in analyzing data retrieved from the CCCCCO (2011) *Data Mart*. During the statistical testing of the instructional strategies and student demographics on retention rates, this study contributed to develop an understanding of factors leading to student achievement in undergraduate online credit courses. In chapter 5, these findings are discussed, and the instructional methods are examined for alignment with the Community of Inquiry (COI) model, as well as Moore’s principles of transactional distance. In addition, implications for practice and recommendations for future research are presented.
CHAPTER 5—DISCUSSION AND RECOMMENDATIONS

The purpose of the study was to examine the online instructional methods in place in the California community colleges (CCCs) that facilitate students’ learning in an online environment. Retention rates were used to measure the effectiveness of three instruction method that include on-campus, asynchronous, and synchronous online courses. The previous chapters provided an introduction to the study and a description of the research design (chapter 1), a review of the literature (chapter 2), a description of the method and theoretical framework (chapter 3), and findings from ANOVA analyses of data (chapter 4). This final chapter presents a discussion of key findings, the significance of these findings, and conclusions. This chapter also addresses recommendations based on the study findings, and implications for future research. It is important that undergraduate students with different backgrounds studying any subject areas be able to identify the appropriate instructional method (on-campus, asynchronous, or synchronous online) that allows them to comprehend, navigate, and succeed (as measured by retention rates) in credit courses offered by CCCs. Similarly, community colleges need to be able to identify effective and meaningful online teaching tools that will improve online learners’ retention rates.

For the theoretical framework, this study used the Garrison et al. (1999) Model of Online Learning that includes six interrelated perspectives to guide the design of interaction in online learning environments. They refer to the conceptual model of online learning as a Community of Inquiry (CoI) model. The CoI model focuses on appropriate interaction analysis techniques that assist in examining the negotiation of meaning and co-construction of knowledge in collaborative learning environments facilitated by
computer conferencing with interaction capabilities. In alignment with the CoI model, this analysis tested the interaction among participants, such as interaction between teacher and students, as well as interactions between students and students. This study did not explore the interaction between participants and course content.

When examining instructional strategies in online courses, it was important to consider the theory that supports learning in community college online students since online course offerings are expected to grow exponentially, and the CoI framework was developed with interaction and collaboration in online courses in mind. Garrison et al. (1999) identified six principles of interaction that need to be considered when designing online courses for adult learners. The principles suggested that learners need to be actively motivated and engaged through interaction in the learning process by implementing activities that encourage discourse and interaction between students and students, between students and content, between students and teachers, between teacher and content, between teacher and teacher, and between content and content (T. Anderson, 2008). For the purpose of this present study, alignment with the CoI model was limited to Garrison et al.’s (1999) principles of interaction between student to instructor and student to student interactions. Specifically, their assumptions consider online learners to improve learning by providing a sufficient degree of: (a) cognitive presence; (b) social presence; and (c) teacher presence.

To briefly summarize, while the overall number of students taking at least one online course has gone up every year (I. E. Allen & Seaman, 2011), undergraduate students in online courses at California’s community colleges are not reaching the same retention rates as students in on-campus classes. With higher dropout rates for distance
education (10-20%) over traditional programs (Carr, 2000), researchers have isolated the lack of face-to-face contact as the cause of why online courses were not effective with some learners (Garrison et al., 2003; Garrison, Cleveland-Innes, et al., 2010; Rovai, 2001; Rovai & Downey, 2010). Such findings continue to correlate with results that were recognized at the local level. For example, in 2011, the Office of Institutional Research and Planning at the San Diego Community College District (SDCCD) reported that the overall retention rates of SDCCD on-campus students were higher than the retention rates of SDCCD online students. In the academic year of 2010-11, retention rates of on-campus classes reached 85%, and retention rates of online classes remained at 80%.

In response to the growing number of community college students in online courses that demonstrated consistently lower retention rates, the emphasis of this present study was on different types of online course delivery (asynchronous versus synchronous) and student demographics of ethnicity, gender, and age groups.

