

ABSTRACT

ZHENG, YAXIN. Do Students Who Complete an Online Preparedness Program have Higher Success Rates in Online Courses? (Under the direction of Drs. Duane Akroyd and Susan J. Barcinas).

The purpose of this dissertation was to understand the importance of online student success and to investigate the effect of an online student preparedness program on student success. This study was a quasi-experimental research design using quantitative analytic methods. Descriptive statistics summarized respondent characteristics. OLS regression with the Difference-in-difference method in conjunction with propensity score matching was used to determine online student learning outcomes (GPA and completion status) before and after the start of the online student preparedness program (ELI program). An interrupted time-series model was implemented to capture the course level changes on online course success rates under the effect of the ELI program.

This study confirmed a positive relationship between the ELI program and online students' GPA and course completion rates. Furthermore, the course level analysis indicated that online course success rates improved after the start of the ELI program and continued to improve. These analyses provide strong evidence of the positive impact of an online course preparedness program on online student success, which is consistent with prior studies on the benefits of implementing an online orientation/preparedness program to help students acquire the skills, computer literacy, and navigate online course components.

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Do Students Who Complete an Online Preparedness Program have Higher Success Rates in
Online Courses?

by
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DEDICATION

To my parents, Fei Zheng and Chengju Wei; my husband, Ji Shen; and my children, with thanks
for your unwavering love and support.

BIOGRAPHY

Yaxin Zheng was born in Changde, Hunan, China. Yaxin graduated from Changde No.1 High School in Changde, Hunan in 2008. She then attended Hunan First Normal University from 2008-2012, earning a Bachelor of Arts in English Education. During these years of studying, Yaxin developed a passion for educational research and realized there has a bigger world in the concept of education. In 2012, Yaxin applied to the Master's program at North Carolina State University (Raleigh, NC) and was accepted into the Adult & Continuing Education program. In 2014, she earned a Master's degree in this area. Holding this passion for educational research, Yaxin continued her study and became a recipient of the Doctoral Program in Educational Research & Policy Analysis at NC State. During her doctoral study, she focused on quantitative research and earned another Master's degree in Statistics from NC State in 2018. Yaxin's research interest is applying statistical methods in studying educational research. More specifically, she is concerned with topics related to online learning, digital learners, student success, as well as educational policy analysis.

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CHAPTER 1: INTRODUCTION

Increased development and use of online education have caused instructors, institutions, and researchers to take a closer look at student success in online courses. Some students appreciate the flexibility of online education; yet, not all students succeed in the online classroom. Research indicates that online course failure rates are 10 to 20 percent higher than traditional face-to-face classes (Bawa, 2016). Students may drop out of online classes for personal reasons like job changes or to take care of family members; however, many of the factors that lead to dropout are related to institutional and course level support. While the issue is complex, often, students enroll in online courses without the required skills to succeed in an online environment. Therefore, institutional level interventions are a necessary support to better prepare students for online courses and programs. This dissertation is designed to investigate the effect of an online student preparedness program on student success.

Online Education

Distance education can be traced back more broadly to correspondence or other modes of education that offered academic or professional studies beginning in the nineteenth century and continuing to current times (Belanger & Jordan, 2000; Moore, 2013; Roffe, 2004). As an alternative course delivery format, distance online learning is supported by learning management technologies and social media and relies heavily on the Internet. Over decades, online education has changed the way students receive and construct knowledge, how faculty teach, and institutional supports of technology and pedagogical infrastructures.

Trends in Higher Education

Online education has grown dramatically and become a popular mainstream course delivery mode in higher education. In 1995, the first nationally representative data about distance

education course offerings in higher education was surveyed and collected by the National Center for Educational Statistics. In the survey, an estimate of more than 25,000 distance education courses were offered, which was one-third (33%) of all higher education institutions, with about 753,000 students formally enrolled in distance education in the academic year 1994-1995 (Lewis, Alexander, & Farris, 1997). Since then, there has been a steady increase in distance courses enrollment in higher education. Then, according to the Ninth Annual Report on The State of Online Learning in U.S. Higher Education (2011), as of fall 2002, about 9.6% of students were taking at least one online course. However, by fall of 2010, there were 31.3% of students taking at least one online course. Thus, it can be seen that the percentage of students taking at least one online course had tripled in just eight years. Year-to-year changes have been very uneven and fluctuated around 30% in online course enrollment in recent years.

The most recent analysis of students taking at least one online course is 29.7% (Allen & Seaman, 2017). The Distance Education Enrollment Report (2017) shows that more than 6 million students took at least one distance course, which was nine times more compared to 1997. Online enrollments grew more consistently than overall higher education enrollment since 2003 (Allen & Seaman, 2015), demonstrating a shift in institutional practices and in student modes of learning in postsecondary education.

The same trend is shown in public postsecondary institutions. The fourteenth annual report of distance education by Babson Survey Research Group pointed out that about two-thirds (67.8%) of all distance students were enrolled in public institutions in fall 2015 education (Allen & Seaman, 2017). An IPEDS report indicates that over 90% of universities and community colleges offered distance courses, and private institutions took only one-third of the share,

including both nonprofit and for-profit sectors of higher education (Miller, Topper & Richardson, 2017).

Despite consistent substantial growth of online education and optimism among academic leaders about the prospects of online learning, college faculty appear to remain doubtful or skeptical about the value of online education. Almost half to two-thirds of online faculty in nationwide surveys state that they are skeptical and unconvinced about online education and have doubts about whether online courses can achieve student outcomes at least as well as those face-to-face courses (Allen & Seaman, 2012; Jaschik & Lederman, 2017). However, in spite of that perspective, 60% of faculty report that they recommended online courses for their students. Given the complexity of institutional financial and policy levers and student needs for flexible learning opportunities, online learning appears to be prevalent even though with skepticism and concerns about online course success.

From the most recent 2017 faculty attitude survey of Inside Higher Ed, barely half of the faculty members reported teaching an online course (Jaschik & Lederman, 2017). Faculty who have taught online courses hold more positive attitudes towards online learning than those who have not. For those faculty who viewed online courses as inferior to in-person courses, their concerns are largely surrounding interaction with students and the risks associated with distance education and the ability to adequately reach at-risk students.

Compared to the traditional in-person classroom, faculty perceive that online courses have many challenging instructional factors (Dumont & Raggio, 2018). To successfully operate and deliver an online course, faculty need technical and administrative support and ongoing professional development in a rapidly changing technology rich environment. Moreover, student preparedness is a key factor in the online classroom. Students who are self-disciplined, self-

motivated, and know how to manage their time are better suited for online learning. Faculty believe it is a natural trend to adopt the online course format, but there are gaps between the expected student learning outcomes and the reality of student performance (Bork & Rucks-Ahidiana, 2013).

Community College Online Learning

Community Colleges serve more adult and non-traditional learners than any other postsecondary institutional type. Information from the Integrated Postsecondary Education Data System (IPEDS) Fall 2016 data, finds that the average age of community college students is 28, and nearly 38% of community college students are age 25 or above; more than 60% of community college students attended school part-time, and of these students, almost 40% are employed full-time, which is twice more than four-year universities (American Association of Community Colleges, 2018; IPEDS, 2017). In addition, many of those students have increased needs for flexible delivery – whether that be alternative course scheduling times, ability to study part-time, or delivery via online education modes. In particular, the rise of online education is often most attractive to nontraditional students who have multiple responsibilities such as work, family, and academics (Bambara, Harbour, Davies & Athey, 2009; Xu & Jaggars, 2014).

As a result of these factors, online enrollment has increased more rapidly in community colleges than at other types of higher education institutions (Parsad & Lewis, 2008). In 2012, there were 3.3 million distance education students in community colleges, which comprised one-third of the total student enrollments (NCES, 2014). In the IPEDS data, one out of three students in community colleges takes distance education courses (NCES, 2018). The most recent national analyses show a 10% drop in on-campus students at community colleges (who do not take any

distance courses) and an increase in online degree or certificate completion. (Allen & Seaman, 2017; Lokken & Mullins, 2014).

As a crucial sector of higher education, the community college enrolls the majority of postsecondary students and provides education for minority, elderly, and working-class students, and those in need of academic remediation (Cox, 2005; Ma & Baum, 2016). Although they are often location or geography bound, community colleges are rarely residential and thus face many challenges to attract and retain students. Online courses and programs reduce costs for community colleges for maintenance fees such as classroom and on-campus facilities. However, empirical research indicated a clear performance gap between online and face-to-face students, especially among underrepresented racial minority students, younger students, and students with lower academic preparedness (Xu & Xu, 2019). The existing performance gap and the inevitable development of online education in community college makes this investigation into online student success in the community college environment more crucial and practical.

North Carolina Community Colleges Online Learning

The North Carolina Community College System (NCCCS) has a total of 58 community colleges, which is the third largest in the nation (North Carolina Community College System, 2016). The NCCCS mission is to provide high-quality and accessible education to minimize barriers to post-secondary education and maximize student success. They offer distance education with 248 curriculum courses and 45 continuing education courses online at the local colleges. To reduce the costs of course development and enhance the quality of online courses, the NC system office created the Virtual Learning Community (VLC) in 1998. VLC established a platform to provide resources and increase the quality and availability of online learning. The purpose of VLC is to “develop, edit, and broker content for curriculum and continuing education

distance learning courses and to provide professional development for distance learning faculty and staff” (VLC, 2020).

Online learning provides students access to education and opportunities to advance their careers and achieve educational goals, which strengthens the missions of all NCCCS colleges. NCCCS has shown yearly increases in online course offerings and student enrollment over time. From 2013 to 2017, the fall full-time equivalent (FTE) grew from 19% to 25%. In Fall 2017, 116,981 curriculum students were enrolled in online only courses or a mix of online and face-to-face courses, which was 52% of total enrollment (Sieman, 2018). Moreover, 2674 unique curriculum courses were taught in the NCCCS, and 43% of these courses were offered in an online format (Sieman, 2018). The high percentage of online course offerings and enrollments revealed the importance of online learning in North Carolina community colleges. Online learning represented a significant share of students’ academic lives. Community colleges in North Carolina have an explicit focus on completion, retention and student success. Student success is a goal for community colleges whether it is residential or online. Therefore, student success in online courses and programs has become a strategic goal for North Carolina community colleges.

Statement of the Problem

With the rapid growth and steady development of online education, there is no shortage of co-existing opportunities and challenges. The effectiveness and quality of online programs and courses and online student success are the primary issues that concern policy-makers and practitioners who support this learning format. Online learners are different from traditional learners in many aspects such as skill sets and learning styles (Bernard et al, 2004). Studies have frequently found that students perform more poorly in the online classroom compared to the

traditional in-person classroom (Jaggars, Edgecombe, & Stacey, 2013; Xu & Jaggars, 2011). Students in online courses not only need to acquire basic technical skills to manipulate computer software and the online course environment, but they also need to be self-directed and self-motivated. Face-to-face courses host regularly in a weekly or bi-weekly manner, giving students more opportunities to interact with instructors and peers directly, to feel connected when they have questions or encounter problems, and to receive immediate feedback. In the online classroom, students typically take classes in an asynchronous format where they read and review course materials with their own schedule and raise questions via email or forum participation, and get responses from instructors within a certain time period (usually 24 to 48 hours).

Not all online students, especially students at community college, are equipped with these skill sets mentioned above (Bork & Rucks-Ahidiana, 2013). Unlike traditional classes, students in the online classroom cannot be passive learners and need to seek out points of connection with their instructors and classmates. In addition, they must actively control the pace of their learning to successfully complete the course.

As colleges continually expand online courses and programs across a broader range of different subjects, disciplines, and regions, they must think about how to improve students' performance and better prepare students to succeed in the virtual world (Hu & Driscoll, 2013; Xu & Jaggars, 2011). Reports suggest that online courses may be more challenging for some students with technical difficulties, a sense of social distance, and a lack of self-discipline (Xu & Jaggars, 2011). In other words, if students have not built their capacities regarding how to acquire knowledge online and be self-motivated and disciplined, they are at a disadvantage and may drop out of online courses. Preparing students with the required skills before they enter the online learning environment is critical. Community colleges enroll more first-generation,

minority and at-risk learners compared to four-year universities, and online learning format puts these students at risk if not having essential supports in place (Pascarella, Pierson, Wolniak, & Terenzini, 2004; Xu & Xu, 2019).

Issues Related to Online Student Success

Mixed Findings. Though online course enrollment has increased dramatically in higher education and many institutions have devoted significant resources toward online course and program development, online student success is still a big concern for educational leaders, practitioners, and researchers. Online learning as an alternative course delivery format has long been compared to the traditional face-to-face course format. A large body of research literature with mixed research findings emerged in the comparison of online and face-to-face courses (Jaggars & Bailey, 2010).

Nguyen (2015) summarized that there has been a significant quantity of studies with positive effects for student learning outcomes in online or hybrid courses compared to face-to-face courses. The positive effects were discovered in test scores, deeper connection with instructors and course materials, stronger sense of community, and reduction of withdrawing. Nguyen also pointed out that these positive effects could not hold across comparison studies. Echo on Nguyen's positive findings there were other studies show superior student outcomes in online courses compared to in-person counterparts (Harmon & Lambrinos, 2006; Means et al., 2010; Navarro & Shoemaker, 2000).

Some studies provided negative and non-significant implications regarding test scores, student engagement, course completion, retention, persistence and degree attainment rates (Nguyen, 2015). Studies found that students in online courses had lower exam scores and GPAs or high dropout rates (Figlio, Rush & Yin, 2013; Johnson & Cuellar Mejia, 2014; Xu & Jaggars,

2011a; 2011b). Nationally, student retention was 8% lower in online courses compared to traditional courses (Lokken & Mullins, 2014).

Means and colleagues conducted a meta-analysis of online learning studies sponsored by the U.S. Department of Education in 2009. Interestingly, they concluded online learning appeared to be more effective than traditional face-to-face instruction for undergraduates and older learners and in medical, adult training, professional development, etc. The main effect size for all contrasts in this meta-analysis was positive. This result was intriguing for policy-makers and college leaders and surprised many researchers in this field. However, the Community College Research Center investigated the literature and scope of Means et al's (2009) study and noted that their findings did not hold true for fully online courses (Jaggars & Bailey, 2010). Means et al' (2009) study focused not only on fully online courses (80% course content were taught online) in postsecondary institutions, but also on blended courses (have both face-to-face and online sessions) and online courses in the K-12 environment.

Community College Research Center (CCRC), a leading community college research center, examined student performance in a systemwide course delivery comparison study between Virginia Community College System and the Washington State community colleges. Their analyses yielded that online course performance was inferior to its face-to-face counterpart (Xu & Jaggars, 2011a; 2011b). Jaggars and Bailey (2010) report that online learning might even undercut progression among low-income and academically underprepared students.

These mixed results in comparison studies revealed the uneven development of online learning and student performance. Although online learning has expanded educational access and made postsecondary education more achievable, the effectiveness of online courses and how to improve student success in the online environment still need further study. Because of the

diversity of the studied population, methodology and context, these comparisons are hard “apples to apples,” and the conclusions drawn from them about which delivery mode is over another one may be definitive. Therefore, instead of competing online courses to face-to-face counterparts, research should explore how students learn in the online environment with technology and how to prepare students to succeed in online courses.

Completion Paradox. A different perspective in recent studies focuses on degree attainment comparison between online and face-to-face courses. Surprisingly, researchers found out that even though students were less likely to complete an online course compared to a face-to-face course with a passing grade, they were more likely than traditional course students to earn an associate degree or transfer to a four-year institution (Johnson & Mejia, 2014). Johnson and Mejia’s study was conducted in California community colleges among students taking credit courses in the 2011-12 school year. When controlling for student characteristics and institutional factors, they found out that online course success rates were about 11 to 14 percentage points lower than face-to-face courses in all subject areas at almost all colleges around the state. However, when they examine the long-term degree completion rate (during six years), online students were more successful than those who enrolled only in traditional courses.

A study conducted by Shea and Bidjerano (2014) yielded a similar conclusion. Using the National Center for Educational Statistics' (NCES) Beginning Postsecondary Survey data, they found that online learning and distance education predicted higher rates of degree attainment when controlled for student background characteristics and self-selection bias. In their analyses, students who had taken some online courses had 5% higher degree completion rate than students who had not taken any online courses. This study concluded that even though students were less

prepared in online courses, they still were more likely to attain a degree than students who had not taken courses online.

Their analyses seemed contrary to expectations based upon many comparison studies that consistently yielded lower online course completion rates in the online classroom compared to the traditional face-to-face courses (Xu & Jaggars, 2011a; 2011b; Lokken & Mullins, 2014). However, when measuring the long-term achievement, this learning format showed its advantages in giving students flexibility to juggle school, family and work obligations, and they don't need to wait for the course to be offered in the classroom with limited seats (Johnson & Mejia, 2014). Moreover, it is logistically possible to set up multiple online sessions for the online course compared to the resource requirements of a face-to-face classroom. Johnson and Mejia (2014) also report that students who take more course credits were more likely to take them online. The more credits you take the more likely you will complete and achieve education credentialing goals. From this perspective, students may perform poorer in certain online courses compared to face-to-face ones but may still achieve stronger long-term success by taking more courses online.

Factors associated with online student success. Bork and Rucks-Ahidiana (2013) conducted a qualitative investigation of online courses at two community colleges. Their findings suggest that there existed “a misalignment of student and instructor expectations of one another’s skills and behaviors leads to role ambiguity in the online context” (Bork & Rucks-Ahidiana, 2013, p.1). This role ambiguity included information deficiency and unpredictability, which revealed a lack of clear information about behavior expectations and uncertain consequences of associated behaviors related to social roles (Bork & Rucks-Ahidiana, 2013; Pearce, 1981). The study interviewed 38 online instructors and employees whose job related to

distance learning and 47 students who enrolled online. Additional findings indicate that instructors believe students should possess the technological skills to succeed in online courses, yet most of their students did not meet this requisite. In contrast, many of the students believed that they already had the necessary technological skills. Both instructors and students acknowledged that strong learning management skills were essential to student success in online courses, yet held different assessments and perceptions of actual learning management skill levels.

Time management is a prioritized skill for successful online course outcomes. Self-motivation and self-discipline were important elements to encourage students to succeed online, particularly if students can participate in peripheral ways or do not have structures in place to alleviate procrastination or disconnection. Students reported that they believed they were responsible for identifying materials, assigning priorities, and keeping deadlines with guidance from instructors. Students also indicated their view that instructors should help them understand the course and meet their responsibilities on assignments, forum participation, etc. However, most instructors thought students should be responsible for their own learning rather than instructors fostering student responsibilities. Importantly, both instructors and students in this study pointed out that students did not know how to effectively ask for help in the online environment. In sum, this study suggests that reframing the issues from an individual front-line interaction to institutional-level interventions such as student readiness and faculty professional development were needed to improve online student performance and success.

To more closely understand what students experienced in online courses, Bambara, Harbour, Davies and Athey (2009) conducted a phenomenological study to examine the lived experience of community college students in high-risk online courses at a community college.

Their study findings summarized four structural themes (isolation, academic challenge, ownership, and acquiescence) that inform students' online learning experiences. Students explained that the lack of student-instructor interaction and peer-to-peer interaction made them feel isolated in the virtual environment. The cumulative course structure and technology hurdles created additional challenges. In contrast, many students believed that it was easy to understand and navigate the online course environment until they were actually immersed within the courses. This type of unrealistic expectation about academic content, course organization, and technology frustrations diminished their motivation and progress in online courses. "Participants were especially vulnerable when technology issues occurred at the beginning of the semester" (Bambara, Harbour, Davies, & Athey, 2009, p.227).

Bambara et al. (2009) also discussed the ownership associated with student success in online learning. Student participants described that positive aspects such as self-motivation, commitment, independence, self-direction, and resourcefulness enabled them to survive in the online courses and it is unclear whether students felt that these aspects of their learning were strengths. An additional issue that surfaced was the misjudgment of the time and effort students anticipated they would need to spend versus the actual time they spent completing course material. Students indicated that they "were surprised by the time and effort to complete their courses" (Bambara et al., 2009, p. 229). Some students overcame these obstacles and successfully completed the online courses, while others failed, which led to reports that students feel defeated, shameful, and resentful. Therefore, providing an academic support program and orientation to help mitigate these challenges might be a feasible solution to prevent students from feeling intimidated by the technology at the beginning of online learning and alert them to be aware of the time and effort required in online learning.