Since August of 2008, the process of planning, designing, and teaching online at California’s community colleges is guided by the CCCCO’s Distance Education Guidelines (CCCCO, 2008). The Board of Governor’s for the California Community Colleges approved these guidelines in alignment with the California Code of Regulations, Title 5 related to distance education. The regulations covered in these guidelines permit colleges to explore and develop educational initiatives using advanced communication and computing technologies to address student access issues related to geographical, cultural, disability, and facility barriers. In combination, these regulations, codes, and policies inform accepted standards for responsible conduct of online education. However, while there are recommended standards for online courses, practices can vary
among institutions and instructors. Researchers recognized the inconsistency across online education specific to standards, and norms of online teaching practice present challenges to curricular development (Garrison et al., 2003). The question of the relative efficacy of online and face-to-face instruction needed to be revisited in light of the wide range of online learning applications, software options, and internet resources in today’s distance education. Policymakers and practitioners want to know about the effectiveness of internet-based, interactive online approaches and need information about the conditions under which online learning is effective with consideration of students’ background. This study examined an approach to online instruction that employed interactive strategies with the opportunity for immediate communication.

Clearly, the literature presents a myriad of results, implications, and potential pathways to higher student retention in online courses (Enriquez, 2010; Garrison et al., 1999, 2010; Moore & Kearsley, 1996, 2011; Shea & Bidjerano, 2009). However, a re-examination of online learning and online students against online education’s current backdrop in CCCs is necessary in determining appropriate and innovative approaches to lowering students’ dropout rates in online courses. In order to compare the student learning outcomes of online students (asynchronous and synchronous) with on-campus students at California’s community colleges, the following research questions were addressed:

1. Is there a difference in retention rates by ethnicity in the various instructional methods?

2. Is there a difference in retention rates by gender in the various instructional methods?
3. Is there a difference in retention rates by age groups in the various instructional methods?

Findings from this study provide insight into instructional methods that are associated with greater retention rates for particular students. The results of the two-way ANOVA analyses exposed the student groups (ethnicity, gender, and age groups) that demonstrated better performances as measured by retention rates when taking a course that is utilizing one particular instructional approach (on-campus, asynchronous, and synchronous).

**Key Findings**

The theoretical framework and analysis of data sources produced key findings that have significant implications for teaching and learning in CCCs. These findings are introduced in the order of the three research questions, followed by a more detailed explanation of implications for online instruction.

**Research Question 1**

The first research question to be answered was to identify whether there is a difference in retention rates by ethnicity in the various instructional methods in credit courses at CCCs.

The statistical analyses confirmed that all ethnic groups performed better in synchronous online courses than in asynchronous online courses. All students, independent of their ethnic background, performed better in on-campus courses than in any of the online courses under investigation. However, retention rates in online courses improved significantly when the synchronous instructional methods were employed.
It is important to note that the differences in retention rates between on-campus and online students tended to be significantly larger for some ethnic groups in the asynchronous learning environment when compared to the synchronous online course. The instructional online method did not seem to impact significantly the retention rates of Asian and White students in any of the three instructional methods. When differences among the ethnic groups in on-campus classes were compared, it was the Asian students compared with White students and the Hispanic students compared with Multi-Ethnic students who demonstrated no significant difference. All other comparisons among ethnic groups showed significant difference in retention rates. The same correlation in retention rates among the same ethnic groups were found in asynchronous online courses.

The results changed tremendously when ethnic groups were compared in the synchronous online courses. In the pairwise comparison, most ethnic groups did not show a significant difference in retention rates when the synchronous instructional method was employed and when compared with on-campus students. This phenomenon was evident in the following comparisons:

1. African American students compared with Hispanic students ($p = \text{n.s.}$).
2. African American students compared with Multi-Ethnic students ($p = \text{n.s.}$).
3. Asian students compared with Multi-Ethnic students ($p = \text{n.s.}$).
4. Asian students compared with White students ($p = \text{n.s.}$).
5. Hispanic students compared with Multi-Ethnic students ($p = \text{n.s.}$).
6. Multi-Ethnic students compared with White students ($p = \text{n.s.}$).

Multi-Ethnic students performed as well as the Asian and White students followed closely by Hispanic students who showed no significant difference in retention rates as
compared with Multi-Ethnic students. Even though there was a significant difference in retention rates between the lowest performing group (African American students) and the highest performing group (Asian students), the difference between the two ethnic groups was to a great extent smaller than in any other instructional method including traditional on-campus method. Thus, the African American students improved their retention rates in an online class when they were able to interact without delay. It can be concluded that the synchronous instructional method has an overall significant impact on retention rates among students of minority groups, such as African American, Hispanic, and Multi-Ethnic students.