Hart (2012) did a literature review on the factors related to online student success and summarized six main factors associated with student persistence in online learning: satisfaction with online learning, a sense of belonging the learning community, self-motivation, peer and family support, time management skills, and communication with instructors. Hart explained that lack of persistence is an essential factor leading to student attrition in online courses. As expected, a higher GPA is associated with lower withdrawal rates in many studies (Aragon & Johnson, 2008; Harrell & Bower, 2011; Muse,2003). Online courses with flexibility and asynchronous format have been favored by online students (Müller, 2008). Students with better time management skills, goal commitment, and self-efficacy had a higher persistence rate in online courses compared to non-completers (Holder, 2007). Moreover, social presence and support from peers and family are facilitators for higher student persistence. Meanwhile, auditory learning style, lack of basic computer skills, difficulty accessing resources, isolation and decreased engagement, lack of computer accessibility, work and family demands, and poor communication were barriers students encountered during online learning (Bunn, 2004; Harrell & Bower, 2011; Stanford-Bowers, 2008).

From the above literature, Online students are expected to come to the online course with certain skill sets such as basic computer skills, time management, self-discipline, and self-efficacy. However, there exists a gap of mutual understandings of these essential components between students and instructors, which might due to lack of information (Lokken & Mullins, 2014). Without the physical presence of an instructor and peers, the adjustment of a brand-new online environment might intimidate first-time online learners. Especially for community college students with multiple responsibilities and less time to exploring all the helping resources, this kind of frustration may cause resistance or even dropout.

Student Preparedness Programs

The analyses of issues related to online learning show that offering higher-level interventions such as student orientation and preparedness programs is a credible strategy to help students succeed in the online environment. From 2005 to 2014, more than two-thirds of academic leaders in the Distance Learning in the U.S. annual reports have consistently stated that students need specific discipline, knowledge, and skills to succeed in online environments (Allen & Seaman, 2015). The asynchronous characteristics of online programs require a constant Internet connection and capable technologies for students to navigate and operate online course material. These require students to be technology ready with basic computer skills. A nationwide survey in community college ELearning revealed that about 50% of community colleges offered online student orientations for online courses (Lokken & Mullins, 2014). Administrators in this survey indicated that “providing students with a clear, detailed orientation can clarify what is expected so students do not rush in and set themselves up for failure” (Lokken & Mullins, 2014, p.5).

Student orientation has been recognized as having a strong correlation with student success in online courses (Wojciechowski & Palmer, 2005). Wojciechowski and Palmer (2005) explored factors such as the number of previous course withdrawals, ASSET reading scores, the number of previous online courses, age, and attendance at a class orientation session that impacted student success in an online undergraduate business course at a community college. An optional (not mandatory but highly recommended) orientation of the online course was offered prior to the start of the academic semester, which included information on assignments, usage of Blackboard (LMS), social presence, and provided an opportunity to develop community within the course. The study found that students who participated in the orientation session had the

second highest relationship to the final grade received in the class ($r = .338$; $p = .000$). Students who attended the session had higher scores than those who did not. Particularly if a student had a somewhat low academic performance (i.e., low GPA; low ASSET reading score; high number of previous withdrawals). However, the orientation was not a mandatory requirement. Students who participated in the orientation session might be more motivated and hardworking.

Jones (2013) created a mandatory online student orientation in a rural community college to prepare students for online courses. The ADDIE (Analysis, Design, Development, Implement, & Evaluation) model of instructional design used to evaluate and implement this mandatory student preparedness orientation was developed by online learning staff based on feedback from faculty and students. Jones (2013) explained “When students got into the self-oriented online environments, they were easily confused and lacked the knowledge for how to work through their course content on their own. Students also lacked time management, study skills, and the knowledge of what student services were available and how to access them” (p.44). Therefore, this orientation included modules on topics of computer technological skills, how to be a successful online student, online student services, and LMS (Learning Management System) navigation. Jones (2013) pointed out that after participating in the mandatory online orientation, first time online/hybrid students felt optimistic and better prepared for their online courses. This result has been supported by an increase in online student retention rate. This kind of student preparedness orientation helped students become more comfortable with the online learning environment and overcome any potential technology barriers at the beginning of classes. Jones’s work showed a positive relationship between the mandatory student preparedness program and student success. However, no statistical analyses have been performed in this study. Without controlling for possible biases, it is hard to determine if there is a significant correlation between

student orientation and learning outcomes. More sophisticated studies should closely examine this issue for online courses.

Studies on preparedness programs affirm a presumed high association with positive student experiences and preparation programs in online learning. Apparently, a learning gap exists in the expectation and skillsets between the traditional instructor lecture learning style and the self-directed learning in the online environment. However, an extensive review of the literature revealed very little research focused on the application of online student preparedness programs, let alone the examination of the relationship between the effectiveness of such programs and student success in online courses. Specifically, there do not appear to be any studies that focus on the effectiveness of student preparedness programs from a quantitative perspective in the community college environment. Online student preparedness programs or orientations have been considered an important factor but have yet to be examined specifically with rigorous large-scale empirical controls and methodology. This study responds to the need to examine, with rigorous research methodology, causal inference regarding whether providing a student orientation (teaching basic computer skills, LMS, and self-directed learning skills etc.) leads to better student performance and success. This study aims to address the empirical gap and examine the effectiveness of one mandatory online student preparedness program in a large urban community college.

Purpose of the Study

The overall purpose of this dissertation study is to examine the effectiveness of a student preparedness program in a large urban community college in the Southeast U.S. This study examines a student preparedness program that assesses students' online learning preparedness, remediates their differences, and helps them to meet the criteria and skillsets for online courses.

In this study, external and internal factors are considered with the question “Is an online student preparedness program improving student learning outcomes?” The quasi-experimental methodology is applied to investigate the learning outcome differences between students who participated in the program and students who did not. The study is performed on two levels: level one is a student-level assessment, and level two is course level assessment before and after the initiation of a student preparedness program.

Research Questions

The following research questions are explored and answered in the research study:

1. Student level: *to what extent does the student preparedness program affect:*
 - a. *student grade point average (GPA) in online courses?*
 - b. *student online course completion rate?*
2. Course level: *is grade distribution significantly different in online courses before and after the student preparedness program, as measured by course success rate (% of grades “A,” “B,” “C,” and “Pass” of all grades)?*

Theoretical Framework

Community colleges are heralded for having diverse student populations and serving all segments of society through their open-access policy. The study aims to understand the student preparedness program and how it is associated with online student success and persistence in community college. Student success is often composed of student persistence and educational attainment or educational goal attainment (Krajewski, 2015). Student persistence has been widely studied for decades, and numerous variables have been identified as factors that influence a student’s decision to persist or drop out. Persistence continues to be a challenge for community colleges. Several theoretical models such as Spady (1970), Tinto (1975), and Bean and Metzner

(1985) have been accepted and commonly used to study student persistence in community colleges.

Different from university students, community college students are primarily commuters and have multiple work and life responsibilities. Online learners' personal characteristics are also different from traditional on-campus students. Online students tend to be older, full-time workers, fewer minorities, and less low-income status (Jaggars, 2012). Therefore, with the scope of this dissertation, it is important to identify and address the variables related to this combination group: community college online students. The framework for this study is a multi-theoretical reconstructed framework drawing from 3 sources: Rovai (2003), Bean and Metzner (1985) and Falcone (2011). The framework has been adapted to highlight factors suitable to capture the complexities of community college student characteristics and the online learning environment.

Rovai (2003) found that distance education students are likely to be nontraditional students. He synthesized the elements of student persistence from Tinto's (1993) and Bean and Metzner's (1985) models and added additional skills theorized to be required by online students. His model created categories for student characteristics, skills prior to admission, and external and internal factors after admission. Besides the common student characteristics such as age, gender, and academic performance, Rovai (2003) also included student skills in computer and information literacy, time management, reading and writing, and internet-based interaction as essential variables for students to succeed in online distance learning in the "prior to admission" category. A deficiency in these skills might lead to academic difficulties and dropouts.

Rovai (2003) subdivided the group of student characteristics after admission into external and internal factors affecting student online success. The external factors such as finance,

employment, and family responsibilities primarily draw from Bean and Metzner's (1985) model. The internal factors took the biggest portion in his model, which emphasized the needs of online students and borrowed from Workman and Stenard's (1996) study on distance learners. Online students needed to have confidence that they could successfully navigate the online Learning Management System (LMS) and master the learning tools in the system. Rovai (2003) explains "a distance learning program can build self-esteem by requiring students to participate in an orientation program prior to their course" (p.11). Those required skillsets for online learners were introduced as fundamental elements in the student preparedness program for online learning. Moreover, Rovai's (2003) model has been tested in many studies in the community college environment. Consequently, this study adapts and integrates Rovai's (2003) online student persistence model into the larger theoretical framework supporting the research.

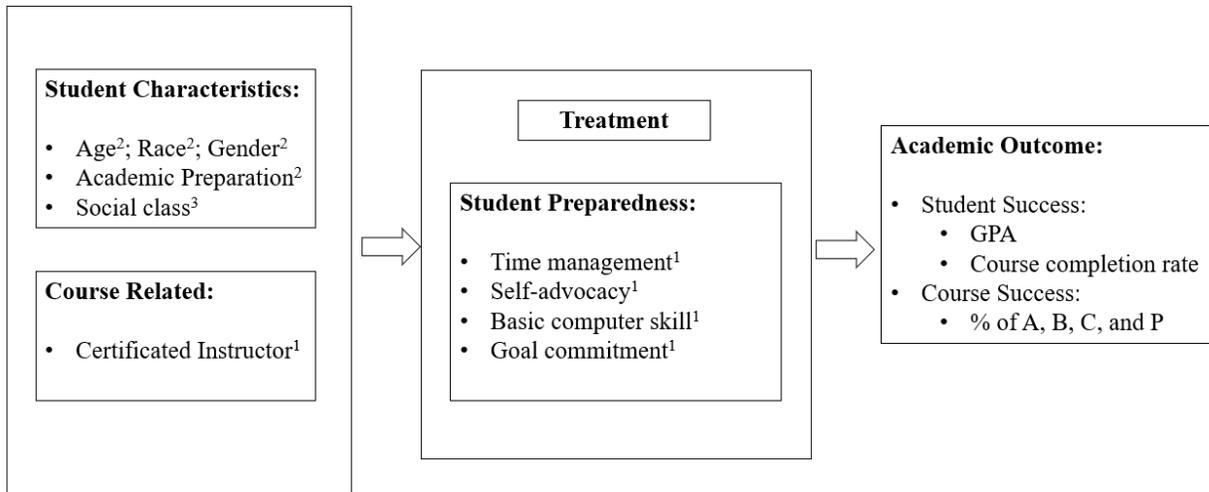
Next, Bean and Metzner's (1985) model is one of the most cited and tested student persistence models designed for nontraditional college students (older, part-time and commuter students). Their model appears to be valid and widely used for studying student persistence at two-year colleges (Webb, 1989). They divided student persistence into four factors: academic offerings (e.g. study skills, academic advising, and major certainty), student backgrounds (e.g. age, enrollment status, and previous GPA), student academic and psychological outcomes while at college (e.g. academic performance, satisfaction, and goal commitment) and environment variables (e.g. finances, employment, and family responsibilities). These are essential factors related to student characteristics that closely interact with life for online students. In their model, social integration played a smaller role in student persistence compared to other components. Bean and Metzner argued that nontraditional students were more affected by the external environment such as work and family responsibilities (Lee, Choi, Kim, 2013).

Factors used to predict student persistence and attrition in Bean and Metzner's (1985) model have shed light on student success in the online environment. Online learners compared to face-to-face learners have less intensity and duration to interact and socialize with the instructor, peers, and the institution they enrolled in. Moreover, socialization was not the prime reason for online students to be in school, but rather academic and environmental reasons.

Finally, Falcone's (2011) student persistence model emphasizes factors such as low-income, low-socioeconomic status, and working-class students' postsecondary experiences. Though Falcone's model was built to understand the traditionally marginalized four-year university student, those characteristics were conventional features of community college students. The uniqueness of Falcone's (2011) model was that he introduced a Bourdieuan lens to reflect the structural context surrounding individuals' lives and combined this factor with their academic actions. Online students possessed complex attributes as described in Falcone's model. As Falcone (2011) mentioned in her study, individuals socialize differently in different environments and have different practices in their habitus and capital. Online learning attracts community college students based on its flexibility that allows them to arrange and balance their family, work, and academic responsibilities. Juggling multiple identities requires students to participate in several contexts simultaneously, which constructs different communities in their lives. The internal and external communities shape online students' goals and commitments in their academic lives and links to their academic success (Shea & Bidjerano, 2014). Therefore, it is important to understand their figures on a multidimensional scale.

Therefore, to fully capture the characteristics of the online student and understand their persistence and success patterns and how these factors associated with the student preparedness program process, this dissertation study incorporates segments of the three models: Rovai's

(2003)¹, Bean and Metzner's (1985)² and Falcone's (2011)³ concepts and develop the Theoretical Framework Map as shown in Figure 1.



A combination of student success model of Rovai's¹ (2003) nontraditional online student success model, Bean and Metzner's² (1985) nontraditional student success model, Falcone's³ (2011) Higher education nontraditional student success model. This framework will be revised based on data availability to make it more precise, replace weak bins with more meaningful ones, and reconfigure relationships.

Figure 1. Theoretical framework map

Significance of The Study

Online enrollment has increased at all types of higher education institutions, especially at community colleges. Comparison studies of online versus face-to-face programs have resulted in mixed findings. However, data still suggests low student performance and high attrition rates in online courses compared to the traditional counterpart at least in the community college environment (Lokken & Mullins, 2014). Literature reveals that one of the reasons student performance is lower in the online environment is because of the lack of essential technical and communication skills and misjudgment of time and effort in the online classroom. A clear and well-designed online orientation program could reduce the risk of this kind of misalignment to help students succeed. This study contributes to research and practice by exploring and

examining the effectiveness of an online student preparedness program in the community college setting.

With the development of online courses and programs, community colleges recruit large numbers of students through their online programs. To maintain the high quality of online courses and retain students is crucial for community colleges. Low online persistence rates mean a potential loss of students and revenue, which has often been an issue for community colleges (Liu, Gomez & Yen, 2009). Adding support systems for online students is strategic for sustainable development. This study is also essential and practical for community college leaders and administrators to discover the efficacy of an institutional level intervention.

Understanding the uniqueness of online student characteristics to help them survive and succeed academically is critical. Different from the traditional classroom, online learning requires self-directed learning, time management, computer literacy, and self-motivation. Not all online students are equipped with these prerequisite skills. Preparedness determines the baseline of student success. There is a long history of providing developmental education for the academic underprepared and at-risk students to help them meet the academic rigor of college-level coursework (King, et al, 2017). The same holds true of the need to develop online student preparedness programs to ensure student learning experience and increase retention.

From a research perspective, very few studies have investigated the use of a pre-course program, orientation, or training, especially in the community college environment. The importance of providing such programs to students before taking online courses has been emphasized and strongly recommended (Wojciechowski & Palmer, 2005; Jones, 2013). Online education requires more proactive learning to construct knowledge and required skills (Hu & Driscoll, 2013).

Moreover, previous empirical research has generally used qualitative methodology or has had a small group of participants or simple regression with limited controls. In this study, a quasi-experimental difference-in-difference (DD) study is applied to student panel data. A complete randomized experiment is usually difficult to conduct and very uncommon in educational studies due to cost, experimental control, unobserved confounding variables, and ethics. However, a quasi-experimental study can examine the causal impact of the program without random assignment and avoid the obstacles mentioned above. With statistical controls, a quasi-experimental study could simulate the desired research outcomes of random experimental studies (Levin, 2007). The findings of this study contribute to the empirical literature and elaborate on whether these types of programs have a significant causal-inference with student learning outcomes.

From a practice perspective, this study is valuable in refining continued efforts towards student success; in this case with the help of a student preparedness program from college-level support. The findings of this study may also provide evidence of whether a mandatory student preparedness program helps students overcome any potential technology barriers, obtain essential academic skills, and enrich the learning experience. As such, this research potentially yields benefits for educators and students in the community college arena.

Compared to other institutions, community colleges enroll the least advantaged students (Cox, 2005). Moreover, course level comparisons are presented to demonstrate the effectiveness of the student ELearning preparedness program. Examining online courses can provide a holistic view of the impact of the program on students, which has not been examined in existing empirical studies. Moreover, course level investigations are conducted to draw a detailed picture of student performance, which has not been discussed in past literature. It is essential for course

designers, program administrators, faculty members, and policymakers to understand the impact and influence of these programs for best practice.

Definition of Terms

Distance education: defined in IPEDS (2018) as “Education that uses one or more technologies to deliver instruction to students who are separated from the instructor and to support regular and substantive interaction between the students and the instructor synchronously or asynchronously.”

Distance education course: defined in IPEDS (2018) as “A course in which the instructional content is delivered exclusively via distance education. Requirements for coming to campus for orientation, testing, or academic support services do not exclude a course from being classified as distance education.”

Distance education program: defined in IPEDS (2018) as “A program for which all the required coursework for program completion is able to be completed via distance education courses.”

Online education/learning: Online education is a form of distance education that uses the internet as the primary delivery method for distance courses for which 80% of the course content is presented and delivered over the internet (Allen & Seaman, 2008).

Online course: Online courses are those in which at least 80% of the course content is delivered in an online environment (Allen & Seaman, 2007; 2011; 2013; 2015).

Learning Management System (LMS)/Course Management System (CMS): supports the placement of course materials, associates students with courses, tracks student performance, stores student submissions, and mediates communication between the students and their instructor (Watson & Watson, 2007).

Persistence: the antonym of attrition or as a constellation of factors that lead to the completion of a course (Park & Choi, 2009; Wake Technical Community College, 2014).

Course success rate: In this study, the course success rate is measured by the percentage of grades “A,” “B,” and “C,” and “P” (for pass/no pass course) among all grades including withdrawals for all online course.

Summary of Chapter One

This chapter provides an overview of online learning and its upward trend in higher education and community colleges. The current literature has a gap in student performance between online courses and face-to-face courses (or hybrid courses). However, there is a structural difference from the traditional face-to-face classroom to the online classroom. The focus of this study is not on which course delivery method is better than the other. Instead, this study focuses on what is important to online student success and how we prepare the student to succeed in online learning.

CHAPTER 2: LITERATURE REVIEW

Introduction

This chapter reviews the literature regarding online education in the context of higher education, the benefits and challenges of online learning, student performance and persistence in the online environment, student and faculty support in online courses, online student preparedness, and theories that support this study.

Online Education in Higher Education

Distance education dawned in the 1800s and continued to grow through postal service correspondence, to audio and video clips, to a variety of web-based communication tools. In the late 1990s, distance education ushered in the online technology revolution (Kentnor, 2015). Online learning or E-learning was a relatively new concept associated with the development of the Internet (Guri-Rosenblit, 2009). This new learning environment inspired educators to create new terminologies to differentiate the technologies, learning objectives, audience, instructions, and type of content (Moore, Dickson-Deane & Galyen, 2011). In this literature review, I focus specifically on postsecondary distance learning in the online format.

The Evolution of Distance Education

Early traditional distance education was introduced in postsecondary education in Germany in 1856 (Holmberg, 1995). “At the end of the nineteenth-century distance education was above all applied on the one hand to university and pre-university study, on the other hand to occupational training. The university extension movement promoted the use of distance education” (Holmberg, 1995, p.47). William Rainey Harper founded American University distance education, and William Lighty introduced teaching by radio; Charles Wedemeyer acknowledged as the founder of the distance education in postsecondary education, recognized

the gap between adults' need for extension education and the realities of what was delivered or could be delivered to the learners (Moore, 2013).

Distance education evolved from correspondence education to the use of communication technologies, like radio and television, and then extended to the Internet (Kentnor, 2015). Moore and Kearsley (2011) five generations of distance education development in their book *Distance Education: A Systems View of Online Learning*. The first generation of distance education was marked by correspondence education, also referred to as independent study or "home study". It reflected an early stage of distance education at the collegiate-level (Pittman, 2003) and it was used primarily for nonresident students who received course materials via parcel post and then completed and returned those materials to the instructors (Encyclopedia Britannica, 2012). "Teaching through the mail was first used for higher education courses by the Chautauqua Correspondence College" (Moore & Kearsley, 2011, p.24). In this first generation of evolution, distance education opened opportunities for learning to nontraditional learners, covered a wide range of vocational subjects, and provided training for professionals and engineers.