The analysis on differences in retention rates in different instructional methods under the lens of ethnicity painted a salient picture of results. It was the combination of elements in the treatment conditions that allowed some students to perform better in synchronous online courses than in asynchronous classes. For example, synchronous online courses included additional opportunities for collaboration and immediate interactions, as well as additional learning time and materials through archived web-based recordings of each live session. These features, unique to synchronous online learning, produced the observed learning advantage as demonstrated in higher retention rates. When African American, Hispanic, and Multi-Ethnic students experienced a lack of social interaction with immediacy, retention rates in an online course decreased significantly. There was a significant mean difference between African American students in an on-campus course and African American students in an asynchronous online course, with a mean difference of 10.0 points ($p < .001$). The mean difference between on-campus and synchronous African American students was also significant.
with 4.0 points ($p < .001$). However, even if the difference was modest, it is important to acknowledge the significantly higher retention rates of African American students in a synchronous online course versus an asynchronous online course.

This ethnic and racial gap in the academic retention of undergraduate online students in community colleges sheds light on the academic difficulties especially experienced by African American, Hispanic, and Multi-Ethnic students in asynchronous online courses. As Barnes (2010) demonstrated, students enter community colleges with an increased need for remediation, and just over half (51%) of high school graduates have the reading skills they need to succeed in college. Matthews, Kizzie, Rowley, and Cortina (2010) found that this literacy gap among African American and Hispanic students begins as early as in fifth grade. African American and Hispanic college students are nearly twice as likely to need remedial help (Cole & Gonyea, 2010). In asynchronous online courses, students spent the majority of time reading course materials, posting their writings on the discussion board and taking written quizzes or tests. Other online learning resources that are used to support asynchronous interaction include emails, wikis, and blogs. In summary, students are required to comprehend and interact through reading and writing. A study by Wojciechowski and Palmer (2005) confirmed a statistically significant relationship within the overall student population ($n = 179$) at a community college between the student’s online grade and the GPA, ASSET Reading score, and ACT English score. Similar to the findings for the ASSET Reading scores, there was statistically significant relationship between ACT English scores and final grades in the asynchronous online course ($r = .307; p = .07$), meaning that the higher the ACT English test score for the general population, the higher the grade
in the online course. The findings of this study reinforced the implication in this study that online African American, Hispanic, and Multi-Ethnic students with reading and writing challenges benefitted from increased interaction offered by the synchronous online method.

The civil rights movement transformed race relations in the United States and produced a vigorous effort to incorporate African American and Hispanic students into colleges and universities (A. M. Cohen & Brower, 2008; Massey & Fischer, 2005; Milem, Clayton-Pedersen, Hurtado, & Allen, 1998). Decades later, despite a variety of retention efforts (e.g., remedial education, financial aid, etc.), African American and Hispanic students continued to underperform relative to their White and Asian counterparts, earning lower grades and dropping out at higher rates (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008). While these differentials persisted among African American students in asynchronous online classes, the present study found that controlling for the opportunity of immediate interaction in synchronous online classes improved significantly the retention rates of these students. Therefore, African American, Hispanic, and Multi-Ethnic students benefitted the most from the opportunity for immediate interaction. This trend demonstrated a potential path to increasing the course completion levels among these students who traditionally demonstrate lower retention rates.

**Research Question 2**

The second research question sought to identify whether there is a difference in retention rates by gender in the various instructional methods in credit courses at CCCs.

The pairwise comparison of female and male students in all three types of courses revealed that (a) there was a significant difference in retention between female on-campus
students when compared with asynchronous and synchronous online students; and (b) there was a significant difference in retention between male on-campus students when compared with asynchronous and synchronous online students. Thus, both female and male students were achieving higher retention rates in on-campus classes.

The comparison between female asynchronous and synchronous online students demonstrated no significant differences in retention rates. When retention rates of female students in both online instructional methods were compared, it did not matter if female students took an online course with or without the opportunity of immediate interaction. This finding suggested that female students are self-directed learners who do not depend on the instructor-guided learning environment in the synchronous online courses.