The second generation of distance education is categorized as broadcasting technology, which includes radio and television (Moore & Kearsley, 2011). Radio was one of the dedicated communication technologies for educational broadcasting in the early 20th century (Moore, 2013; Rumble, 1986). In a current context, it remains a popular means of distance education, including live radio broadcasts as well as podcasts. Next, the popularity of television prompted the development of visual technology in education (Holmberg, 1995; Verduin & Clark, 1991). The use of cable television or film-based correspondence courses meant that educational channels could be offered to a significantly large audience and that there was a visual, auditory and experiential element introduced for learners. In the 1980s, there were about 200 tele-courses

produced by various higher education institutions and private and public broadcasting stations and producers such as Pennsylvania State University, the Corporation for Public Broadcasting (CPB), and Coastline Community College (Moore & Kearsley, 2011).

The third generation Moore describes as the Articulated Instructional Media Project (AIM) and the popularity of open universities worldwide. In this generation, various communication technologies were applied with the idea of delivering high-quality and low-cost teaching.

Fourth, generation distance education is considered the last generation before online learning, and it includes the use of teleconferencing, which emerged in the U.S. in the 1980s (Moore & Kearsley, 2011). The uniqueness of this generation is the use of teleconferencing technology, which enabled simultaneous interaction between instructors and students in real time and in different locations. Arguably, in current times the use of internet-teleconferencing software still plays an ongoing crucial role in distance education.

The development of the internet signals the fifth and current generation of distance education that Moore conceptualizes - an era of informational technology with computer and internet based online classes. Compared to the earlier integration of radio, television, and teleconferencing, the mechanism of current distance education is via computer networking. Allen and Seaman (2008) defined online education as a form of distance education that uses the internet as the primary medium for distance courses that 80% of the course content presented and delivered over the Internet". The use of the internet boosted the development of distance education and its participants. Universities and colleges expand their curriculums and degree programs to fulfill the growing needs of large online learning populations.

The University of Phoenix was the first higher education institution to offer online education programs via the internet (Carlson & Carnevale, 2001; Kentnor, 2015). In the 1990s, several universities started offering computer-based programs, which included the online campus of the New York Institute of Technology, Jones International University, and Mind Extension University (Moore & Kearsley, 2011). Not surprisingly, the for-profit sector acted quickly in the adaptation of online distance education. Several large, new for-profit institutions formed as a result of the attraction and perception of the immense potential of distance education. Some of the well-known newcomers were the University of Phoenix, DeVry University, Strayer University, and Capella University (Moore & Kearsley, 2011). For instance, the University of Phoenix focused on working adult audiences and offered a wide range of vocational courses and degrees in business, management, education, and continuing education courses for professional development. For-profit institutions enrolled a great proportion of distance learners in the early stages of online education.

Nonprofit higher education institutions did not undergo the rapid growth of online education until the late 1990s (Arenson, 1998). New York University (NYU) was the first large traditional not-for-profit university to create an online education subsidiary to make education more accessible (Kentnor, 2015). Currently, there is a tremendous variety and exponential increase in the availability of online courses and degrees offered by private and public nonprofit universities and colleges. In fact, over 80% of degree-granting institutions offered distance education courses in 2007 (Parsad & Lewis, 2008).

The evolution of distance education in higher education has been a natural outcome of adapting to an evolving cultural and social environment in postsecondary education. The national Babson Survey team reports that more than one-third of postsecondary students took at least one

online course in 2010, and the enrollment percentage remained almost the same in 2015 (Allen & Seaman, 2011; 2017). Lehman & Conceição (2013) classified the evolution of higher education due to technological advances into three categories: brick-and-mortar, brick-and-click, and click-link-and-connect. They indicated that the majority of brick-and-mortar students were traditional college-age students who perceived the advantage of using technology but actually lived close to campus. However, click-link-and-connect students are primarily nontraditional students who have a full-time or part-time job and multiple external responsibilities.

The goal of distance education in higher education is to enable students who cannot attend a conventional campus to pursue academic, professional, or recreational studies (Guri-Rosenblit, 2009). Online distance education has and continues to play a vital role in today's educational environment for providing access, flexibility, and affordability without geographical limitations. In 1997, NCES reported that about one-third (33%) of institutions in higher education offered distance courses (Lewis, Alexander & Farris, 1997). "Two-thirds (66 percent) of 2-year and 4-year Title IV degree-granting postsecondary institutions reported offering online, hybrid/blended online, or other distance education courses for any level or audience." (Parsad & Lewis, 2008, p2). Among the students enrolled in online education, 83% were undergraduate students, and 17% were at the graduate level. This number indicated that distance enrollments were primarily undergraduates. For decades, the number of online students in higher education in the United States has increased. Online education has become the new mainstream in higher education.

The annual growth rate has dropped in recent years, according to the 2011 report by the U.S. Department of Education (Allen & Seaman, 2011). This might be a sign that we have reached a saturation point. A double-digits year-to-year increase was distributed in distance

education from 2002 to 2012. Even though the online enrollment growth was slower than in previous years, it was still more substantial than the growth rate of the overall higher education (Allen & Seaman, 2014). Growth of distance education enrollment has caused a decrease in on-campus students such that the total number of students who were physically on campus has dropped fast (Allen & Seaman, 2017). As of fall 2015, there were more than 6 million students taking at least one distance course. Fiscal constraints promoted the rapid improvement and popularity of technology development in public colleges and universities (Means, Toyama, Murphy, Bakia & Jone, 2010). Advanced technology dramatically changed the ways of learning for distance learners from correspondence parcel post to virtual online learning communities. Learning is now provided anytime, anywhere, informally and commonly as long as you are on a technology device (Lehman & Conceição, 2013).

Benefits of Online Learning

Why invest in online learning? There are many potential benefits of online learning, such as nation-wide and international markets, economic benefits, educational accessibility, administrative accountability, etc. Online distance education provides economies of scale while absorbing vast numbers of students (Guri-Rosenblit, 2009). Online courses and programs play an important role in the U.S. educational industry and greatly impact postsecondary education with affordability and accessibility (Kentnor, 2015).

Online learning has proven beneficial when students and instructors were separated geographically or by time and communicated via the Internet (Appana, 2008). The flexibility of taking courses any time and anywhere helped students balance their work and life responsibilities and schedule (Jaggars, 2014). This is especially helpful for community college students who usually worked full-time and had family members to take care of. Online learning

allows students to work at their own pace to complete reading and finish assignments. The asynchronous format provides students the time and space to read and digest learning materials and study on a schedule that is optimal for them, which is an essential part of the learning process (Parsad & Lewis, 2008) so that students could engage in critical thinking and research topics in online discussion with the instructor and classmates (Palloff & Pratt, 2013). The prevalence of the Internet made accessing the online course easy, which increased the popularity of mobile technology and enabled students to participate in activities using the functions and applications via their cell phone or tablet.

At the institutional level, online learning has empowered institutions to extend course sizes and sections and enroll more students without on-campus physical limitations. Many colleges and institutions considered online courses and programs as a lifesaver to salvage declining enrollment and to serve students with different needs (Palloff & Pratt, 2013). In addition, the cost of college tuition has risen faster than the inflation rate, and student loan debt has risen over one trillion dollars since 2014 (Nguyen, 2015). Therefore, the increasing cost of higher education and the reduction of budgets has made administrators apter to expand their online course programs to save money on facilities, and more students may enroll in online programs to save tuition. The use of technology in teaching and learning has been a promising option for controlling costs while reducing achievement gaps and improving access (Bowen, Nygren, Lack & Chingos, 2013).

Challenges of Online Learning

Quality online courses and programs may be optimal for institutions and students, but creating them can be costly, and institutions are challenged by the reductions of higher education revenue, higher tuitions, and increased technology costs (Kuruvilla, Norton, Chalasani, & Gee,

2012). Though the cost of facilities might be lower for online courses, the investment costs of online programs are comparatively higher than continuing in the traditional classroom (Gratton-Lavoie & Stanley, 2009). This high entry cost makes institutions reluctant to keep investing in computers, servers, and technical support (Dumont & Raggo, 2018). Further, the costs of utilizing the new technologies and creating support systems and training for both instructors and students were more expensive than expected (Guri-Rosenblit, 2009). Without proper planning and evaluation, institutions can make costly mistakes by ignoring real problems like online teaching techniques, student needs, technology selection, etc. In the long run, the cost per student and concept taught online could prove to be lower than the traditional face-to-face classroom (Gratton-Lavoie & Stanley, 2009; Ortagus, 2017).

Online education was introduced with the hope to improve teaching effectiveness with the strength of advanced technology (Allen & Seaman, 2015). Critics of online courses and programs are concerned with reports of low quality and of less personalized educational experiences (Bowen, Nygren, Lack & Chingos, 2013). In a national survey, more than two-thirds of academic leaders believed that the concerns about the relative quality of online courses still existed (Allen & Seaman, 2014). The effectiveness of online learning is usually examined by direct comparisons with traditional face-to-face course delivery methods and at times this yields variable results. However, the course delivery method is only one of the factors that affect learning outcomes. How well a course is designed, how the course is delivered, and how the students and instructors are prepared are all main factors to consider when evaluating course effectiveness (Bell & Federman, 2013).

Moreover, one research study noted that underprepared students may perform worse than their peers in online courses and are potentially most harmed by online instruction (Figlio, Rush

& Yin, 2010). Academically underprepared students lack the specific skills to achieve the same learning outcomes as other students. Compared to the virtual online learning environment, the face-to-face interactive learning experience gives at-risk students more opportunities to be seen by instructors and to receive academic guidance and support.

Self-discipline and learning autonomy were seen as critical characteristics of successful online students in a study by Johnston and Berge (2012). Furthermore, some online students could not make the transition from the traditional classroom to the virtual classroom and could not fully adapt to the online learning format. Even now, students in online courses experience technical difficulties consistently. Online instructors and students are expected to learn technical skills to be able to successfully pass online courses. Instructors are further expected to and are able to answer students' questions with rapid turnaround and to resolve technical problems (Palloff & Pratt, 2013). Ongoing professional and technical support for course development and personnel training to consistently guide and help online instructors and students as a must (Guri-Rosenblit, 2009). Multiple studies report that there is a persistent achievement gap among online students and as well as a technical and pedagogical gap among online instructors.

Another problem associated with online education is academic integrity and plagiarism. A self-reported survey conducted in a large state university regarding cheating behaviors found that about 40% of students reported cheating during online courses, and more than half of the students believed cheating was more prevalent in online courses than the traditional in-person courses (Lanier, 2006). Institutions, in turn, responded with numerous strategies to prevent cheating in online courses, such as having students take exams on campus or in test centers, or using reports to replace multi-choice questions (Bell & Federman, 2013).

Online Student Success and Persistence

Conflicting findings are presented in the research of student success and persistence in the online classroom. Though online enrollment rates have increased dramatically over a decade (Allen & Seaman, 2013), student performance and retention rate have been consistently lower than face-to-face students according to many rigorous studies (Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, & Marczynski, 2011; Figlio, Rush & Yin, 2010; Xu & Jaggars, 2014). Xu and Jaggars (2014) studied the completion rates in the Washington State community and technical college system and concluded that online course completion rates were 5.5 percentage points lower than face-to-face courses. Figlio, Rush, and Yin (2010) examined a large introductory microeconomics course at a university with a random assignment of students in live lectures and internet lectures and found that the live-only lecture was modestly superior to the internet lecture, especially for Hispanic students, male students, and lower-achieving students. Patterson and McFadden (2009) discovered that the dropout rate of online students was significantly higher than on-campus students at a national research university. Student satisfaction serves as an important sign of impending dropout decisions and has a significant impact on student retention in online courses (Kim, Liu, & Bonk, 2005).

Student success and persistence has always been a typical measurement of learning outcome in higher education, and research on this topic has been conducted for decades. The development of the Internet and the popularity of online learning brought attention to online student retention. Various studies were conducted to understand the impact factors that affect online student retention and how it differs from the traditional face-to-face classroom (Hart, 2012; Muse, 2003). Xu and Jaggars (2011) found that the institutional supports to succeed academically were not provided in online gatekeeper courses as typically designed and

implemented for on-campus students. Overall, the lack of well-designed high-quality online courses with sufficient student and faculty support puts student success in danger (Bell & Federman, 2013).

Student and Faculty Support

Online Student Support

Student support has a direct impact on students' decisions to persist or dropout. Typically, traditional higher educational institutions offer student support centers like counseling centers, academic advising centers, admission and financial aid offices, and various facilities to support students and increase the social interaction between students. Student support for online learning is overall less organized, less comprehensive, and valued differently than the subsystems of academic support, course design and technology and instructional support (Moore & Kearsley, 2011). Moore also explains, "The need for guidance and counseling can come at any stage of the distance-learning experience" (p.167).

A study of quality components for online programs reveal terms such as "customer focus", "student support", "learner support", "supporting the needs of learners", "tutor support", "effective student services" and "support" employed as important elements in online courses and programs (Stewart, Goodson, Miertschin, Norwood & Ezell, 2013). Stewart and her colleagues divided student support services into three categories: course design elements and features, department and college services, and university support services. Under course design elements and features, student support meant creating a user-friendly course learning platform. For example, the university should adopt a standard Learning Management System (LMS) and hire technical specialists to support the LMS and faculty to develop and maintain online courses. Students in their study showed strong appreciation for consistency across online courses.

Department and college support services is the second category to support online learners in Stewart's paper, which is a component of "learning support, student organizations, academic advising, and instructional design" (learning support, student organizations, academic advising, and instructional, p. 296). Many colleges have student service centers and provide various support services from academic to social and life support services for on-campus students. In the online environment, often, students were served by school administrators and academic advisors via email, telephone or on-campus visits. Either way, online students have to seek auxiliary tools to access those materials. It is essential to provide guidance in the early stages of online learning to help students understand the requirements for online courses and provide basic support such as time to learn basic technical skills to survive in the online environment (Moore & Kearsley, 2011).

Sometimes, the accessibility of the services mentioned above is not obvious to online students. In this situation, Stewart and her team included the concept of "university support services" for student and learning outcomes. The "university support services" category includes a general orientation with college facilities and the online orientation specifically for online course content and learning environment, which are very important to support online student success from the beginning of the collegial journey. Moreover, student success and retention programs provide tutoring and resources for students to make the transition to college and support their academic pursuits. Other university services such as libraries, the admission office, and financial aid should all be designed in a way to support the needs of online students.

We should never assume students are equipped with the skill sets to succeed in the online learning environment. Educators need to identify the important unique student success elements and examine the resources within their colleges to remediate students who may be at risk and

provide corresponding support services for student success. Nationally and internally, there are a number of professional associations like Educause, Online Learning Consortium (OLC), University of Wisconsin distance learning conference, CREAD, CAST, etc. providing valuable resources, guidance and strategies that taken together, indicate a commitment to improving and studying best practices in online education.

Faculty Support Online

Faculty play a central role in students' academic success and even have an impact on students' future careers. Especially in online courses, often, students treat instructors as their one and only resource to acquire knowledge and support in all aspects. To help students succeed in the online environment, faculty should receive enough support and resources to build a strong supportive environment for the online student.

Covington, Petherbridge, and Warren (2005) outlined three areas to support and prepare faculty members in online teaching: administrative support, peer reassurance, and professional development opportunities. The first area of support is administrative support. College administrators should provide sufficient faculty support in common online course materials development and additional general support for the online course and program assessment activities. This gives faculty opportunities to express concerns and receive confirmation in the virtual classroom.

The second area of support is peer support, which was consistently noted as an important aspect to help faculty teach in the online environment (Bailey, Jaggars & Jenkins, 2015; Johnson & Berge, 2012; Rogers, 1995). Sharing experiences through orientation and peer-to-peer workshops connect experienced online instructors with online teaching beginners. A sense of security and community provides technical and emotional support for faculty members.

The third area of support is professional development. The course structure, the means of knowledge delivery, and the pedagogy in online learning were very different from the traditional classroom. Professional training should include technical training in the use of LMS and pedagogical training with the concern of how to teach online students. The faculty members in their study were accustomed to teaching in traditional classrooms and at the beginning of the transition from the traditional face-to-face instruction to online teaching received particular support. After experiencing and participating in the support program, all elements and barriers to online teaching were addressed and resolved, and they then accepted and embraced the new teaching format (Bork & Rucks-Ahidiana, 2013).

Compared to four-year universities, community college faculty have fewer formal professional development opportunities and hiring and onboarding practices for part-time faculty can greatly influence their access to resources (Akroyd, Patton & Bracken, 2013; Martin, 2019). Further, considerable attention is needed to redesign online courses using different pedagogies and approaches. The online environment is perceived as isolated compared to the traditional in-person classes where teaching has high levels of direct interaction and communication. However, synchronization became much more convenient in current online courses. Technical issues may still present barriers to quality learning and teaching experiences based on the familiarity of technology for both instructors and students.

Technology integration in online teaching has been explored in many studies (Jackowski & Akroyd 2010; Meyer & Xu, 2009). For instance, Meyer (2014) interviewed eleven experienced community college faculty members to elicit examples of how they instructed and addressed improving student learning in their online courses. She itemized and summarized four aspects of best practices of faculty preparedness to teach online. Students' learning experiences

can be improved when online instructors (a) emphasized seven approaches to increase student engagement and success in online courses: participation, variety, resources, personal, relevance, interpersonal, and faculty (b) used six different structuring tactics to focus student attention on learning, which includes emphasizing the first two weeks, structuring visual design elements, chunking information into appropriate sizes, scaffolding concepts, allowing multiple drafts of assignments, structuring suspense (c) used assessment techniques to improve learning, and (d) pursued a personal passion for online teaching. With the availability of instructional and administrative support, faculty members can utilize the technology integrated with strong pedagogy to improve student learning and productivity.

Finally, in a study by Hinson and LaPrairie (2005), the researchers collected pre-, mid- and post-faculty interviews to determine the impact of the professional development on faculty's abilities to develop and implement online course materials. The study found that pedagogical change can be initiated through sustained professional development for community college instructors. Support for community college faculty in an online environment is especially important and necessary in both technology skills and pedagogical adaptation, ultimately leading to increased student success.

Online Student Preparedness

With the open access policy for community colleges, students who want to enter community colleges typically need only a high school diploma or equivalent credentials such as the General Education Development (GED) certificate (Shulock & Callan, 2010). One of the problems for the open access policy is that there may be a gap between students' college eligibility and their readiness for college-level courses. Research shows that more than two-thirds of community college students take at least one developmental course to prepare them for

college-level study, and these developmental courses do not earn any college credits (Ganga, Mazzariello & Edgecombe, 2018). Low income, rural or at-risk students may also be entering community colleges with access to adequate equipment, internet access and experience with online technology and environments.

This suggests that the majority of community college students are underprepared, though to varying degrees. When these students study in the online environment, they need to be prepared both academically and technologically. Research in community colleges identified an 8.2% completion rate for all online courses, 12.7% lower than the completion rate for face-to-face courses (Jaggars, Edgecombe, & Stacey, 2013; Xu & Jaggars, 2011). There is an obvious gap between online students' eligibility and their readiness to navigate online coursework, which requires more attention and support.

Preparing students with required techniques and skills is the key to fill in the gap between students' eligibility and college readiness and help them succeed throughout courses. "All types of community college students have a degree of difficulty in adapting to online learning," said Bailey and his colleagues in their book *Redesigning America's Community Colleges* (2015, p.94). Researchers at the Community College Research Center interviewed students at two community colleges and found that one of the top reasons why students struggled in online courses was because of the lack of administration to support online students (Bork & Rucks-Ahidiana, 2013; Jaggars, 2014; Jaggars & Xu, 2013).

Skill Sets for Studying Online

Students need a wide range of skills to learn in the online environment compared to traditional face-to-face classes. First, the ability to use technology to navigate the course learning management system, communicate with instructors, collaborate with peers and self-manage the

course are essential for survival in the online course and have been often discussed or referred to as the required skillsets for online students (Jaggars, Edgecombe & Stacey, 2013; Travers, 2016).

Second, while online learning addresses the physical limitations to allow students access to education in their convenient time and space, other issues are introduced. Online environments require strength in self-selection and self-motivation, the autonomy of course taking, and awareness of their own learning style as very important segments of online learner preparedness (Truman-Davis, Futch, Thompson, & Yonekura, 2000). Without a specific goal to work toward, it may be difficult for students to maintain their motivation to persist in college. A thirteen-item instrument for online student readiness assessment designed by McVay (2000) has been widely used to measure students' skills in technology familiarity, the utility of communication tools and the online learning process. Self- management of learning, online communication, computer technology, and comfort with e-learning were primary factors related to online student success (Smith, Murphy and Mahoney, 2003; Hung, Chou, Chen, and Own, 2010). Actually, not all students are aware of the value of this kind of self-management and autonomy as essential for study in the online environment.