In contrast, male online students performed significantly better when they were studying in the synchronous online environment rather than in the asynchronous online setting. Male learners might have dropped out of asynchronous online courses due to the lack of instructor oversight, lack of motivation, and lack of support. This finding is in alignment with research of Swanson, Cunningham, and Spencer (2003) who found that negative stereotyping and tracking from early experiences in educational settings influence African American males’ scholastic achievement. In summary, it was important for retention that male online students felt connected with the course, its instructor, and fellow classmates. The group dynamic of synchronous online learning was an important factor in creating a supportive and comfortable learning environment for male online students.
Research Question 3

The third research question to be answered was to identify whether there is a difference in retention rates by age in the three instructional methods in credit courses at CCCs.

Because students’ lives today are saturated with digital media at a time when their brains are still developing, many popular press authors claim that the youngest generation of undergraduate students thinks and learns differently than any other generation. However, according to Thompson (2013) the evidence to support these claims is scarce. The results of this present study also found no evidence to support claims about the advantage of the digital native generation as online learners.

Although access to and use of the internet is widespread, students who were 18 to 24 years old showed a significant difference in retention between on-campus learning methods and both online learning methods. Neither of the online instructional methods, referring to asynchronous as well as synchronous online learning strategies, had a positive impact on retention for this age group of digital natives. In contrast, students 25 to 29 years old performed equally well in on-campus, asynchronous, and synchronous online courses. It is the only age group who demonstrated no significant difference in retention in any of the pairwise comparisons. Students within category are digital natives as well, but slightly more mature than those in the 18-24 group.

In most age groups, even if the differences were not significant, students performed better in synchronous online courses when compared with students in asynchronous online courses. The only age group where differences in both online instructional methods were equally lower than in the on-campus students was the 30- to
34-year-old age group. Community college students at this particular age have often more complex life circumstances that include work schedules, care of children, single parent status, and more. These factors outside the course environment seemed to influence the retention rates of students in this age group. Bean and Metzner (1985) identified age, especially being over 24, as one of the most common variables in studies of nontraditional student attrition. In their opinion, students over 24 years old represented a population of adult learners who often have family and work responsibilities that can interfere with successful attainment of educational goals. Other characteristics typically used to characterize nontraditional students are part-time student status and full-time employment. The results of this study implied that the impact of being a nontraditional student still holds true. However, the nontraditional student label in this study seemed to be more accurately describing the older students particularly to the students 30 to 34 years old. While the 24- to 29-year-old students was the best performing age group with no significant differences in retention rates, the age group with the lowest overall retention rates was the group of students 30 to 34 years old.

High rates of attrition for asynchronous online students, ages 30 to 34 years old, can be seen as dissatisfaction with their online learning environment. In short, while adults of this age group might have been attracted to higher education online programs because of advantages of time and location flexibility, those advantages were not strong enough to retain them. However, retention was positively impacted by establishing a social environment within the course.

Comparing the retention rates of the older age groups, it is important to note that, for online students 35 to 39 years old and 40 to 49 years old, the opportunity for
immediate interaction with instructor, peers, and course content made a difference in their retention rates. While there was no significant difference between on-campus students and synchronous online students, there was a significant difference between on-campus students and asynchronous students. Findings suggested the influence of the synchronous online teaching methodology for these age groups was very decisive. In alignment with previous research (T. Anderson & Dron, 2010; Moore, 1993; Rovai, 2001; Vygotsky, 1978), the 35- to 39- and the 40- to 49-year-old college students need to feel involved and develop relationships with other students in an online course. Following from an appreciation of the social nature of synchronous online learning, learning and cognitive development were recognized as substantially impacting retention rates among some age groups.

The most unexpected finding of this study was the low performance of students 50+ years old in the synchronous online environment. This age group was the only age group that performed worse in synchronous online courses than in asynchronous online courses. This is also the age group furthest removed from digital native category. Some of the methods used in asynchronous courses parallel the computer-assisted programs of the 1960s and 1970s, but a sharp learning curve is required for achieving a comfort level with the computer skills needed in synchronous courses.