Last but not least, online students, especially first-time online learners, lack understanding of how much time to put into and how the technology works in the learning management system (LMS) (Kelly, 2013). Most of the time, the LMS is the only platform for students to complete their course activities, such as download reading files, upload assignments, access course materials and watch course videos. How to navigate and efficiently manage the LMS is essential for online student course survival.

Preparedness Programs

As mentioned in the above section, there are several different types of skills that are essential for students to successfully complete an online course. Research has found that offering a student orientation at the beginning of taking online courses helps students better prepare for online courses and increases course retention rates (Jones, 2013; Koehnke, 2013). Training in computer skills, how to be a successful online student, and how to navigate online student services and the learning management system (LMS) helps students to become more comfortable with the online learning environment and can also assist in helping overcome potential technology barriers at the beginning of classes (Moore, 2013). In reality, online students often receive little or no orientation compared to face-to-face students who are commonly provided with a full class orientation during the first several classes (Jones, 2013).

Institutions usually offer professional training to online instructors to familiarize them with the technology used online. Just as faculty need to be trained to teach online, students also need to be taught how to learn online. “It is assumed that if students can navigate the course management system, they should successfully complete the class” (Palloff & Pratt, 2013, p.15). Student orientation programs and academic services are aimed to cultivate relevant skill sets and learning strategies for online students to help them prepare for their online courses (Koehnke, 2013).

The effectiveness of these programs that helped students develop essential technical skills to handle the learning management system (LMS) and good learning habits have been verified in many studies. Promotion of academic skill development in a college’s academic support services like time management, effective writing, teamwork, and understanding of active and independent learning provides evidence for encouraging skill preparation in students’ first term

in a recent case study (Miller, Benke, Chaloux & Ragan, 2013). Miller et al (2013) studied Rio Salado Community College's online orientations, which are directly built into the LMS and based on students' characteristics so that staff can focus on each student to help them survive throughout the degree program. Academic leaders are the key to promote this kind of student orientation service for strategic planning activities that provide support and improve the quality of online courses and programs at the institutional level.

As mentioned before, not all online students enter already equipped with the essential techniques and skillsets to succeed in the online classroom. To succeed in the online classroom, students have to be self-motivated and self-disciplined and technologically savvy to be able to navigate the LMS and complete and submit assignments online (Hung, Chou, Chen, and Own, 2010; Moore, 2013; Travers, 2016). Drawing upon both literature and practice, we can conclude that with the support of preparedness programs, course administrators, instructors and students will have higher confidence and can effectively align student expectations and skills with the course requirement to help students succeed in the virtual learning environment.

Online Students in Community Colleges

With the open access mission, community colleges aim to serve a wide variety of students from different socioeconomic statuses, educational levels, family backgrounds, etc. Compared to four-year universities, community colleges have a significant portion of non-traditional and first-generation students and students who face academic and economic challenges (Bailey, Jaggars & Jenkins, 2015; Snart, 2017). Those students often work full-time or part-time jobs, and many have family responsibilities. According to the most recent American Association of Community Colleges' (AACC) 2018 fact sheet, 63% of community college students worked part-time, while 37% worked full-time, and 36% were first-generation students.

The flexibility and convenience of online courses provides a solution for them to pursue their educational goals but still keep a balance of life and school. A study by Bailey, Jaggars, and Jenkins (2015) showed that approximately half of community college students took at least one online course in their academic life. Though the advantages of online coursework fit the schedule of busy community college students, students still struggled in these courses, and the dropout rates in online courses remained high. On the other hand, multiple demands challenge students to find balance among academic work, career, and families, and students are often academically underprepared for college courses (Scheuertz & Barr, 2009; Xu & Jaggars, 2011).

Students attend community college for credentials, professional certificates, professional training, and associate degrees or as a stepping stone to enter a four-year university to earn a bachelor's degree. Community colleges have had large populations of working and older students who have multiple commitments besides academia (Travers, 2016). Bailey and his team found that about 60% of students in 83 surveyed community colleges enrolled in at least one developmental course in English, reading, or math over three years (Bailey, Jeong & Cho, 2010). These unique characteristics of community college students impact their success and retention. Studies reveal that online education might undercut student academic progression among low-income and academically underprepared students (Jaggars & Bailey, 2010). Underprepared students who have been separated from the formal education environment for several years also had difficulty re-adapting to formal learning settings (Travers, 2016). Travers (2016) also found that underprepared students were usually underachievers, from lower socioeconomic families, subjected to lower standard K-12 education, and had family or work obligations. Student support and orientations and a sense of inclusion or engagement are especially needed for those students prior to the beginning of online distance courses.

A noticeable demographic shift has also emerged in community college online learning (Castillo, 2013). Castillo (2013) pointed to an increasing number of adult learners who were attracted by the flexibilities in the online environment and a growing number of younger and academically at-risk students who were in need of remedial education who have enrolled in online courses. Based on the analysis of AACC 2011-12 National Postsecondary Student Aid Study (NPSAS: 12): the average age of community college students was 28, which was higher than the average age of the traditional student (age 18-22). As always, nontraditional adult learners comprise a significant proportion of the community college student population. This group of students has a unique set of needs and perspectives in online courses and programs. Castillo (2013) explained that adult students have distinctive psychological features with regard to learning styles, which requires a specific online instructional style. The theory of andragogy (adult learning) should be applied to the online learning process to attend to the fact that adult students tend to be more independent and self-reliant, tend to be intrinsically motivated, and value relevance and application in how they learn and solve problems (Knowles, Holton, & Swanson, 2012). Adult learners benefit most from a teaching style delivered with independence and flexibility where work and life experience can be recognized and utilized within the learning process (Castillo, 2013).

In addition, half of the undergraduate students enrolled in community colleges were 21 years old or younger (American Association of Community Colleges, 2018). A substantial portion of this younger student population is categorized as academically underprepared and in need of remedial or developmental education. According to Castillo (2013), those students recognized their deficiencies and were less confident about their ability to achieve their academic goals. Therefore, close academic guidance and instruction are necessary for their success in the

online classroom. Tailored program innovation must be provided to serve different student groups to help them succeed in online learning environments.

Theories of Student Success and Persistence

There is a long history of research in the field of student success and persistence, which could be traced back to the 1600s and systematic studies did not take place until the 1970s (Aljohani, 2016; Berger et al., 2012). In recent decades, student success and persistence have become hot topics around the world where numerous research and theoretical studies were developed to investigate their impact on higher education. The purpose of this dissertation study is to investigate the effectiveness of an online student preparedness program. It is necessary to fully understand the elements associated with student success and persistence and understand the theories behind it. Thus, this study focuses on three student success and persistence models based on the fundamental structure and the target population: community college online students. Accordingly, Bean and Metzner's (1985) nontraditional student persistence model, Falcone's (2011) student persistence model, and Rovai's (2003) non-traditional students as online learners model are introduced and discussed.

Bean and Metzner's (1985) Conceptual Model of Nontraditional Student Attrition

Bean and Metzner (1985) defined a nontraditional student as a combination of these factors: age higher than 24, off-campus commuter, and enrolled as a part-time student. Tinto's (1993) early model was very popular and validated during that time with a focus on traditional college students. However, students who lived outside of campus and commuted to school rarely participated in social groups and activities. Tinto's model did not include the characteristics of the off-campus commuters and the impact of the external environment for this group of students and was unable to capture their needs and characteristics overall. Therefore, Bean and Metzner

(1985) developed this conceptual model to focus on nontraditional undergraduate students to fill out the gap of research at that time. Compared to Tinto's model, Bean and Metzner embraced socio-psychological and environmental perspectives.

Different from previous student attrition models, Bean and Metzner's model includes the environmental aspect, which makes it a good fit as a model for studying community college students (Stahl & Pavel, 1992). This model has been examined and tested in empirical studies of student persistence in both four-year universities and community college settings. They were the first to identify nontraditional students' needs and establish a model of the persistence and attrition process. Though this model was not targeted for distance students, there are similarities between nontraditional students and online learners, such as being enrolled part-time and off-campus, which indicate a high influence of environmental influences external to the school, referred to by Bean and Metzner as "external environmental factors" (Bean and Metzner, 1985).

Four main categories of student characteristics were summarized as variables that affect students' success and persistence: background variables, academic variables, environmental variables, and academic and psychological outcomes (see Figure 2). Compared to previous student persistence models, Bean and Metzner's model focuses on nontraditional students who were primarily affected by external environmental factors like family responsibilities and other external commitments (Aljohani, 2016). Social integration variables in their model emphasize a weak impact of the school's social environment on nontraditional students compared to their on-campus peers, which also holds true for online learners. Bean and Metzner also hypothesized that students with lower academic performance are more likely to withdraw and indicated that environmental variables such as finance, working hours, outside encouragement, family responsibilities, etc., were closely related to nontraditional student attrition, which are also

similar to online student characteristics and performance (Aljohani, 2016; Lee, Choi, Kim, 2003). These factors described have shed light on student success in the online environment.

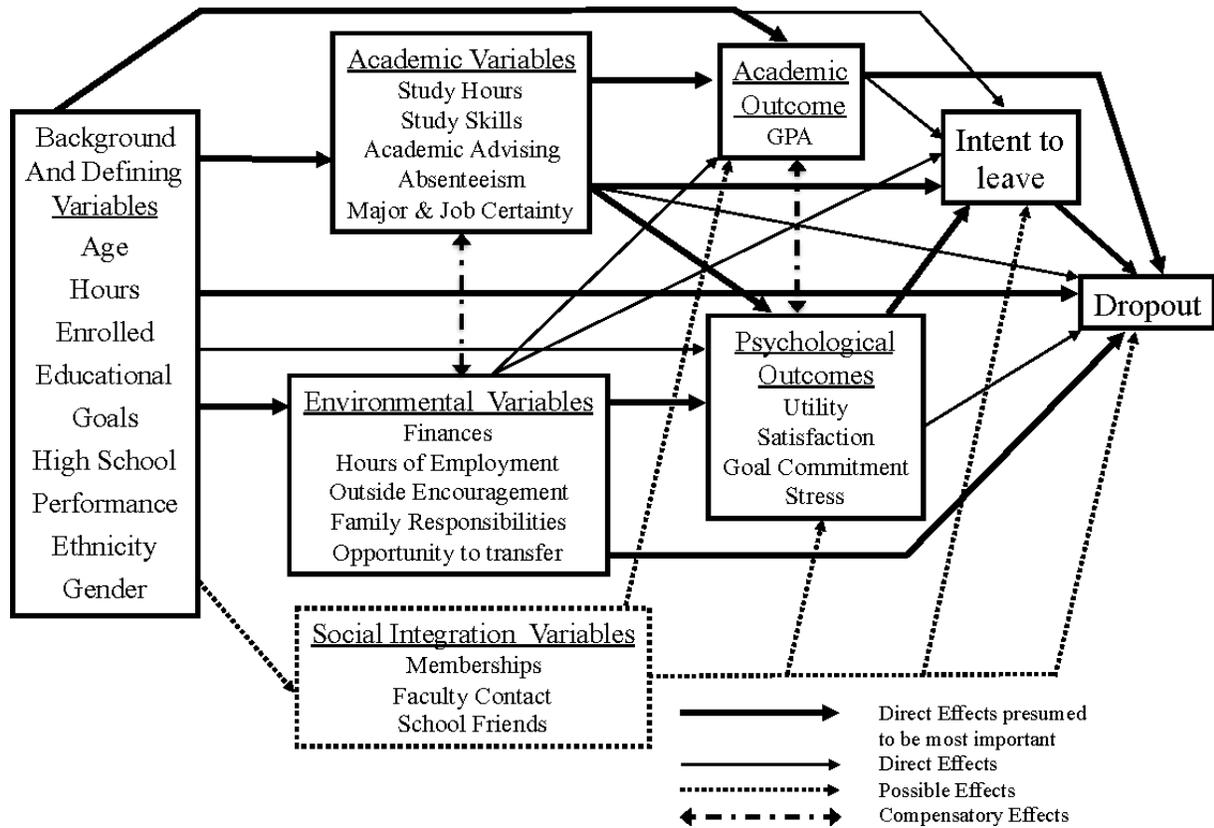


Figure 2. Bean and Metzner's Conceptual Model of Nontraditional Student Attrition

Falcone's (2011) Student Persistence Model

Falcone's (2011) model focuses on marginalized groups in higher education, such as non-traditional students who are low-income, have low-socioeconomic status, or are first-generation and working class. This group of students comprises an overlapping group of students with unique experiences and has not been well explained in previous literature. Compared to four-year higher education institutions, the containment nature of community colleges requires them to accept students from different educational-levels and socioeconomic groups. Therefore, it is

reasonable to apply this model to understand the intricate background of community college students (Shea & Bidjerano, 2014).

Falcone's model emerged from Tinto's (1993) Model of Institutional Departure and Rendon's (1994; 2002) theory of validation. Falcone found that Tinto's model limited student departure in the first institution where he or she enrolled. Students who transferred to another college or university would be considered dropouts in Tinto's model (Falcone, 2011). Moreover, Tinto's model primarily focused on traditional, white middle-class students rather than nontraditional students who are often minorities and/or nontraditionally aged students, community college students, working-class students, and so on.

Falcone (2011) also learned from Rendon's (1994) Theory of Validation and suggests that the academic culture needs to change to meet the diverse student population. Validation exists in two types: academic validation and interpersonal validation (Rendon, 1994). Different from others at that time, Rendon's studies (1994, 2002) focused on nontraditional students in a community college at an African American state university. Rendon emphasized that nontraditional students may experience invalidation from friends and family, which may discourage their willingness to pursue academic goals. Moreover, Rendon pointed out that when the environment is different in college than in their real lives, students may not be able to take full advantage of college support services. Falcone included Rendon's theory of validation and explored recognition, respect, and involved students' cultures, communities, and families as important aspects in his own model, which strongly associated with an individual's decision to persist (Falcone, 2011).

Falcone also adopts Barnett's (2011) idea of using the combination of Tinto's student departure model and Rendon's construct of validation to examine the persistence patterns of

community college students. Barnett found that faculty validation was a strong predictor for student academic integration, which Falcone (2011) called a “sense of belonging” (Wolf-Wendle et al., 2009).

In the final model, Falcone (2011) combines Tinto’s model and Rendon’s validation construction with a Bourdieuan framework and creates a multi-theoretical model to look into student persistence. Different from Tinto’s (1993) model, Falcone included students’ perceptions of themselves and perceptions of the college environment which gave opportunities for students to react differently from different college environments. The “integration” was placed in Falcone’s model to provide students with a sense of belonging in their college lives. The Bourdieuan lens of Falcone’s model embraced the complex context and different identities for each individual learner when they act on academic performance, which is similar to online learners.

As Falcone mentions in her study, individuals socialize differently in different environments and have different practices in their habitus and capital. With the Bourdieuan framework in mind, Falcone brings in the personal capital characteristics of students who interact with different contexts and fields. Taking all into account, Falcone’s model examines students’ experiences with the interaction of institution, community, and themselves, which influence their perception of fit in college in both social and academic environments.

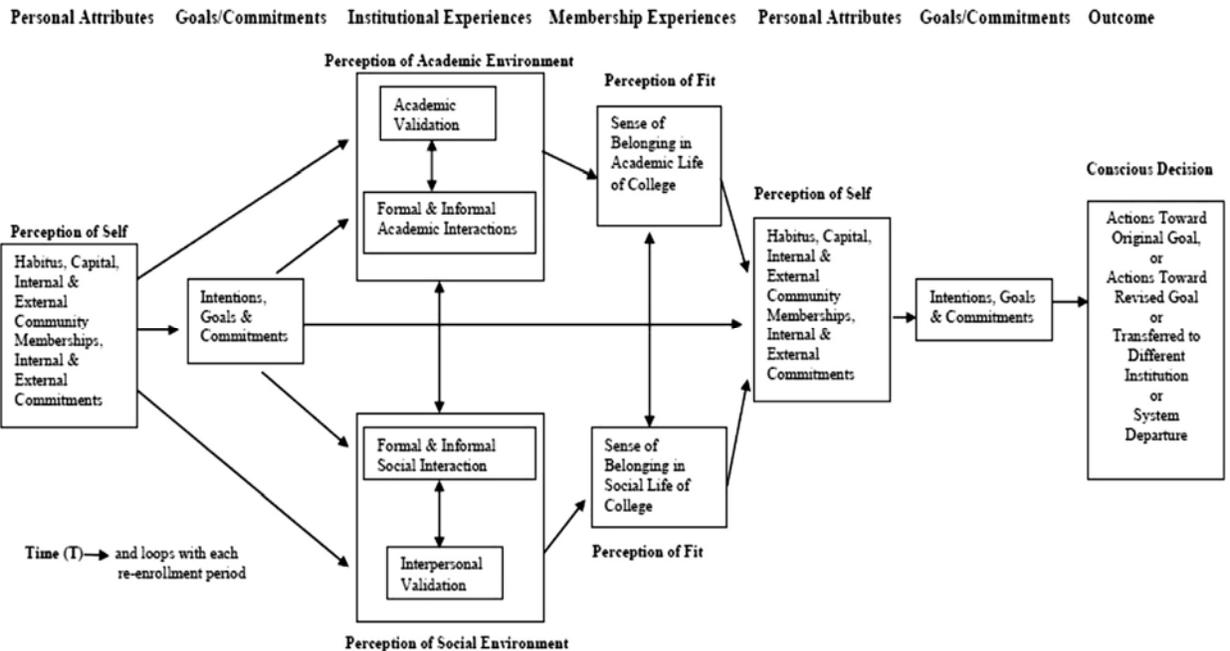


Figure 3. Falcone's Model of Student Persistence in Higher Education

Rovai (2003) Non-traditional Students as Online Learners

Rovai started from Tinto's (1993) student departure model and Bean and Metzner's (1985) student attrition model and includes further from studies (Cole, 2000; Grow, 1996) on online student needs, skills, and learning and teaching styles. He finds that previous studies were limited to explain the persistence of online students and then developed this new student composite persistence model for distance education students.

Rovai exposes implications for the lower persistence of nontraditional students in distance education since typical online learners are nontraditional students. The increasing population of nontraditional and distance learning students increased the need to analyze the old student persistence models with an online population of adult learners.

Rovai (2003) examined student persistence associated with two timestamps: prior to admission and after admission. Student characteristics and skills variables presented in *before admission categories* such as age, ethnicity, gender, academic performance and other factors

were found to affect student persistence. Different from previous student persistence models, Rovai added “prior to admission” variables in student skills such as “computer literacy, information literacy, time management, reading & writing and computer-based interaction,” which took a big portion of his model and were conceptualized as essential elements to succeed in the distance learning environment. For instance, information literacy skills are required for students to locate, evaluate and use the corresponding information.

Two factors were introduced into the *after the admission category* in his model: external factors and internal factors. The external factors affecting students after admission draw heavily from the environmental variables from Bean and Metzner’s (1985) model, which included finances, hours of employment, family responsibilities, outside encouragement, the opportunity to transfer, and life crises. Those external factors were outside of the academic environment but were closely interacted with nontraditional students’ life that would then affect persistence.

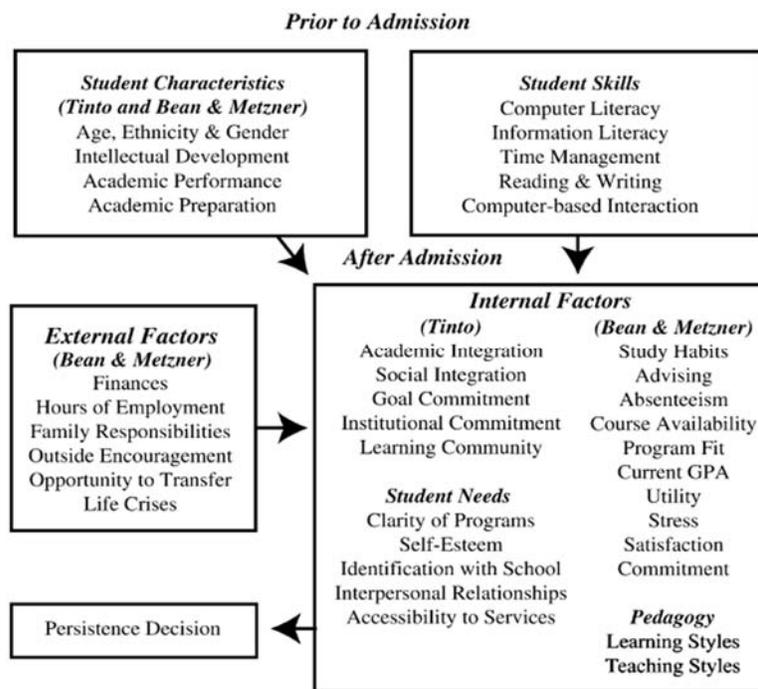


Figure 4. Rovai’s Composite Persistence Model

Another grouping within “after admission” is internal factors, which is transferred from Tinto’s (1993) and Bean & Metzner’s (1985) model, both of which emphasize integration for traditional college students. Distance education students have different needs than their on-campus counterparts. Rovai (2003) analyzed distance learner needs for program clarity, self-esteem, identification with school, interpersonal relationships, and accessibility to services (Workman & Stenard, 1996). He also explained that distance learning students have different learning styles than on-campus students. Various pedagogical and andragogical strategies were needed to adapt to students’ learning styles and evaluate their learning outcomes (Knowles, Holton & Swanson, 2012).

Summary of Chapter Two

As discussed in the body of the literature review, over half of all online enrollments occur at community colleges, making the impact of online education has been significant to study as a postsecondary online environment (Allen & Seaman, 2008). There are many benefits to adopting online learning, but community colleges continue to face many challenges to attract and retain students. The prosperous and inevitable development of online education in community college makes this investigation into online student success in the community college environment more crucial and practical.

Online education is quite different from traditional face-to-face education in instructional design, technology facilitation, and pedagogy. The skill sets and learning strategies of online learners need to be continually updated to achieve the best learning outcomes. Obviously, not all students realized the different expectations of skills and behaviors in the online environment (Bork & Rucks-Ahidiana, 2013). Therefore, institutional level interventions such as student

readiness and preparedness programs are needed to strive for student success in the online environment.

After reviewing various models in student success and persistence in both traditional and online courses. I adapted the study theoretical model from elements of three empirical models to establish and unravel the myths of student success and persistence in higher education (Bean & Metzner, 1985; Tinto, 1993; Rovai, 2003; Falcone, 2011). The characteristics of the community college student population require an emphasis on the influence of work and family on academic performance (Falcone, 2011). The difference in learning in an online environment for non-traditional students requires different needs and skills (Rovai, 2003).

In the next chapter, I introduce the student preparedness program in the local urban community college and present and discuss the methodology that was used in this study.

CHAPTER 3: METHODOLOGY

This chapter describes the methodology that is used in this study, the demographics of the community college, research sample, research design (treatment, dependent variable, independent variable), and data analysis. The purpose of this study is to investigate the effectiveness of an online student preparedness program in an urban community college. This research has been submitted to and approved by the Institutional Review Board (IRB) of North Carolina State University and the IRB office of the studied community college before any research has been conducted.

The two research questions that guide this study are:

3. Student level: *to what extent does the student preparedness program affect:*
 - a. *student grade point average (GPA) in online courses?*
 - b. *student online course completion rate?*
4. Course level: *is grade distribution significantly different in online courses before and after the student preparedness program, as measured by course success rate (% of grades "A," "B," "C," and "Pass" of all grades)?*

Setting

The community college used for this study is located in a county that has a service population of one million. The college has ten campuses located throughout the county. It offers associates degrees, technical certification, and non-credit courses to serve all learners throughout the county and distance learners throughout the U.S. with more than 20,000 students enrolled annually. According to IPEDS, 70% of its student population is enrolled part-time, 50% are white students, and approximately 40% are aged 25 and over, which is similar to national demographics of community college students with 48% white students and over 50% aged over

21 (AACC, 2018). About 40% of students in this college received some type of grant or scholarship aid. Almost half of the students in this college enrolled in at least one distance education course. Among the students in distance education, about half of them enrolled only in distance education courses.

The studied community college offers the largest number of online courses in various disciplines and programs in the state and has more online students than any other community college in North Carolina. According to the college's recent report, students in face-to-face classes had a 5% greater success rate (% of grades "A," "B," "C," and "Pass" of all grades including withdrawals) than those in online classes. Additionally, course retention rates in face-to-face sections were 10% greater than in online sections. The gap between online and face-to-face success and retention rates raised concerns for college leaders and administrators about the quality of online courses. To shrink the achievement gap and better serve the online student population, the college designed an interactive e-Learning Introduction (ELI) student preparedness program. The purpose of the ELI program is to provide training for online students to help them succeed in online course environments by providing knowledge and skills for students in expectation management, basic computer skills, and how to navigate and use the learning management system (LMS).

Research Question One

Since the two research questions focus on two different levels of research methods and design, the following sections will be presented in the order of each research question.

Sample

The college's institutional research office provided and prepared the student longitudinal data to the researcher. This study identified the effect of the ELearning Initiative (ELI) program.

Research question one focuses on student-level data, which examines the student level program effect on online student's GPA and course completion rate. The ELI Program began in fall 2015. To compare students' performance before and after the ELI program, the sample for research question one included students that keep enrolled through fall 2015, specifically all students had any online courses in fall 2012 to spring 2015 (before ELI program), as well as in fall 2015 to fall 2018 (after ELI program starts) time periods (same students took courses before and after the ELI program). Summer semesters were excluded in this sample selection since the course offerings and structure were very different. Therefore, the analytical sample includes student data of the same students in the studied college before and after the ELI program (Appendix A displayed a detailed explanation of the data structure).

It is important to mention that the college research office provided the student data from their online data management system and masked student personal identifying information to protect student privacy. This study used aggregated student information of averaged individual performance. There is no way to identify a single student based on the analyses.

Research Design

Research question one applies a quasi-experimental research design using quantitative analytic methods. It adds to the current literature by examining the causal effects of an online student preparedness program on student success.

To obtain an unbiased estimation of the causal effect of the ELI program, the problem of confounding variables must be handled. In theory, A randomized field experiment would be the "gold standard" to assess causal effects to avoid selection bias and calculate the treatment effect (Khandker, Koolwal & Samad, 2009). However, it is not the current practice and not feasible to use the randomized design to select a group of students to participate in the ELI program and not

include other students. Often in educational settings, we are not able to apply this randomization due to equality, ethical, and policy issues (Si, 2011).

In this situation, quasi-experimental designs can be used to simulate the change in outcomes of the comparison and treatment groups to determine learning outcomes without randomly assigning participants to groups (Cresswell, 2014). This quasi-experimental design examines the causal relationship between student learning outcomes and the ELI program, which relaxes some of the key requirements of randomized experiments and eliminates the unobserved time-invariant individual variables and avoid bias from unmeasured confounders. “In quasi-experiments, the investigator uses control and experimental groups but does not randomly assign participants to groups” (Cresswell, 2014, pp. 159).

Treatment. The purpose of the study is to investigate the impact of the ELI program on student learning outcomes in the online environment. The treatment here is the ELI program, which consists of a set of three new online orientation modules: (1) Expectation Management, (2) Basic Computer Skills, and (3) the Learning Management System (LMS). Prior to Fall 2015, there were no universal required online orientation modules for students taking online courses.

Starting fall 2015, all students were required to take a pre-assessment test for each of the three modules, and they were required to score a 90 or above on each the pre-assessment test to be recognized as online ready and allowed to register for online courses. If a student failed in the pre-assessment test, he/she would need to take the corresponding modules and achieve passing grade to be eligible to take online courses. Although, they could take face-to-face courses without this requirement.

ELI Modules. The three modules comprising the ELI student preparedness program are (1) Expectation Management, (2) Basic Computer Skills, and (3) the Learning Management

System (LMS) used at the college. Figure 5 is a flow chart demonstrating a student’s progression through the three modules.

Module one, “Expectation Management and Transferable Skills”, emphasizes the “soft skills” like time management, goal setting, self-advocacy, and accountability while using technologies. Informational videos and interactive platforms are applied to the skills. Key elements in this module contain communication skills, interpersonal and teamwork skills, academic integrity, problem-solving, responsibility and accountability, adaptability and organizational skills. The skillset in this module may assist them not only in the online courses but also in life skills.

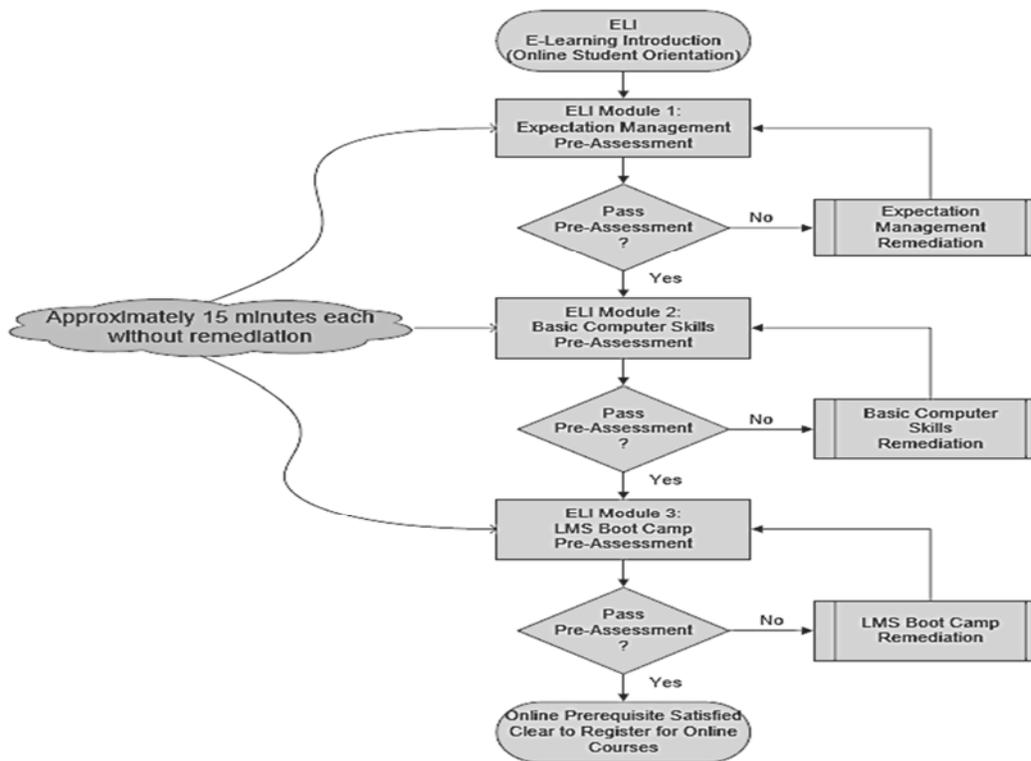


Figure 5. Flow chart of the ELI program three modules.

Upon the completion of Module one, the students will then move forward to Module two, “Basic Computer Skills”, which covers the basic computer skills required to survive in online

courses. Computer skill deficiency or inconsistency is one of the reasons students fail online courses (DuFrene, Clipson, & Wilson, 2010; Crotty & Farren, 2013). In this remediation module, students learn keyboarding, mouse and CPU knowledge, computer concepts, file management, digital literacy (internet usage), and communication in an online format (aka. emailing, create attachments, screenshots). Acquiring these basic computer literacy skills is designed to improve student success in online courses.

Upon the completion of Module two, students will then move forward to Module three, “the Orientation for the Learning Management System (LMS)”, which is the platform the college uses for all online courses. The training in this area is essential to assist students in successfully navigating online courses using the college LMS. This LMS boot camp module covers the skills that needed to navigate the LMS successfully, such as how to submit assignments, participate in discussion forums, and manage wireless and portable devices.

Treatment in research question one. Student-level data is used to study the effect of the ELI program treatment on online student GPA and course completion rate. Research question 1 student-level data consists of two groups: one group are students who participated in the ELI program and failed at least one or more of the pre-assessment tests and had to take one or more of the ELI modules. The second group consists of students who tested out of all three pre-assessment tests and were considered online ready. Students in both groups have pre and post academic records.

Dependent Variables for Research Question One. There are two dependent variables in research question 1. This question uses student-level data to examine the ELI program treatment effect on students’ GPA and completion rate in the online environment.

The first dependent variable for research question 1 is student's grade point average (GPA) in online courses. Student GPA is based on a 0 to 4.0 scale (A or Pass = 4.0, B = 3.0, C = 2.0, D = 1.0, and F = 0) with a 4.0 representing the highest GPA level. For students who take more than 1 online course per semester, the cumulative online course GPA for that particular semester will be used.

The second dependent variable for research question 1 is student's online course completion rate. It defined as a percentage from 0% to 100%. A percentage instead of a binary variable was used because a student may take more than 1 online course per semester, and all the online course completions for the student in the studied semesters need to be taken into account. The formula used to calculate this dependent variable is: *(# of online courses completed in studied semesters) / (total # of all online courses taken in studied semesters)*. Therefore, for students who only take 1 online course in studied semesters and failed to complete the course (withdraw), the completion rate would be 0%, and 100% if completed. For students who take more than 1 online course in studied semesters, the completion rate is calculated using the above formula to get the percentage rate.

Independent variables for Research question one. Research question 1 has 8 independent variables. They consist of 4 student characteristics (gender, race, low socio-economic status, and age group) and 1 course related variable (faculty certification) and 1 treatment variable (ELI treatment program), 1 time indicator variable (Post) and 1 interaction term of time and the treatment (ELI \times Post). The interaction value is the core of interest because it represents the effect of the ELI program on student outcomes. See Table 1 for variable definitions.

Table 1. Independent variables for research question one

Variable	Label	Variable description	How measured
Demographics	Gender	Gender of student	Female = 1 Male = 0
	Race	Race of student	White =1 (reference group) ¹ African American =2 Asian American = 3 Native American = 4 Hispanic = 5 Other (includes foreign, multiple-race, and unknown) = 6
	Lowses	Low socio-economic status	lowses = 1 Otherwise = 0
	Age_group	Age breakdown groups of students at post time	17 and below = 1 18 to 21 = 2 (reference group) ² 22 to 34 = 3 35 to 49 = 4 50 to 64 = 5 65 and above = 6
Course related	Instructor_certified ³	% online course instructor is certified to teach online	0% - 100%
Treatment	ELI	whether student participated in the ELI preparedness program	Yes = 1 No = 0
Time	Post	Semester term pre or post ELI program	fall 2012 to spring 2015 =0 fall 2015 to fall 2018 = 1
Interaction	ELI × Post	Interaction of treatment and time variables	Yes = 1 No = 0

Note: 1. White was used as the reference group in variable Race for analysis. 2. Age group “18 to 21” was used as the reference group in variable Age_group for analysis.

3. Students may take 1 to multiple online courses with different instructors, and the instructor certification rate were different. For the data analysis, this variable was calculated as a percentage from 0% to 100%. Instructor_certified was calculated: (# of online course instructors certified in studied semesters) / (total # of all online course instructors studied semesters).

Data Analysis

For research question one, since there are two dependent variables (student’s GPA, and completion rate), two regression models both using Difference-in-difference method with the propensity score matching to equalize the samples were used. Research question 1 (student

level): *to what extent does the student preparedness program affect: a. Student grade point average (GPA) in the online environment; b. student online course Completion rates?*

To answer this research question, 2 ordinary least squares (OLS) regression models (one for GPA and one for completion rate) were implemented, each with an interaction term of time and the treatment effect (1=Yes, 0=No). since this is the usual way to apply the DD method (Angrist & Pischke, 2008) to determine if the treatment (ELI program) has an effect on GPA and online course completion rate.

Propensity Score Matching. Before running the regression models, the propensity score matching technique was applied to equalize the comparison and the treatment groups. After the equalization of these two groups, regression models were performed on the equalized data sets.

The propensity score matching technique is applied to deal with the confounding variables in non-experimental studies, using a baseline (pre-treatment) of characteristics to balance the program group and comparison group (Rosenbaum & Rubin, 1983).

The DD method does not require the same conditions for the comparison and treatment groups (Gertler et al., 2016). Using propensity score analysis as the first step in conjunction with the DD framework has become popular in observational research to minimize case mix differences (Warton & Parker, 2018). Here, propensity score matching was applied to further reduces the fluctuation and variance between these two groups on time-variant factors of heterogeneity (handling the bias from unobserved individual characteristics), thus increasing the confidence of the parallel trend assumption of the DD method (Si, 2011).

The matching method used was the one-to-one greedy nearest neighbor matching method with caliper equals 0.25 is used to select the comparison unit, which is nearest (most optimal) to each treated unit without replacement (Coca-Perrillon, 2007; SAS Inc, 2016). PROC

PSMATCH (SAS Institute Inc., 2016) was used to get the propensity scores by establishing a logistic regression model using the treatment indicator as the binary dependent variable, and race, gender, low-socioeconomics and age group were used as the explanatory variables.

Comparison group to the treatment group with similar propensity scores (aka similar individual characteristics, like same gender, race) are matched, so as to enable the treatment group and comparison group statistically equivalent and reduce the selection bias caused by the pre-assessment test and increase the credibility of the parallel trend assumption of the DD approach (Stuart et al., 2014). The data structure and detailed explanation of matching steps were discussed in Appendix A.

Difference-in-difference. DD method was used to compare learning outcomes (online course GPA and online course completion rate) on students who completed the ELI program (treatment group) and students who did not take the ELI (comparison group) before and after the implementation of the ELI program. The use of the DD method has become widespread since the work by Ashenfelter and Card (1985).

By using the DD method, the distinguishes between the treatment and comparison groups do not matter much, since DD does not require the same conditions for those two groups (Gertler et al., 2016). DD is used when there is a natural division of treated and untreated groups to understand the effect of economic or policy changes (Meyer, 1995). In this study, the ELI program is the natural division to separate these two groups. The treatment group (students who completed the ELI program) is exposed to the ELI program treatment from fall 2015 – fall 2018 but from fall 2012 to spring 2015. Appendix B explained the fundamental structure and steps of the DD method.

Statistical Model for Research Question One. Two statistical models for each dependent variable (one for GPA and another model for completion) use ordinary least regression (OLS) with the interaction term representing the Difference-in-difference (DD) technique. The key estimating equation is the following:

$$Y_{it} = \beta_0 + \beta_G * Gender_i + \beta_R * Race_i + \beta_L * LOWSES_i + \beta_A * Age_group_i + \beta_C * Certified_faculty_{it} + \beta_{tr} * ELI_i + \beta_T * Post_t + \beta_1(ELI_i * Post_t) + \epsilon_{it},$$

$$i = 1, \dots, n; t = 0, 1.$$

Note: because race and age_group are categorical variables, dummy variables are actually used so that $\beta_R * Race_i$ is shorthand notation for $\beta_{R1} * Race_1 + \beta_{R2} * Race_2 + \beta_{R3} * Race_3$; $\beta_A * Age_group_i$ is shorthand notation for $\beta_{A1} * Age_group_1 + \beta_{A2} * Age_group_2 + \beta_{A3} * Age_group_3 + \beta_{A4} * Age_group_4 + \beta_{A5} * Age_group_5$

For the two regression models, the only difference is the dependent variables. Y_{it} here represents the dependent variable (either student online course GPA or student online course completion rates). in the GPA model, Y_{it} is an online student's GPA (range from 0 to 4); in the Completion rate model, Y_{it} is online student completion rate (range from 0% to 100%) for each student (i) at time (t).

β_0 represents the intercept, which means the baseline student GPA or completion before the program for the comparison group. Students' individual variables that are not changing over time are represented as $Gender_i$, $Race_i$, $LOWSES_i$ and Age_group_i . This equation also controlled for individual variables that vary over time $Certified_faculty_{it}$, since students had different instructors in different online courses. ELI_{it} indexes treatment variable of whether student (i) was in the ELI treatment group. $Post_t$ variable categorizes the different time periods (1 = post ELI program semesters, 0 = pre-ELI program semesters), and reduces possible omitted variables biases by accounting for changes over time.