In the last decade, an important debate about the age-related characteristics of today’s students has arisen due to their intensive experience as users of technology. The most common belief is that frequent use of technologies in everyday life creates competent users who are able to transfer their digital skills to learning activities in an online environment. Several researchers labeled the younger generation as digital natives.
(Gros, Garcia, & Escofet, 2012; Jung & McMahon, 2012; Prensky, 2001; Simpson, 2013). In their opinion, the millennium students have the advantage of being accustomed to the use of online technologies. However, findings of this study reveal different results suggesting that the digital native label does not provide evidence of a better use of technology to support improved learning. The younger age (18 to 24 years old) group did not perform as well as the other age groups in either type of online instructional method. This finding implies that the use of technology to support learning is not related to the fact of belonging or not to the internet generation. Retention rates among freshmen students might be influenced by other factors, including the general maturity of students, freshman year mental health status (e.g., internet addiction, anxiety, depression, and self-concept) and freshman year adaptive problems. The debate has to expand and focus on the implications of being a learner in a digitalized world.

Summary

Many studies have explored the benefits of online learning, such as convenience and flexibility (T. Anderson, 2008), as well as its challenges including technical difficulties, lack of a sense of community (McBrien et al., 2009), and delayed communication (Song, Singleton, Hill, & Koh, 2004). However, only a few studies have investigated the impact on retention rates among community college online students in a synchronous online environment under the lens of ethnicity, gender, and age. These studies were limited in scope. The present research, extending to all CCC students across all subject areas, led to the conclusion that online learning can be enhanced by giving learners the opportunity for immediate interactions. The results indicated that manipulations by the synchronous online method trigger learner activity, learner
reflection, and effective learning as measured by retention rates. The present study provided evidence of higher retention rates when immediate interaction dominates internet instruction. These results were particularly strong for African American, Multi-Ethnic, and Hispanic students, 25- to 29- and 35- to 49-year-old students, as well as for male students.

**Recommendations**

This study focused on two main goals for improved online student retention. The first goal was the relationship between student characteristics and online student retention. The second goal was to examine the results of the online course by considering increased interaction in online courses. The findings presented here will inform policy-makers, practitioners, and administrators about the effectiveness of internet-based, interactive online learning approaches and can guide decisions on creating conditions under which online learning is effective for specific groups of community college students. Those students who have the opportunity to communicate promptly with instructors and peers are more likely to persist than those students who must wait for a response. Therefore, one strategy to help increase retention is to provide students with increased effective support by promoting a strong sense of community through the CoI. Such a strategy has the potential to reverse feelings of isolation and, by making connections with other learners, to provide students with a larger base of academic support through immediate interactions.

By manipulating the communications media and designing an online course to take full advantage of these capabilities, dialogue can be increased and transactional distance reduced. To encourage all learners to access and participate in online
discussions on a regular basis, learners should understand that course participation (synchronous and asynchronous) is not only a course requirement, but is also a graded component of the course. Accordingly, all members of the learning community should be graded on the quantity, quality, and timeliness of their interactions.

The physical separation of students in programs offered at a distance has a tendency to reduce the sense of community, giving rise to feelings of disconnection, isolation, distraction, and lack of personal attention, which could affect student persistence in distance education courses or programs. The findings from this study support the idea that these students benefitted from an instructional format that offered increased opportunity to interact immediately with the instructor and peers and not an online format that relies primarily on written interaction. Consequently, it seems that a face as provided in synchronous online classes does make a difference for students who are more likely to have a need for remediation and are more immature learners. Instructors and institutions need to examine curricular alignment with principles of synchronous online learning in relation to adult online learning. Implications from this study include instructional strategies to facilitate the community-building process and guidelines for instructors to effectively conduct collaborative learning experiences in online courses.

In addition, according to the results of this study, self-regulation seemed to be a considerable challenge for younger, male students with African American, Hispanic, or Multi-Ethnic background. Deci and Ryan (1985) defined self-regulation as self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals. Research states that self-regulation and self-determination are the best
predictors of academic success in educational environments (Hull, 1958; Pintrich & De Groot, 1990; Skinner, 1953; B. J. Zimmerman, 2008). Also, research shows that successful students use self-regulated learning strategies in online courses (Artino & Jones, 2012; Dabbagh & Kitsantas, 2012). In general, successful students are mature enough to know what their responsibilities are and can control their learning through self-discipline. At the same time, interaction with peers and instructors without delay as in synchronous online courses played an important role in ensuring students’ success. The ANOVA results showed that synchronous instructional methods can successfully guide students in their learning process and can make up for their lack of self-regulatory learning strategies.