The core casual effect of interest in this OLS regression equation is to capture the coefficient of the interaction term $\beta_1(ELI_i * Post_t)$ which represents the DD technique. β_1 captures the effect of the ELI student preparedness program. ELI_i is a dummy variable (1 = participated in the ELI program, 0 = not participated) that indicates whether student participated in the treatment or not, and $Post_t$ is another dummy variable (1 = post ELI program semesters, 0 = pre ELI program semesters) that denotes which semester year the student was in. Therefore, $ELI_i * Post_t$ has a value of “1” in the semester year when the student participated in the ELI program, and “0” otherwise. Specifically, the interaction term coefficient β_1 captures the effect on the ELI program on online student learning outcomes in each of the regression models (online GPA, online course completion rate). Lastly, ϵ_{it} is a stochastic error term, and standard errors are clustered at the individual student level.

All statistical analyses are conducted using SAS statistical analysis software. PROC MIXED model was used for DD analyses to solve the repeated measurement problem in panel data. PROC MIXED is a more flexible analytic approach to do repeated measures linear model while accounting for the correlation between measures (Warton, Parker & Karter, 2016). Two mixed models (one for each dependent variable) were built to estimate the coefficients. Appendix C included relevant SAS code for modeling propensity score matching and difference-in-difference.

Student and course level descriptive statistics of all data are aggregative and presented, such as student socio-demographic variables, and academic variables. The use of descriptive statistics allows us to describe the population of interest and summarize online student characteristics in the studied community college.

Research Question Two

Sample Selection

Research question two investigates the course level program effect, which focuses on the course success rate (% of grades “A,” “B,” “C,” and “Pass” of all grades). Since the course level analysis is different from the student level analysis, the online course is used as the unit of analysis. To examine the time series related to the course success rate, online courses offered in spring and fall semesters from 2012 through 2018 were selected. Next, from all these online courses, only online priority courses were selected for this study. These courses were selected because of high student enrollments and demonstrated the success rate gap between face-to-face and online courses. A total of 33 different online priority courses was anticipated to be selected.

Treatment in Research Question Two

The detailed design of the ELI program was discussed in the treatment section within research question one. Here discusses the treatment in research question two, which focuses on the course level effect. Course level data consists of online course grades before the implementation of the ELI program in the Fall of 2015 and online course grades after the implementation treatment of the ELI program. Therefore, all online courses on and after fall 2015 were under the treatment of the ELI program.

Dependent Variable for Research Question Two

Research question 2 studies course-level data to examine whether the online course success rate (defined below) is significantly different in online courses before and after the student preparedness program. There is only one dependent variable for research question 2, which is the course success rate (% of grades “A,” “B,” “C,” and “Pass” of all grades) in each online course by the end of each semester. Therefore, it is a percentage rate from 0% to 100%.

Independent Variables for Research Question Two

Research question 2 has only 3 independent variables. The first variable is a binary “treatment” variable: received ELI treatment =1, otherwise =0. The second variable is a continuous “time” variable which represents the time series of fall and spring semesters: fall 2012 =1, spring 2013 =2, through fall 2018 = 13. The third variable is the interaction of time and ELI treatment: pre-ELI (fall 2012 to spring 2015) = 0, post-ELI (fall 2015) = 1, post-ELI (spring 2016) = 2, through post-ELI (fall 2018) = 7. This interaction value is important because it represents the course success rate trend after the implementation of the ELI program. See Table 2 for research question 2 variable definitions.

Table 2. Independent variables for research question two

Variable	Label	Variable description	How measured
Time trend	Time	the number of fall and spring semesters from the start of the series	1 = fall 2012 2 = spring 2013 3 = fall 2013 4 = spring 2014 ... 13 = fall 2018
Intervention	ELI	a dummy variable taking the values "0" for pre-ELI and "1" after the ELI intervention	0 = pre-ELI 1 = post-ELI
Interaction	Time × ELI	"Time after ELI intervention" counts the semesters in the post-ELI intervention segment at time "t"	0 = pre-ELI (fall 2012 to spring 2015) 1 = post-ELI (fall 2015) 2 = post-ELI (spring 2016) 3 = post-ELI (fall 2016) ... 7 = post-ELI (fall 2018)

Data Analysis

Paired t-test analysis. A paired t-test was performed to determine whether there is a statistical difference of the average course success rates before and after the start of the ELI program. All courses were measured and calculated the before means (average success rate from fall 2012 to spring 2015) of course success rate, and the after means (average success rate from fall 2015 to fall 2018). Since it is the same course that been measured twice (before and after), a paired t-test was conducted to control for the dependency and correlations (McDonald, 2009).

Interrupted time series analysis. For research question 2, an interrupted time series regression model is used to determine the difference in grade distribution in online courses before and after the program started.

Research question 2 (course level): *is grade distribution significantly different in online courses before and after the student preparedness program, as measured by online course success rate (% of grades “A,” “B,” “C,” and “Pass” of all grades)?*

Interrupted time series analysis (ITSA) regression model was used to capture the ELI program effect on the online course success rate (% of A, B, C, Pass) using course-level data from fall 2012 to fall 2018. The time series interruption occurred with the start of the ELI program (treatment) in the fall of 2015.

An ITSA model can be used to determine the causal effect of the treatment. “If the treatment had an impact, the causal hypothesis is that the observations after treatment will have a different slope or level from those before treatment” (Shadish, Cook, & Campbell 2002, p. 172). The ITSA is a strong quasi-experimental alternative when randomization designs are not feasible, and it allows the researcher to control for potential confounding omitted variables in the statistical model (Linden, 2015). Since the fall of 2015, every online course was under the effect

of the ELI program. The interruption that occurred starting the fall of 2015 may demonstrate a change of variance in course success rates.

Analysis. Specifically, the ITSA model used in this study is the single-group analysis since there is only one group (all online courses) and no comparison group. This analysis will be used to answer research question 2 by determining if: is there a difference in course success rate (grade percentage of A, B, C, and Pass) before and after the treatment (ELI program). Figure 6 below illustrated the idea of the ITSA method in visualization.

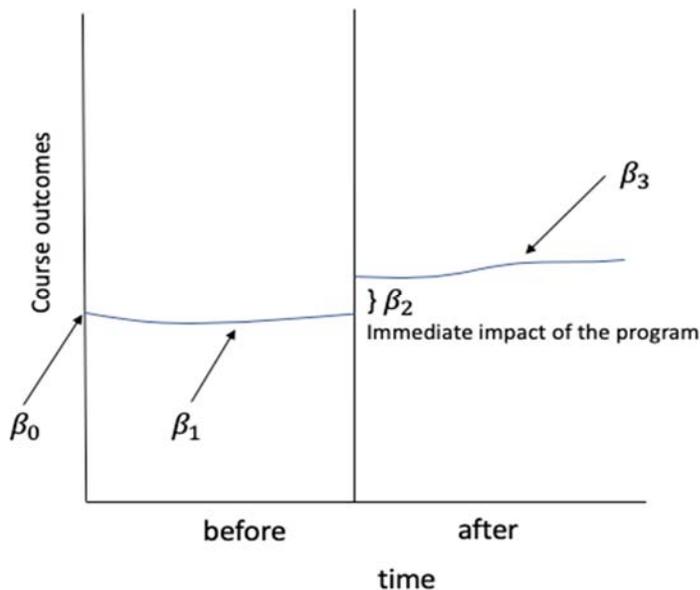


Figure 6. Interrupted Time Series Methodology Display

Statistical Model for Research Question 2. The standard ITSA model for this study is as follows:

$$Y_t = \beta_0 + \beta_1 Time_t + \beta_2 ELI_t + \beta_3 ELI_t \times Time_t + \epsilon_t,$$

$$t = 1, \dots, 13.$$

Y_t is the % of course success rate that measured at each time point t . $Time_t$ indexes each time point from fall 2012 to fall 2018 (only includes spring and fall semesters). ELI_t is a dummy

variable that represents the treatment (1= after ELI, 0 = before ELI). $ELI_t \times Time_t$ is an interaction term of time variable multiple the treatment variable, which determines if there is a significant change in course outcome after the treatment. Refer to Figure 6, β_0 is the intercept of the outcome variable. β_1 is the slop of the online course success rate until the introduction of the treatment (ELI program). β_2 represents the change in the level of the online course success rate that occurs in the time immediately after the introduction of the ELI program. β_3 is the difference between pretreatment and post-treatment slopes of the course learning outcomes. ϵ_t is the random error terms which may follow autocorrelation structure. After control for the autocorrelation, we would expect ϵ_t are independently and identically distributed. Thus, the coefficients of interests here are β_2 and β_3 which represent the immediate treatment effect and the treatment effect over time after the program started (Linden, 2015).

All statistical analyses are conducted using SAS statically analysis software. All outcome measurements are in aggregative form. Descriptive statistics are captured to describe the course level structure and summarize the online course characteristics in the studied community college. Moreover, the visualization of the course distribution helps us to understand the possible effect of the ELI program. Variables included are discussed if in sequence.

Summary of Chapter Three

This study uses quasi-experimental methods with student panel data. This chapter illustrated the methods used for research questions 1 and 2 separately. The dependent variables for research question 1 are student online course grade point average (GPA) and student online course completion rate. The dependent variable for research question 2 is student learning outcomes in online course success rate (% grades of “A” and “B” and “C”, and “Pass”). The treatment variable us the ELI student preparedness program. The population and study sample

are described in detail. Descriptive statistics are used to characterize the study population, and the difference-in-difference methodology in conjunction with propensity score matching is used to compare the before and after student learning outcomes of the comparison and treatment groups. A Paired-t test and an interrupted time series analysis are used to compare the before and after course-level learning outcomes to examine the treatment of the ELI program. The results are presented and discussed in chapters four and five.

CHAPTER 4 RESULTS

Chapter Four presents the results of the analyses described in the preceding chapter with the following two research questions:

1. Student level: *to what extent does the student preparedness program affect:*
 - a. *student grade point average (GPA) in online courses?*
 - b. *student online course completion rate?*
2. Course level: *is grade distribution significantly different in online courses before and after the student preparedness program, as measured by course success rate (% of grades "A," "B," "C," and "Pass" of all grades)?*

Overview

Since there are two research questions, the results are presented in the order of each research question. Research Question One section contains the results of the demographic statistics of online students and the regression model analysis associated with students' online course GPA and online course completion rates. Research Question Two section contains the results of the enrollment information of the online courses and the time series regression model analysis associated with online course success rates. Within each research question section, the descriptive information and the results of correspondent methodologies are reported out in sequence.

Research Question One

The following sections discuss the student sample, demographics, and analysis of research question one - the student level exploration of the student data and the ELI online student preparedness program.

Student data

Research question one answers the question about the effectiveness of the ELI online student preparedness program with student performance data. By comparing students' online course GPA and course completion rate before and after the initiation of the ELI program, this analysis identifies if there has a positive, negative, or no effect of the ELI program on online students' performance.

The student dataset which includes fall 2012 to fall 2018 online students is used to study the ELI program effect on student performance. Fall 2015 can be considered the dividing line that separates student performance before and after the initiation of the ELI program. Semesters before fall 2015 are those with no ELI effect and are considered pre-semesters, which include: fall 2012, spring 2013, fall 2013, spring 2014, and fall 2014 semesters. Following the same logic, semesters on and after fall 2015 (fall 2015, spring 2016, fall 2016, spring 2017, fall 2017, spring 2018, fall 2018) have ELI effect and are coded as post-semesters. Summer semesters have been eliminated from the data analysis based on different course formats and student structures. Students enrolled in at least 1 of online courses in the pre-semesters and at least 1 of online courses in the post-semesters were included in this dataset. Each student's GPA and completion rate were aggregated across pre or post semesters. For example, students who took more than 1 online class in the pre/post semesters, the average of their online course GPA and completion rates will be used (more details about sampling please refer to chapter 3).

Variable descriptions

The definitions and coding for each variable and labels used in analyzing research question 1 are presented in Table 3.

Table 3. Variables for Research Question 1

Variable	Label	Variable description	How measured
Dependent Variable 1: GPA	GPA	student's grade point average (GPA) in online courses.	Numeric: 0 – 4 scale (A = 4.0, B = 3.0, C = 2.0, D = 1.0, and F = 0)
Dependent Variable 2: Completion	Course completion Rate	online course completion rate	Numeric: percentage from 0% to 100%
Independent Variables:			
Demographics	Gender	Gender of student	Female = 1 Male = 0
	Race	Race of student	White =1 (reference group) ¹ African American =2 Asian American = 3 Native American = 4 Hispanic = 5 Other (includes foreign, multiple-race, and unknown) = 6
	Lowses	Low socio-economic status	lowses = 1 Otherwise = 0
	Age_group	Age breakdown groups of students at post time	17 and below = 1 18 to 21 = 2 (reference group) ² 22 to 34 = 3 35 to 49 = 4 50 to 64 = 5 65 and above = 6
Course related	Instructor_certified	% online course instructors certified to teach online	0% - 100%
Treatment	ELI	whether student participated in the ELI preparedness program	Yes = 1 No = 0
Time	Post	Semester term pre or post ELI program	fall 2012 to spring 2015 =0 fall 2015 to fall 2018 = 1
Interaction	ELI × Post	Interaction of treatment and time variables	Yes = 1 No = 0

Note: 1. White was used as the reference group in variable Race for analysis. 2. Age group “18 to 21” was used as the reference group in variable Age_group for analysis.

Descriptive Statistics

Student Characteristics. This profile of the students includes the demographic characteristics of race, gender, socio-economic status, and age group. Additionally, the variable “Instructor_certified” indicates the percentage of online courses the student took with certified online instructors.

Table 4 presents the summary statistics of the frequencies and percentages for each category within each variable for both ELI and no ELI students. Table five presents the summary statistics of the mean table for the numeric variable instructor_certified.

Student demographics were displayed for both comparison groups (students not in the ELI program) and treatment group (students in the ELI program). Looking at the student demographics of students who enrolled in online courses in spring and fall semesters from fall 2012 to fall 2018, overall 7,000 students took online courses in at least one of the pre-semesters (before fall 2015) and at least one of the post semesters (on and after fall 2015). Among these 7,000 students, 1,149 participated in the ELI program on and after fall 2015.

The gender distribution is similar for the comparison group and the treatment group. There were about 64% females and 36% male students for the comparison group; and about 66% females and 34% male students for the treatment group. The gender distribution is similar to a national trend of online students in the Online College Student (OCS) 2019 Survey, which has 60% female and 40% male students (Clinefelter, Aslanian & Magda, 2019). For the data analysis, gender was coded as Female =1 (coded as the reference group) and male = 0.

The race distribution is very similar to the comparison group and the treatment group. The majority were White students which contributed 51% both in the comparison group and in

the treatment group. African-American students' share is about 28% for both the comparison group and the treatment group. Native-American students were less than 1% in the comparison

Table 4. Student demographics: frequency

Variable	Category	Comparison group (No ELI) N=6146		Treatment group (ELI) N=1149	
		Frequency	Percent	Frequency	Percent
Gender	Female	3903	63.50	753	65.54
	Male	2243	36.50	396	34.46
Race	White	3168	51.55	593	51.61
	Africa-American	1703	27.71	328	28.55
	Native-American	27	0.44	8	0.70
	Hispanic	511	8.31	91	7.92
	Asian-American	175	2.85	26	2.26
	Others	562	9.14	103	8.96
Lowses	No	5340	86.89	946	82.33
	Yes	806	13.11	203	17.67
Age_group	17 and below	55	0.90	13	1.13
	18 to 21	1325	21.55	290	25.28
	22 to 34	2931	47.70	545	47.39
	35 to 49	1457	23.71	237	20.67
	50 to 64	369	6.00	63	5.44
	64 and above	9	0.15	1	0.09

Note. 1. total student enrolled in online courses in at least one pre semesters (before fall 2015) and at least one post semesters (on and after fall 2015) are 7,295, with 6,146 not participating in the ELI program, and 1,149 in the ELI program.

Table 5. Student demographics: means

Variable	instructor_certified					
	N	Mean	SD	SE	Min	Max
comparison group	6146	0.124	0.259	0.002	0	1
treatment group	1149	0.193	0.337	0.007	0	1

Among these students, about 13% came from a low-socioeconomic status family in the comparison group, and about 18% in the treatment group. In the national OCS survey, 17% of online college students' annual household was under \$25,000 (Clinefelter, Aslanian & Magda, 2019). For the regression procedure, the categories were coded as lowese=1(coded as the reference group), and otherwise =0.

In the original dataset, students were divided into 6 age group categories. The majority of students fell into the "22 to 34" category, which contributed 48% in the comparison group and 47% in the treatment group. The traditional age ("18 to 21") students were about 22% in the comparison group and 25% in the treatment group. Students aged "35 to 49" were about 24% in the comparison group and 21% in the treatment group. Students who aged over 50 were about 6% both in the comparison group and treatment group, and students aged below 17 were about 1% in the comparison group and the treatment group. In the OCS survey, about 43% of students have ages between "24 to 39", and 10% over age 50. For the data analysis, age group was coded as "17 and below" = 1, "18 to 21" = 2 (coded as the reference group), "22 to 34" = 3, "35 to 49" = 4, "50 to 64" = 5, "65 and above" = 6.

Table 5 displayed the average online instructor certification rate between the comparison group and the treatment group. The average rate of students in the comparison group had certified instructor is about 12%, and the average rate of students in the treatment group had certified instructor is about 19% rate. The online instructor certification program did not begin until fall 2015. For the data analysis, this variable was calculated as a percentage from 0% to 100%.

Dependent variable characteristics. There are two dependent variables in research question one. Table 6 presented the mean and standard errors in both the comparison group and the treatment group.

Table 6. Dependent variable characteristics

Variable	Comparison group			Treatment group		
	N	Mean	SE	N	Mean	SE
GPA (pre-semester)	6146	2.892	0.687	1149	2.426	0.041
GPA (post-semester)	6146	2.813	0.013	1149	2.762	0.032
Course completion rate (pre-semester)	6864	0.871	0.003	1831	0.599	0.010
Course completion rate (post-semester)	6864	0.801	0.010	1831	0.719	0.009

As seen in Table 6, the mean value for student’s online course GPA was 2.892 for comparison group, and 2.426 for the treatment group in the pre-semester, which indicated a gap between these two groups. The mean value for student’s online course GPA was 2.813 for the comparison group, and 2.762 for the treatment student in the post-semester. Even though student’s GPA in the treatment group was still lower than the comparison group, the GPA for the treatment group was higher in the post-semester compared to the pre-semester.

The same trend was also demonstrated in the course completion rate mean values. The treatment group has lower course completion rate than the comparison group both in pre and post semester. However, after the ELI program (post-semester), the gap between these two groups reduced.

A simple pre and post comparison analysis was performed before the actual DD model analysis to take a glance at whether there has an impact of the ELI program on the students who took the program. There’s a significant improvement for the participated students on GPA and

completion rate which increased our confidence in exploring the impact with the full model. Please see Appendix D for details.

Model Analysis

This model analysis section illustrates the research question one analysis process and results. Step 1, before performing the regression analysis on the two dependent variables for research question 1, a propensity score matching was conducted to equalize the comparison group and the treatment group. Step 2, after matching, two regression analyses were performed on each dependent variable (GPA and completion rate). The results of using a regression model with difference-in-difference (DD) method accounting for other covariates were displayed in table 8.

Step 1. Propensity score matching. As introduced in Chapter 3, propensity score matching technique worked as an add-on step to the Difference-in-difference (DD) method of this study to further reduce bias and balance the background characteristics of the treatment (student who participated in the ELI program) group, and the comparison (student who did not participate in the ELI program) group.

The propensity score is the probability of each student receiving the program treatment. The score is estimated by the fitted values from a logistic regression of treatment (1=treated, 0=no) on the student's baseline (pre-treatment) characteristics. The variables of baseline characteristics used to calculate the propensity score in this study include students' gender, race, socio-economic status, and age group. Therefore, each student has a propensity score based on these above baseline variables. Next, the propensity scores were used to match the samples from the treatment group to the comparison group with similar scores. The greedy matching method was used where 1 treated student was matched to 1 (the nearest best matched) non-treated

student without replacement. The average propensity score of full and matched sample for the pre ELI semesters and post ELI semesters dataset is presented in Table 7. In Table 7, the ELI (treatment) group had higher propensities (0.161) than the non ELI (comparison) group (0.157). After matching, the mean of propensities of 0.161 for ELI and non ELI groups shared the same propensities.

The propensity score method is only for the data preparation for the later DD regression analysis. Next, these matched samples were employed in the difference-in-difference models for this study by the outcome variables of interest.

Table 7. Average Propensity Score of the full and matched sample

	Program	N	Mean propensity scores	SD	Min	Max	mean difference
All	non ELI (comparison)	6146	0.157	0.023	0.051	0.307	0.004
	ELI (treatment)	1149	0.161	0.025	0.068	0.287	0
Matched	non ELI (comparison)	1149	0.161	0.025	0.068	0.287	0
	ELI (treatment)	1149	0.161	0.025	0.068	0.287	0

Step 2 Difference-in-difference (DD) Model. Each of the regression models utilized an interaction term of ELI*Time. This interaction term gives the difference of each dependent variable before and after the treatment with both groups (ELI and non ELI). By comparing with another group of students who do not participate in the ELI program but have studied in the online environment on and after fall 2015, this model eliminates the impact on student learning outcomes from other policies or variables besides the ELI program. Using this model, unobserved individual variables that do not change over time will be eliminated. Table 8 displays the results with studied student covariates.

Table 8. Model results

Variables		GPA:	Completion:
Interaction	ELI × Post	0.353*** (0.048)	0.179*** (0.014)
Gender	Female	0.058 (0.039)	0.019* (0.009)
Race (reference group: White)	African American	-0.651*** (0.044)	-0.088*** (0.011)
	Asian American	0.127 (0.124)	0.012 (0.029)
	Hispanic	-0.253** (0.069)	-0.019 (0.017)
	Native American	-0.160 (0.226)	-0.101* (0.045)
	Other	-0.201** (0.065)	-0.028 (0.016)
Low socio-economic status	lowses	-0.244*** (0.049)	-0.010 (0.012)
Age Group (reference group: 18-21)	17 and below	0.125 (0.139)	0.022 (0.037)
	22 to 34	0.319*** (0.041)	0.028** (0.010)
	35 to 49	0.635*** (0.052)	0.109*** (0.013)
	50 to 64	0.690*** (0.082)	0.095*** (0.022)
	64 and above	-0.461 (0.642)	-0.065 (0.157)
Course Related	Instructor_certified	0.293*** (0.056)	0.068*** (0.016)
	Constant	2.793*** (0.049)	0.849*** (0.012)
	Program & Time Fixed Effects	Yes	Yes

* p<.05, ** p<.01, *** p<.001

Note. 1. The effect of the ELI treatment is represented by the interaction term ELI × Post.

2. Standard errors are in parentheses.

GPA: Model Results. In Table 8, for the dependent variable GPA, the interaction term (ELI \times Post) was significant and with a small standard error ($\beta=0.353$, $p<0.001$, $\epsilon =0.048$), which illustrates that participating in the ELI program increases students' GPA in online courses by almost 0.4 points.

Eight control variables were significantly associated with student GPA in the dataset. "African American Student" was associated with a 0.651 point decrease in GPA compared to White students. Similarly, "Hispanic Student" was associated with a 0.253 point decrease in GPA. "Other Race Student" (foreigner, multiple race and unknown) was also negatively associated with student GPA by 0.201 points. Lowses (low socio-economic status) was associated with a 0.244 point decrease in student GPA. Regarding the age_group variable, older students performed better in GPA. More specific, the student age range "22 to 34" was associated with a 0.319 point increase in GPA; the student age range "35 to 49" was associated with a 0.635 point increase in GPA; and the student age range "50 to 64" was associated with a 0.690 point increase in GPA. The variable "Instructor_certified," which indicated the percent rate of student had courses with certified instructors was associated with 0.293 point increase in GPA.

Completion rate: Model Results. For the dependent variable completion, the results also demonstrated a positive effect of the ELI program on students' online course completion rate, suggesting that participating in the ELI program corresponded to a 18% increase in students' online course completion rate.

Six control variables were significantly associated with the online course completion rate. Female students have a 2% higher completion rate than male students. Compared to White students, African American students and Native American students exhibited a negative 9% and

10% course completion rate respectively. Compared to traditional aged students (“18 to 21”), students whose age ranged “22 to 34”, “35 to 49” and “50 to 64” showed a higher percentage of course completion respectively. Another variable showed a significant effect in this dataset is the “Instructor_certified.” Students who had a higher rate in courses with certified instructors had a 7% higher course completion.

Validity

A series of validity analyses were performed to ensure the validity of the findings. One of the big assumptions for the DD model is the “equal trends” assumption that the differences between the treatment and the comparison group are constant over time (Gertler, Martinez, Premand, Rawlings & Vermeersch, 2016). To provide a valid estimate of the counterfactual of the study, it is assumed that there are no time-varying differences in the student outcome variables between the ELI group and the non-ELI group.

A series of tests to verify that there were no significant differences in the trend among treatment and comparison groups prior to the ELI program intervention on both dependent variables were generated. This check using the pseudo-time that should not be impacted by the ELI program to test the assumption of an equal trend. Each model included the previous set of variables with student and time fixed effects.

The full validity analysis results may be found in Appendix E. In the comparisons from fall 2012 to spring 2015 prior to the ELI program for both dependent variables, and only 2 (out of 30 comparisons) were significantly different for course completion rate. Notably, there were no significant findings between the treatment and comparison group trends in the term GPA comparison prior to the ELI program. Overall, it is fair to conclude that the treatment and comparison groups were on similar trajectories prior to the start of the ELI program.

Research Question Two

Research question two course-level: *is grade distribution significantly different in online courses before and after the student preparedness program, as measured by course success rate (% of grades “A,” “B,” “C,” and “Pass” of all grades)?*

The following section discuss the sample used for research question 2, summary statistics, the data structure, and the model results of the paired t-test and the interrupted time series analyses for this course level exploration of the ELI program effect.

Course data

Online priority courses were used to analyze the course level effect. Priority courses represented online courses with high student enrollment and success rates less than face-to-face courses that are at or greater than 5%. In this dataset, priority course data was gathered from fall 2012 to fall 2018.

Only spring and fall semesters were in the scope of this analysis since summer sessions were in a different course format and course offerings. Thirteen time points (fall 2012, spring and fall from 2013 to 2018) were collected for 33 priority courses. The total priority courses in the original dataset were 33, but four courses have been deleted due to missing values in multiple semesters. Therefore, only 29 courses have none missing data points across fall 2012 to fall 2018. Table 9 demonstrates the total course enrollment over time in decreasing order.

Variables Description

The definitions and coding for each variable and labels used in analyzing research question 2 are presented in Table 10.

Table 9. Total course enrollment overtime

#	Course Name	Total enrollment overtime ¹
1	ENG-111	8188
2	PSY-150	7424
3	ENG-112	6355
4	SOC-210	6135
5	BUS-110	5758
6	ECO-251	4358
7	HUM-115	4114
8	CIS-110	3765
9	ACC-120	3709
10	ART-111	3160
11	PHI-240	3142
12	HIS-131	3063
13	ECO-252	2761
14	COM-110	2662
15	REL-110	2469
16	HIS-111	2342
17	PSY-118	2111
18	ACC-121	1938
19	ENG-114	1878
20	CIS-115	1732
21	BIO-110	1725
22	EDU-119	1660
23	DBA-110	1556
24	BUS-153	1512
25	CHM-090	1436
26	POL-120	1380
27	DRA-111	860
28	CSC-134	814
29	ENG-241	813

Note. 1. overtime means spring and fall semesters from fall 2012 to fall 2018. This list is a descending order of enrollment.

Table 10. Variables for research question 2

Variable	Label	Variable description	How measured
Dependent Variable:			
Online course success rate	SuccessRate	the percentage of grades A, B, and C in course(s)	numeric: 0% - 100%
Independent Variables:			
Time trend	Time	the number of fall and spring semesters from the start of the series	1 = fall 2012 2 = spring 2013 3 = fall 2013 4 = spring 2014 ... 13 = fall 2018
Intervention	ELI	a dummy variable taking the values "0" for pre-ELI and "1" after the ELI intervention	0 = pre-ELI 1 = post-ELI
Interaction	Time × ELI	"Time after ELI intervention" counts the semesters in the post-ELI intervention segment at time "t"	0 = pre-ELI (fall 2012 to spring 2015) 1 = post-ELI (fall 2015) 2 = post-ELI (spring 2016) 3 = post-ELI (fall 2016) ... 7 = post-ELI (fall 2018)

Dependent Variable: Course Success Rate. The course success rate measures the percentage of As, Bs, Cs and Pass in online course(s) in a time series manner to observe the pre and post trend and changes of online course success rate before and after the ELI program intervention. It is worth noting that each online course includes a mix of ELI and non-ELI students. Non-ELI students did not participate in the ELI online preparedness program because they passed the pre-assessment test and were considered online courses ready. The course level measurement included those non-ELI students because the intervention of the ELI program is a course-wide solution to prepare online students with necessary online skills to help them successfully finish online courses. The impact of the ELI program was covered in research question 1. Here, this study also wanted to know from a policy intervention perspective the

impact on the course level over time and whether it is sustainable. Figure 7 is a trend chart of the course success rate for all 29 priority courses from fall 2012 to fall 2018.



Figure 7. Trend chart of course success rate

This time series trend chart shows that the course success rate decreased from fall 2012 to spring 2015 before the ELI intervention. From spring 2015 to fall 2015, there was a big jump from 58% to 65% when the ELI program started, and the course success rates remained in the 65% and above region from fall 2015 to fall 2018. Next, the interrupted time-series analysis was used to find out whether the trend shown above has a statistically significant explanation.

Paired T-Test Analysis

A paired t-test was performed to determine whether there is a statistical difference of the average course success rates before and after the start of the ELI program controlling for the

dependency and correlations. All 29 courses were measured and calculated the before means (average success rate of fall 2012 to spring 2015) of course success rate, and the after means (average success rate of fall 2015 to fall 2018). Table 11 displayed the paired t-test model results for the all course combined analysis. The results show a significant average difference between pre and post course success rates of the ELI program ($t_{28} = 2.74, p = 0.01$). On average, post course success rate were 1.68 percent higher than pre course success rates.

Table 11. Paired t-test results

	Mean	SE	Lower 95% CI	Upper 95% CI	t	df	p-value
Post - Pre	1.68	0.62	0.42	2.63	2.74	28	0.01*

* p<.05, ** p<.01, *** p<.001

Interrupted Time-series Analysis (ITS)

In the course-level analysis, the interrupted time-series analysis was also performed to study the semester by semester trend of course success rates. Since fall 2015, all online courses experienced the ELI program intervention. The analysis of a time series quasi-experiment focused on testing if the intervention had an impact on the time series (McDowall, McCleary, Meidinger & Hay, 1980). Table 12 displayed the ITS model results for fall 29 online courses combined.

Table 12. Interrupted time-series analysis for all course combined

	Interpretation	Coefficient	Standard error	P-value
β_0	intercept	63.770	0.379	<.0001***
β_1	Pre-Trend (before ELI started)	-0.760	0.101	<.0001***
β_2	Post-Level Change	-0.666	0.919	0.487
β_3	Post-Trend Change (after ELI)	0.917	0.126	<.0001***

* p<.05, ** p<.01, *** p<.001

Note. This is the results for all 29 analyzed online course success rate.

This model suggested that before the ELI program (β_1), the online course success rate decreased at a statistically significant rate of 0.76%, which decreased annually from fall 2012 to spring 2015. Post-level change (β_2) was not statistically significant. β_3 represented the change in the trend after the ELI intervention. Here the model suggests that after the implementation of the ELI program, there was a significant increase in the average online course success rate of 0.9% every semester for all courses average analysis. Table 13 presents the post-trend for each of the 29 analyzed courses specifically.

In Table 13, ten out of the 29 analyzed online courses demonstrated significant increase in course success rates after initiating the ELI program. Course CHM-090 has the highest increase (7.9%) in course success rate after the ELI program, followed by COM-110 (4.5%), ACC-121 (4.3%), CIS-110 (3.3%), HIS-111 (2.5%), ACC-120 (2.3%), ENG-114 (2.3%), BIO-110 (2.0%), REL-110 (2.0%), and BUS-110 (1.7%). Three out of the 29 courses showed a significant decrease in course success rate after the ELI program: PSY-150 (-1.9%), HUM-115 (-3.4%), and CIS-115 (-4.2%).

Table 13. Post-trend estimates for each analyzed online course

#	Course Name	Estimate ¹	Standard Error	P-Value
1	CHM-090	7.948	2.727	0.017**
2	COM-110	4.492	1.084	0.003**
3	ACC-121	4.362	0.647	<0.001***
4	CIS-110	3.271	1.07	0.014**
5	HIS-111	2.479	0.727	0.008**
6	ACC-120	2.317	0.63	0.005**
7	ENG-114	2.271	0.836	0.023*
8	BUS-153	2.01	1.313	0.16
9	ECO-252	1.986	1.796	0.298
10	BIO-110	1.942	0.727	0.026*
11	REL-110	1.795	0.779	0.047*
12	BUS-110	1.739	0.618	0.020**
13	ENG-241	1.445	0.966	0.169
14	PHI-240	1.385	0.699	0.079
15	EDU-119	1.336	0.907	0.175
16	PSY-118	1.115	0.718	0.155
17	HIS-131	1.107	0.44	0.033
18	POL-120	1.028	0.558	0.099
19	ENG-111	0.885	0.556	0.145
20	DBA-110	0.522	0.731	0.493
21	DRA-111	0.261	0.934	0.787
22	CSC-134	0.047	0.991	0.963
23	SOC-210	-0.214	0.484	0.669
24	ENG-112	-0.481	0.443	0.305
25	ECO-251	-0.821	0.461	0.109
26	ART-111	-1.088	1.479	0.481
27	PSY-150	-1.873	0.577	0.01*
28	HUM-115	-3.371	0.4	<0.001***
29	CIS-115	-4.238	0.937	0.001**

* p<.05, ** p<.01, *** p<.001

Note. 1. Estimate is the predicted increase in course success rate in percentage per semester.

Chapter Summary

This study sought to determine the impact of the ELI online preparedness program on students' learning outcomes and course success. Models answered the two research questions, and the test results were significant for both the student-level analyses and the course-level analyses.

Research question 1 asked whether the ELI program has an impact on online student GPA and course completion rate. From the model results, participating in the ELI program increases student GPA by 0.4 points over time. Also, students that participated in the ELI program also increased course completion rate by a 18% increase over time.

Research question 2 explored the impact of the ELI program on the online course completion rate. From the above analyses, from fall 2012 to spring 2015 (prior to the ELI program intervention), the course success rate decreased annually with an estimate of 0.8%. After the initiation of the ELI program, the course success rate increased dramatically in fall 2015 (from 58% in spring 2015 to 65% in fall 2015) and significantly increased with an estimate of 0.9% annually.

CHAPTER 5: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This chapter discusses the study results presented in Chapter 4 in the context of existing theory and literature. This study aimed to build on related studies and fill in the gap to provide evidence on the efficiency of online student preparedness programs on students' success in the community college setting by examining a mandatory online student preparedness program at a local community college on both the student level (GPA and online course completion rate) and course level (online course success rate).

In the recent Integrated Postsecondary Education Data Systems (IPEDS) data, one out of three students in community colleges takes distance education courses (NCES, 2017). Among the 30% enrolled, 12% took distance education courses exclusively. With flexibility and advanced technology, distance education, especially online education, has become a mainstream format at higher education institutions (Xu & Xu, 2019). In recognition of this trend, online student success needs to be continually addressed.

Moreover, at the start of 2020, the outbreak of a worldwide pandemic disease (COVID-19) accelerated the use of online platform for education, medical services, delivery etc. Almost all aspects of people's life. Given the prominence of the student success movement and the mission of community colleges in serving diverse students, understanding how to better ensure online student success is a timely and critical research topic. In fact, with the COVID-19 crisis, understanding how to prepare and support students and faculty for optimal online learning is essential.

The popularity and increase in online courses and programs do not guarantee a surge in student success and completion. Research consistently finds that online students have lower

course grades, completion rates or higher dropout rates compared to their traditional face-to-face classroom counterparts (Figlio, Rush & Yin, 2013; Johnson & Cuellar Mejia, 2014; Xu & Jaggars, 2011; Xu & Xu, 2019). The quality of online courses and student success in online courses have always been primary concerns for educators and policy-makers (Allen & Seaman, 2014; Liu, Gomez & Yen, 2009). It is critical to generate ongoing empirical data and to apply what we know to ensure consistent success in the online environment. While there are multi-faceted approaches to ensuring a robust learning environment, a part of that has been questions about how prepared students are for the online environment. The related research suggests out that students might be prepared with technology, but not with online academic activities in many aspects (Parkes, Stein & Reading, 2015). This study investigated an online student preparedness program in a local community college in North Carolina. This chapter presents a summary of conclusions and discussion, contributions to the literature, recommendations to policy and practice on online student success, limitations as well as future research opportunities.

Conclusions and Discussion

This study applied a quantitative lens to study the effectiveness of a student online course preparedness program on student and course performance. As presented in Chapter 4, the results provide supportive evidence that this E-learning Initiative (ELI) student preparedness program has a statistically significant positive effect on online students' GPA and course completion rate as well as course success rate. Drawing from the focus of this study, the two research questions were:

Student level: *to what extent does the student preparedness program affect:*

- a. *student grade point average (GPA) in online courses?*
- b. *student online course completion rate?*

Course level: is grade distribution significantly different in online courses before and after the student preparedness program, as measured by course success rate (% of grades “A,” “B,” “C,” and “Pass” of all grades)?

Research Question One – Student Level Analysis

The first research question investigated the impact of an online student preparedness program on student GPA and course completion rates in online courses in an urban community college. By using a quasi-experimental method, the data indicates that the ELI student preparedness program had a statistically significant positive impact on online student learning outcomes. Students who participated in the ELI program scored about 0.4 points higher in their GPA, as compared to themselves before the implementation of the program. For student online course completion, the results demonstrated that the ELI program increased student online course completion rate by 18% (the results presented in Chapter 4 Table 6).

These findings contribute to the empirical research on the topic of online student readiness and preparedness, the use of online orientations and strategic requirement (rather than voluntary) taking of student preparedness programs. It echoes previous studies surrounding the positive relationship/correlation between online student program/orientation and student learning outcomes in community college settings (e.g. Jones, 2013; Koehnke, 2013; Wojciechowski & Palmer, 2005).

This study also affirms the recommendations from many online studies that a well-structured online student preparedness program/orientation improves the student learning experience and helps students become more successful in online courses (e.g. Bambara, Harbour, Davies, & Athey, 2009; Cho, 2012; Lokken & Mullins, 2014; Travers, 2016). Research on student readiness and preparedness indicates that online students are not very prepared to balance

work, social, family and academic activities, which are symptomatic of multiple pressures and perhaps also of poor time management skills (Lokken & Mullins, 2014; Parkes, Stein & Reading, 2015). Even though the rapid growth of technologies over decades has changed the profile of students with easy accessibility of computers, Internet, multi-medias, it is not necessarily the case that students enter community colleges prepared to study online (Prensky, 2001). There still exists a readiness gap of the knowledge of how to efficiently use academic technologies (e.g. Learning Management Systems) (Parkes, Stein & Reading, 2015). Taken together, these components are essential for preparing students to succeed in online learning, which aligned with the positive findings of the ELI program.

Moreover, this study aligns with pioneering research that investigated the influence of using online orientations/preparedness programs to improve online student performance. Wojciechowski and Palmer (2005) included an optional orientation before the start of online courses as one of the factors associated with online student grades. They found participation in an online orientation was the second most significant factor associated with student success and subsequently recommended the addition of mandatory online orientation for online students. Jones (2013) studied a mandatory online student orientation in a rural community college designed by college staff to help students acquire relevant online learning skills and knowledge of the availability and accessibility of student services. Jones discovered that students felt optimistic and better prepared for their online courses. While the Jones study did not apply a statistical model, it compliments and aligns with the other research focused upon online student orientation.

Another way to examine the role of orientation is through consideration of well-structured online orientations. Koehnke (2013) studied an online orientation program and

compared student GPA and retention rate for a group who participated in the orientation program and who did not participate in the orientation program in previous semesters. The study found out that students in the orientation group had a higher GPA and course retention rate. All these studies yielded a positive relationship of using an orientation program to improve online student performance, both statistically and non-statistically.

In addition to the existing research focus, this research took a step further to investigate the casual-effect of a mandatory well-structured online student preparedness program on student GPA and course completion rate. The positive findings expanded the concept of success in using a mandatory online orientation/preparedness program prior to the start of online courses. In previous literature, factors such as race, gender or age play a role in online student success, and can place students at a slightly increased risk for success and completion. The study design and analysis, in this case, did not examine the differential performance of students based upon these factors. (Figlio, Rush, and Yin, 2010).