Implications and subsequent efforts toward improving student retention have to focus on the students themselves (T. W. Anderson, 2011). Some of these factors consider the role of life challenges, academic-related skills, student background, and commitment to succeed (T. W. Anderson, 2011). More colleges need to present students who do not complete a course with an exit survey to collect information on reasons why the student is leaving an online course. Some of these self-reported causes for dropping out of courses might include: work demands, discouragement/lack of motivation, cost, obligations to friends/family, lack of support from family and friends, lack of teachers to provide support, obtained employment, and other life events. Together with the quantitative findings of this present study, administrators, and instructors will be able to differentiate the various reasons for low retention rates among certain student groups.

Most traditional universities offer some form or forms of technology-mediated education to selected populations of students. College administrations need to address
issues pertaining to the retention rates of online learning and develop distinctive strategies that fall into the following categories: policy, planning, resources, scheduling, and support. There are two essential levels of planning required to develop and sustain effective online learning: strategic and operational planning. Strategic planning involves the identification of needs, goals, objectives, potential costs, and available resources. Costs that need to be determined will include technology, delivery model and schedules, human resources (e.g., administrative support, course developers, instructors, training, and technical assistance), and infrastructure (e.g., hardware/software, internet access, and office space). Operational plans are necessary to optimize the goals and objectives in a strategic plan. With respect to online learning, operational planning involves attending to the noninstructional components including the following: promotional and advertising strategies, managing technology, and creating an effective assessment process. In summary, there is a need for a more formal approach to the development of policies and operation guidelines to support successful online learning approaches that will provide an interactive learning experience to large numbers of students in ways that are accessible and cost effective.

**Further Research**

Results of this data analysis suggest opportunities for further research that focuses on teacher expectations, adaptation of the Community of Inquiry model for distance delivery, and broadening the application of distance educational research. The data used in this study did not reveal any insight to factors that include: (a) how much experience the instructors have in teaching with a particular method and with a specific tool; (b) how much experience the students have in learning with a particular method and with a
specific tool; (c) how much technical support teachers and instructors receive at their particular college; (d) whether individuals in the CCC distance education environment belong to the *digital natives* or the *digital immigrants* (Prensky, 2001); and (e) whether students display different comfort levels with the various technologies.

Other student demographics beyond ethnicity, gender, and age are elements to explore in future investigations. Factors that might further help to predict student retention in different types of online courses might include students’ life situations, such as work schedules versus full-time student status and marital status with or without children, as well as variables such as academic skills and abilities, motivation, commitment, and locus of control. Emerging quantitative, qualitative, and mixed methods approaches to retention-related research studies could attempt to identify student patterns, pathways, predictors, and personal characteristics informing persistence, progression, and completion. As the distance education field matures, it is to be hoped that greater attention will be paid to variables besides the instructional method, especially the design of courses, the selection and training of instructors, and the learning styles of students.

Also, the nature of reenrollment is not yet well understood and may include complex life factors that do not easily fit within the quantifiable or predictable constructs used in this study. As such, this research is limited by the range of the data and may well not account for students who will return at some later date. The fact that many community college students go back to school during times of high unemployment and return to the labor force when they can find meaningful employment should be considered as a potentially major factor in retention rates.
In order to design online courses or programs to fit the needs of online students, it is necessary to investigate the characteristics of successful online learners. A qualitative method of inquiry could give information about intrinsic goal orientation, task value, self-efficacy, cognitive-strategy use, satisfaction, and self-regulation and how these factors correlate with online success. Educational level, reading skills, and external locus of control could be considered as other variables that influence retention among CCC students. Other variables could include factors such as socioeconomic conditions, academic and institutional interactions, social interactions, and life situations. A student’s grade point average (GPA) might also reveal important information as a predictor of retention rates in online courses. However, there are no studies that investigate if there is a significant difference between the two online course formats (asynchronous and synchronous) among students entering with higher or lower GPAs.

Online instruction should strive to accommodate cognitive styles and preferences of learners of diverse cultures. Culture is defined as values, beliefs, and practices shared by a group of people (A. B. Cohen, 2009; Hunter, 1991) and should be recognized as an important factor influencing learning behavior and approaches in an online learning environment. Cultural expectations could affect communication patterns and manner of information presentation. The interaction in online courses should strive to accommodate cognitive styles and preferences of learners of diverse cultures, which could lead to culturally responsive uses of technology and instructional strategies.

In the field of education, emotions were found to affect students’ cognitive learning. Consequently, emotional intelligence has been discussed as one of the main factors to promote personal intellectual growth (J. Cohen, 2006; Frenzel, Goetz, Lüdtke,
Pekrun, & Sutton, 2009). While the quantitative data and statistical analysis of this present study provided important information on the differences in effectiveness among various instructional methods as measured by retention rates, the findings do not provide researchers and practitioners with insight into what students thought and how students felt as measured by qualitative data, such as written comments from students. Without qualitative or survey data, the voice of the student was not heard, and the institution cannot gather data directly from online students, many of whom were invisible to the institution once they either completed or withdrew from their online course. Future research on retention rates in online education should consider students’ interaction in an emotional dimension, as well as a cognitive dimension, and investigate how the emotional characteristics of a person impact learning capabilities and performance.

Another critical issue in online learning retention is related to a student’s sense of belonging. It is important for retention that online students feel connected with the course, its instructor, and fellow classmates. The dynamics of such online learning groups are an important factor in creating a safe and comfortable learning environment. Future research could investigate the reasons why adult learners drop out of online courses and could lead to determining if dropout rates are due to the lack of time, lack of management oversight, lack of motivation, problems with technology, lack of student support, individual learning preferences, poorly designed courses, substandard or inexperienced instructors, or some combination of these factors. In other words, research is needed to discover what will help students succeed, and the results should be incorporated into the preparation of high-quality online courses. Further research, beyond
the scope of this quantitative study, is needed to investigate what strategies can promote improved retention in online courses.

Conclusions

Within the present educational landscape, institutions cannot afford to limit their definitions of, and responses to, student disenrollment from any courses. Institutions must demonstrate earnest efforts toward understanding their students and identifying all aspects of the college experience influencing persistence, progression, and completion. Because students come from varied backgrounds and take online courses for a variety of reasons, they may also choose various pathways toward course and/or program completion. Being able to recognize and support each student’s personal, academic, and professional goals must be included in long-term institutional strategic planning—regardless of the learning environment.

The synchronous online learning environment includes instructional strategies that align with scientific research on human learning. The implication is that a face makes a difference: immediate interaction leads to positive results. Educators responsible for the design and delivery of online courses will likely see improved student learning outcomes if curriculum considers the perspectives of CoI with the opportunity for immediate interaction. While this study focused on online courses designed for CCC undergraduate students, the instructional design has implications for online education across all disciplines and education sectors.
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APPENDIX A
Data Element Dictionary
California Community Colleges
Management Information System
Session Data Elements

XF01   SESSION-INSTRUCTION-METHOD
Change History
Revision: 10/01/00 Added and Revised

Distance Education
Article 2, Section 55370. Definition and Application.
Distance Education means instruction in which the instructor and student are separated by
distance and interact through the assistance of communication technology. All distance
education is independent study, and subject to the general requirements of Article 1 as
well as the specific requirement of this Article. Provided however, that fully interactive
distance education courses, as defined in guidelines adopted by the Chancellor, shall not
be considered independent study for purposes of calculating state apportionment pursuant
to Section 58003.1. In addition, instruction provided as distance education is subject to
the requirements that may be imposed by the Americans with Disabilities Act, (42 U.S.
Section 12100 et seq.)

Distance Education, Delayed Interaction (old code 30)
50 = Session under the supervision of an instructor not available by line of sight using
media.
   where the content varies depending upon student response without the immediate
   involvement of the instructor (e.g., various types of instructional software,
   computer assisted instruction (CAI); digitized visual, audio or text selected in
   response to student input; or specially structured audio tapes, web enhanced
   television, etc.)

Distance Education, Simultaneous Interaction
Session under supervision of instructor not available by line of sight using medium which
provides an immediate opportunity for exchange between participants, (any technology
that allows immediate two-way interaction e.g. satellite, video conferencing)
51 = Two-way interactive video and audio
52 = One-way interactive video and two-way interactive audio
53 = Two-way interactive audio only
54 = Other simultaneous interactive medium not coded above
**Distance Education, Passive Medium**
Session under supervision of instructor not available by line of sight using one-way medium where the medium used precludes simultaneous interaction.
61 = Text one-way (e.g. newspaper, correspondence, etc.) (old code 60)
62 = Audio one-way (e.g. audio cassette, radio, etc.) (old code 70)
63 = Video one-way (e.g. ITV, video cassette, etc.) (old code 80)
64 = Other passive medium not coded above (old code 81)
XF–

**Distance Education, Internet-based**
71  **Simultaneous Interaction:** Session under supervision of instructor, not available by line of sight, using the Internet with immediate opportunity for exchange between participants.
72  **Delayed Interaction:** Session under supervision of instructor, not available by line of sight, using the Internet without the immediate involvement of the instructor.

1. Refer to Title 5, Section(s) 55317(a), and (c) for regulations with respect to reporting Distance Education instructional activities.
2. Multiple session records may be reported for the same section of a course if multiple methods of instruction are used for the section.
APPENDIX B

Samples of Synchronous Online Sessions via CCC Confer

The video panel (see above) shows a group of on-campus participants, as well as remote participants during a synchronous class session. The CCC Confer virtual class room space allows participants to see and hear each other with the opportunity for immediate interactions.
ORCHESTRATION:

- 3 flutes (one doubles piccolo)
- 3 oboes (one doubles English Horn)
- 3 clarinets (one doubles bass clarinet)
- 3 bassoons (one doubles contrabassoon)
- 4 horns in F
- 3 trumpets in C
- 2 trombones
- 1 bass trombone
- 2 percussion
- 1 timpani
- Harp & strings

Sonata Form Example

Mozart, Symphony No. 40 in G Minor, I
Institutional Review Board Approval and Informed Consent

Emailed Questionnaire

November 1, 2013

SDSU Student Researcher: Claudia Tornäuer
Department: Educational Leadership

Title: Does a Face Make a Difference? Comparing Student Retention Rates in On-Campus, Synchronous Online and Asynchronous Online Credit Courses at California Community Colleges

Dear Claudia Tornäuer:

According to the Code of Federal Regulations, research is defined as, "A systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge." As described in the Belmont Report, "...the term ‘research’ designates an activity designed to test a hypothesis, permit conclusions to be drawn, and thereby to develop or contribute to generalizable knowledge. A human subject is defined as "a living individual about whom an investigator (whether professional or student) conducting research obtains (1) data through intervention or interaction, or (2) identifiable private information."

In applying these definitions to the questionnaire responses submitted via email on 5/21/13 and emailed response on 7/22/13, it appears that your project does not involve human subjects as you are analyzing a publicly available data set that does not contain personally identifiable information. Per SDSU policy, IRB review is not required.

If you have any questions regarding the use of human subjects in research, please contact me at (619) 594-3622 or by E-mail at cvwashington@mail.sdsu.edu. If I am not available, please call the IRB office at (619) 594-6622 or by E-mail at IRB@mail.sdsu.edu.

Sincerely,

Chaya Washington
Regulatory Compliance Analyst
Levene’s Test to Research Question 1

Levene’s Test of Equality of Error Variances concerning the first research question if there is a difference in retention rates among students with different ethnicity utilizing different instructional methods.

**Levene’s Test of Equality of Error Variances**

Dependent Variable: Retention in %

<table>
<thead>
<tr>
<th>$F$</th>
<th>$df_1$</th>
<th>$df_2$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.731</td>
<td>14</td>
<td>20</td>
<td>.00</td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

*Design: Intercept + Ethnicity + Method + Ethnicity * Method.*
APPENDIX E

Levene’s Test to Research Question 2

Levene’s Test of Equality of Error Variances concerning second research question if there is a difference in retention rates among students with different gender utilizing different instructional methods.

Levene’s Test of Equality of Error Variances\(^a\)

Dependent Variable: Retention in %

<table>
<thead>
<tr>
<th>(F)</th>
<th>(df1)</th>
<th>(df2)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.411</td>
<td>5</td>
<td>252</td>
<td>.221</td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

\(^a\)Design: Intercept + Method + Gender + Method * Gender.
Levene’s Test to Research Question 3

Levene’s Test of Equality of Error Variances concerning second research question if there is a difference in retention rates among students with different gender utilizing different instructional methods.

**Levene’s Test of Equality of Error Variances\(^a\)**

Dependent Variable: Retention in %

<table>
<thead>
<tr>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.149</td>
<td>17</td>
<td>240</td>
<td>.006</td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

\(^a\)Design: Intercept + Method + Age Groups + Method * Age Groups.