Research Question Two – Course Level Analysis

The second research question applied a course level analysis to investigate the over-time online course success rate (% of grades “A,” “B,” “C,” and “Pass” of all grades) to understand the impact of this ELI preparedness program on overall online course performance. By applying a time series method, the analyses found that before the ELI program, there is a continuous semester decrease in the online course success rate of 0.76% from fall 2012 to spring 2015. This trend can be clearly observed in Figure 7, the trend chart of course success rate on page 93. Therefore, prior to the implementation of the ELI program, the online course success rate continues to decrease with a negative trend line over time. Of major note is the empirical finding

that students who participated in ELI experienced a positive trend line, and over time their course success, as measured by student online course success rate, improved and continued to improve.

Student Success Rate

The student success rate has always been a strong indicator that a student is at risk of dropping out. Researchers found that the course success rate was lower in online courses compared to traditional courses (Johnson & Cuellar Mejia, 2014). Although, course success rates is a short-term reflection of student performance, it is a cumulative stepping stone. It is the stepping stone towards completing and achieving graduation and degree credentials.

The online course success performance data before and after the start of the ELI program are encouraging. In this case, institutional data prior to the ELI program indicates that the online course success rates were 5% lower than face-to-face courses, and the online course retention rates were 10% lower. Starting from Fall 2015, the ELI online student preparedness program was implemented in every online course. There has been a 7% increase in the online course success rate immediately and thereafter; online courses maintained an average of 65% retention from Fall 2015 to fall 2018 (see Figure 7). There is a significant difference in the average pre course success rate and the post course success rates in the paired t-test. Also, the ITSA results also identified a statistically significant 0.9% increase per semester of the online course success rate after Fall 2015.

Moreover, over 40% of the analyzed online courses' success rates were associated with a semester-by-semester over time increase, in various magnitudes, after the start of the ELI program (see table 11 in detail). Half of the individual course analyses did not indicate any causal relationship. However, three courses were negatively associated with the ELI program (10%). It is very interesting to see the different directions and magnitude of individual course's

reaction to the ELI program. The reasons for this negative associations were not easily identifiable. Perhaps, it could be the mix of students in each course, course characteristics (required or optional, curriculum or vocational, instructors, etc.) Further discussion with school officials might help to better understand the larger context. Overall, the majority of courses were beneficial from the ELI program.

Though this study did not compare the online and face-to-face courses directly, the results clearly indicate an overall course level positive association between the online course success rates and the ELI student preparedness program over time. These analyses provide strong evidence of the positive impact of an online course preparedness program on online student success, which was consistent with many prior studies on the benefits of implementing an online orientation/preparedness program to help the student acquire the skills, computer literacy, and navigate online course components. The spotlights in this study may accelerate the process for online students to success by applying a preparedness program.

Implications for Policy and Practice

The rapid growth of online learning in higher education institutions has created a demand for online courses and programs. Over 90% of universities and community colleges offered distance education courses in the recent IPEDS report (Miller, Topper & Richardson, 2017). However, increased access to online courses does not mean increased completion. Concerns about the quality of online courses and online student performance have always been an essential consideration for educational leaders, administrators, faculty, and the students themselves. High drop-out rates and low retention rates in online courses shown consistently (Bailey, et al., 2015; Lokken & Mullins, 2014). Even though their studies indicate the long-range higher degree or certificate achievement in online students compared to traditional ones, the low course

completion rates have always been an issue of concern (Johnson & Cuellar Mejia, 2014). As a result, positive strategies are necessary to help students succeed in the online environment.

Community colleges carry out a crucial mission by providing open access education to everyone who wants to pursue postsecondary education. Online education accelerated outreach to a variety of students beyond time and place. A large portion of college presidents believed their mission of higher education access was linked to the experiences with online learning (Parker, Stein & Reading, 2015). Though some guidance and training for online students exist, how students acquire and follow instructions is still questionable. Student orientation/student readiness for taking online classes was ranked as the number 1 challenge for community college administrators in the most recent Instructional Technology Council eLearning survey report (Lokken, 2019).

This whole study focused on investigating the ELearning Initiative online student preparedness program. This quasi-experimental study demonstrated the positive impact of implementing a college-level mandatory online student preparedness program on student GPA, course completion rate, and course success rate. These findings confirmed multiple empirical studies on the positive effect of using orientation to improve online student performance. Implications for policy and practice arise from the data results of the ELI program.

Three aspects were discussed in the rest of this section: implications on orientations/preparedness program design; implications on faculty professional development; and using quality standards for an online course and program design.

Implications on Orientation/Preparedness Program Design

There are several essential considerations to consider from the design of the ELI program and some other online tutorials (e.g. California Community College system) for academic

institutions to improve the design of online orientations/preparedness programs. This section focuses on two aspects: college-level design considerations and student-related design considerations.

College Level Design Considerations. The results of this quantitative study show that implementing an institutional-level online student preparedness program for online students increased students' course performance and completion in fully online courses. College-level preparation helps build a fulfilling online student orientation/preparedness program.

Provide a group of systematic pre-assessment tests to identify students' readiness for online courses. There is great diversity and variability within the online student population in academic background, demographics, family, and job obligation (Wojciechowski & Palmer, 2005). A noticeable demographic shift emerged among community college online students with an increased number of adult learners and a growing number of younger and academically at-risk students (Castillo, 2013). Using pre-assessment tests in a formative manner could screen out and group students with online course deficiency of strength types and then provide guidance to online administrators in the online student preparation and orientation design.

Design and provide an institutional-level mandatory online student preparedness program to remediate students' online learning differences. Making the online orientation/preparedness program mandatory, given the strength of the data, ensures students acquire the necessary skills to succeed in the online environment. Previous studies already identify ambiguity among online students and misalignment of student and instructor expectations, which causes frustration, confusion, and tension in online courses (Bork & Rucks-Ahidiana, 2013). Sometimes, students may not realize that they lack essential technological skills, self-motivation, or learning management skills due to information deficiency. A

mandatory program forces them to examine their own abilities to thrive in the online environment.

Add Short Surveys at the end of each module to acquire feedback for the user.

“Continuous student feedback is essential to designing a course that delivers the appropriate learning outcomes and experiences” (Wiley, retrieved 2019). Student feedback allows educators to understand which components benefit them and which ones do not. This immediacy of a response from the “user” side helps the module designers to create timely practical elements to suit student’s needs, also increases the sense of ownership among online students. Moreover, there is a rapid development of technology. It is only about 30 years since the invention of the World Wide Web, and technology has become one of our daily essentials. As technology continues to evolve, institutions need an immediate feedback loop to adapt to evolving needs. Students’ feedback is another way to understand the efficiency of the design of technology skills.

Student Related Design Considerations. The orientation/preparedness programs should provide essential and realistic modules/tutorials for students to understand the real challenges, expectations and required skills to be successful in online courses.

Preparedness for soft skills. Self-motivation, self-advocacy, time management skills, study skills, organizational skills, accountability, adaptability, and effective communication have been identified as factors that are in demand from prospective employers, and are also issues that need to be addressed for student success in the online environment (e.g., Jones, 2013; Miller, Benke, Chaloux & Ragan, 2013; Rovai, 2003). These skills are not concreated and necessarily easily identifiable through the online learning process. Fozdar and his colleagues (2007) found out that 35% of students in their study mentioned they have less time to complete course tasks or even dropout due to changing family circumstances. Parkes suggests that students consider

themselves with poor time management in balancing work, social, family and study lives (Parke, Stein, & Reading, 2015). These soft skills are transferable to all areas of student life and future careers. The modeling and teaching of soft skills should be integrated as a part of intentional online orientation and course designs.

Preparedness for technology skills. An unavoidable challenge for an online student is the need for technology skills and computer literacy to participate in an online course. The younger generation has grown up with technology, but that does not mean they are proficient at using technology, especially for academic purposes (Bennett & Corrin, 2018). Not to mention, community colleges have a large portion of nontraditional aged students who may need help using technologies efficiently without frustration. Studies also found regular inconsistencies between students' perception of their computer skills and their actual level of competence (Grant, Malloy, & Murphy, 2009; Hanson, Kilcoyne, Perez-Mira, Hanson, & Champion, 2011). The preparedness module of technology skills should teach the student how to use keyboarding, mouse, Microsoft office, components of Windows, recognize system and software applications, file management, emailing with etiquette, etc. It is important for the student to efficiently access the online learning environment as well as future work-related tasks. Employers assume that educational institutions will teach students essential computer and technology skills for the working environment (Kozina, Dukic, & Dukic, 2012).

Preparedness for navigating Learning Management System (LMS). Online learning happens in LMS. Different colleges and institutions use different types of LMS, such as Moodle, Blackboard, Sakai, etc. Online students, especially first-time online students, will need guidance to navigate the LMS and understand each relevant component. This area of online preparedness skills should include specific skills on how to navigate the course content, submit assignments,

take assessments, post forum discussion, participate in group discussion, reply to peers' and instructor's posts, manage multiple devices adapted to the LMS, and how to use the help desk in the LMS. This navigation skill is useful for a student to apply more generally in any online resource and problem-solving. For example, the National Center for Education Statistics maintains the online college navigator. This resource allows students to explore information on colleges and universities, including information on available majors, cost, enrollment, admissions, retention, and graduation rates.

Additional Support. Additional student support in both academics and technology are necessary to improve students' online learning experiences, such as increasing help desk hours and arranging some evening or weekends supporting hours for emergency contact from students since they may come from different regions or even counties; standardizing LMS course menu templates and structures that reduce the learning curve for students and faculty on course component navigation; and providing student success counseling, seminars, and workshops on special topics. All of these additional supports provide students and faculty with extra resources and protection to succeed in online courses.

Implications on Faculty Professional Development

Faculty is another important component in students' academic journey. Compared to four-year universities, community colleges have long faced financial problems to allocate resources and hire enough staff and full-time faculty to provide systematic support for students (Bailey, et al., 2015). Beyond preparing and getting the student ready for online courses, another essential aspect of successful online learning is online faculty professional development. Though this is not the main focus of this study, a positive relationship has been found between students' online course performance (GPA and course completion rate) and certified online instructors. In

the studied community college, a faculty online teaching certification program was implemented gradually. Online faculty can obtain an online teaching certificate through professional development or submit an existing online course for review by a team of three evaluators (one rubric expert and two faculty content/online experts). Further, faculty should be aware of what students are learning in online course orientation courses, so that they are able to meet and support student needs as students transition into their courses.

To successfully operate and deliver an online course, faculty need ongoing technical and administrative support and professional development in a rapidly changing technology rich environment. Bork et al. (2013) strongly suggested that colleges invest in stronger professional development activities for online faculty to help them improve course management skills and online pedagogy. Many community colleges and systems created learning resources and online modules for faculty to use in many aspects of online courses. For example, the Virtual Learning Community under the North Carolina Community College System provides courses and workshops on how to use Blackboard or Moodle, employability skills, technology showcase and other professional development opportunities and resources for online faculty. With the expansion of online learning, both students and faculty would be better prepared to teach and learn in the virtual environment.

Using quality standards for the online course and program design

Besides providing student and faculty preparedness programs, there is a shared responsibility and commitment to successful online education. This may mean that in addition to student orientations, faculty professional development and support, that institutions consider adopting some form of internal or external online quality standards or guiding principles.

The center of online course quality is still closely attached to the subject areas and how the content is presented. As quality has always been the concern of online classrooms, is there any standardized instructional design standard that can be implemented with alteration? The answer is yes. The Online Learning Consortium developed the OLC Quality Scorecard to help educators for measuring and quantifying elements of quality within online courses and programs in higher education (Online Learning Consortium, retrieved 2020). This scorecard provides institutions with necessary criteria and benchmarking tools to evaluate the course design, teaching, digital courseware to meet the highest global standards for quality which grounded in research and practice. It is a good tool to use for both online program reform and online course design.

Another universal tool is the Quality Matters Rubrics and Standards. The course design rubric standards are intended for use with fully online courses or courses with high significant online components (Quality Matters, retrieved 2020). There are eight general standards of the Rubric: course overview and introduction, learning objectives, assessment and measurement, instruction materials, learning activities and learner interaction, course technology, learner support, and accessibility and usability. Each of the standards has detailed guidance and measurement for becoming a qualified online course. This is a widespread tool for online course design and becomes more and more popular in higher educational institutions.

There are many advantages of using universal standard tools since they are well organized, grounded on research and expert, and tested on fields. However, each individual college has its own characteristics. It is also important to alternate these standards and rubrics to better fit into your own college students and faculty.

Limitations

This study has a few limitations to acknowledge in consideration of the findings and the implications for policy, practice, and future research in factors like the scope of the study, data frames, research method, detailed operations, etc.

Though this study employed a quasi-experimental design with casual-inference methods to examine the efficiency of an online student preparedness program on students' learning performance and online course level success, it was limited to online students at a large, urban community college who enrolled in online courses through fall 2012 to fall 2018. Since this study only occurred in one community college, no institutional level characteristics could be used in the statistical models. Therefore, the results of this study were specific to the researched urban community college in the southeast region and should be used with caution when applied to other community colleges or university level institutions.

This research applied a quantitative method to examine the ELI student preparedness program on online students' learning outcomes. However, the lived experiences of each individual student were not examined in the scope of this study. This limited the findings, for the study mainly focused on the efficiency of the ELI program itself rather than how each component of the ELI program connected and impacted the students' real lives.

Regarding online student success, this study only examined students' GPA, online student course completion rates, and the online course success rates. Whether this kind of preparedness program accelerates students' credential and degree attainment and other academic achievements were not examined here.

Moreover, this study only focused on online students between fall 2012 to fall 2018 and did not examine any of their face-to-face peers. Though there is a long history of weaker

performance among online students compared to their face-to-face counterparts in the studied community college, this study did not focus on course format comparison and did not fully address this issue.

Though one variable did relate to faculty professional development in the student-level data analysis, it was not the priority of this study to examine the whole faculty online preparedness certification program on student learning performance and the online course success.

Future Research

The results of this study added valuable input in the literature related to online student success by confirming the positive impact of an online student preparedness program on students' learning outcomes in a community college setting. This study seeks to extend the research recommendations of using institutional level student support (Bork & Rucks-Ahidiana, 2013) and online student orientations to better prepare online students with essential skill sets to succeed in an online environment (Jones, 2013; Koehnke, 2015; Lokken & Mullins, 2014; McGill, Klobas and Renzi's, 2014; Travers, 2016). As introduced in the limitations, there are many opportunities for future studies to further identify powerful indicators associated with online student success.

First, more research could be conducted to understand online student preparedness and readiness using in-depth qualitative approaches. It is crucial to understand students' perspectives on the use and efficiency of participating in an online orientation/preparedness program and the satisfaction in their online learning experience. Moreover, it would be very interesting to know how students apply the strategies and skills from the orientation/preparedness program to their academic work and future careers.

Second, as mentioned in the limitations, online students' GPA, course completion rates, and online course success rates are not the only measurement of student success. Other learning outcomes like credential and degree attainment, the achievement of personal and educational goals, and transference of learned knowledge to the workforce are all relevant and important measurements and should be examined. In addition, there is an increased focus on college completion. Most students who start in community colleges never complete a certificate or degree. (Belfield & Bailey, 2011). Therefore, research study with a focus on these kinds of student or even faculty preparedness programs on students' degree attainment is desirable.

Third, additional research could focus on the other college-level online student initiatives on student learning outcomes such as college advising for online students, tutoring in the virtual environment, or professional workshops. There are many ways to help students better prepare and survive in the online environment. But the question remains: How can higher education institutions apply those applications and strategies efficiently and economically?

Fourth, the differential effects of preparedness programs on different student profiles (i.e. gender, race, social classes, etc.) could be another interesting and informative research focus. Student characteristics influence their academic learning in multiple ways. Especially for academic unprepared students, their background identities strongly associate with their academic performance. It would be useful to education policy makers to have access to future additional research that explains the effects of preparedness programs on students with different characteristics.

Last but not least, there is a need to investigate online faculty preparedness. Online faculty professional development is rarely discussed and examined in postsecondary education (Bickerstaff & Edgecombe, 2012; Bork & Rucks-Ahidiana, 2013). Moreover, there is a large

portion of part-time faculty in the community college setting. It is hard to guarantee that they received enough high quality training and resources to teach online.

Though this study focused on investigating the efficiency of an online student preparedness program on online students' learning outcomes, researchers and practitioners should continue to seek opportunities to understand the needs of online students and faculty and maximize their online learning/teaching experience.

Summary

This study investigated the effectiveness of the E-Learning Initiative Program on students' GPA, course completion rate and the online course success rate in a local community college. The data and results presented in this study demonstrated that a well-structured college-level mandatory online student preparedness program (orientation) significantly improved students' performance in the short-term and long-term. Understanding how to develop efficient methods of improving online student performance will increase the accessibility of online courses to the most variety of students. Administrators and institutions should work to ensure the readiness/preparedness of online students, as well as online faculty. The mission of community college requires educators to serve the diverse student groups who want to learn. Online learning further extends this mission to overcome the limit of distance in time and geography. Increasing access to online courses is an important step. What is more important is to ensure that students can complete online course successfully.

References

- Akroyd, D., Patton, B., & Bracken, S. (2013). Factors that predict full-time community college faculty engagement in online instruction. *Community College Journal of Research and Practice*, 37(3), 185-195.
- Allen, I. E., & Seaman, J. (2008). *Staying the course: Online education in the United States, 2008*. Sloan Consortium. PO Box 1238, Newburyport, MA 01950.
- Allen, I. E., & Seaman, J. (2011). *Going the distance: Online education in the United States, 2011*. Sloan Consortium. PO Box 1238, Newburyport, MA 01950.
- Allen, I. E., & Seaman, J. (2014). Grade change. *Tracking Online Education in the United States*. Babson Survey Research Group and Quahog Research Group, LLC.
- Allen, E., & Seaman, J. (2015). *Grade level: Tracking online education in the United States*. Babson Survey Research Group and Quahog Research Group, LLC.
- Allen, I. E., & Seaman, J. (2017). Digital learning compass: Distance education enrollment report 2017. *Babson Survey Research Group, e-Literate, and WCET*.
- Aljohani, O. (2016). A comprehensive review of the major studies and theoretical models of student retention in higher education. *Higher Education Studies*, 6(2), 1.
- American Association of Community Colleges. (2018). *AACC Fast Facts Sheet*. Retrieved from <https://www.aacc.nche.edu/research-trends/fastfacts/aacc-2018-fast-sheet-front/>
- Angrist, J. D., & Pischke, J. S. (2008). *Mostly harmless econometrics: An empiricist's companion*. Princeton university press.
- Appana, S. (2008). A review of benefits and limitations of online learning in the context of the student, the instructor and the tenured faculty. *International Journal on E-learning*, 7(1), 5-22.

- Aragon, S. R., & Johnson, E. S. (2008). Factors influencing completion and noncompletion of community college online courses. *The Amer. Jrnl. of Distance Education*, 22(3), 146-158.
- Arenson, K. (1998, October 7). N.Y.U sees profits in virtual classes. *The New York Times*. Retrieved from: <http://www.nytimes.com/1998/10/07/nyregion/nyu-sees-profits-invirtual-classes.html>
- Ashenfelter, O., & Card, D. (1984). *Using the longitudinal structure of earnings to estimate the effect of training programs* (No. w1489). National Bureau of Economic Research.
- Bambara, C. S., Harbour, C. P., Davies T. G., & Athey, S. (2009). The lived experience of community college students enrolled in high risk online courses. *Community College Review*, 36(3), 219-238.
- Bailey, T., Jeong, D. W., & Cho, S. W. (2010). Referral, enrollment, and completion in developmental education sequences in community colleges. *Economics of Education Review*, 29(2), 255-270.
- Bailey, T. R., Jaggars, S. S., & Jenkins, D. (2015). *Redesigning America's community colleges*. Harvard University Press.
- Bawa, P. (2016). Retention in online courses: Exploring issues and solutions—A literature review. *Sage Open*, 6(1), 2158244015621777.
- Bean, J. P., & Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. *Review of educational Research*, 55(4), 485-540.
- Belanger, F., Jordan, D.H. (2000). *Evaluation and implementation of distance learning: Technologies, tools and techniques*. Hershey, USA: Idea Group Publishing.

- Bell, B. S., & Federman, J. E. (2013). E-learning in postsecondary education. *The future of children*, 165-185.
- Bennett, S., & Corrin, L. (2018). From digital natives to student experiences with technology. In *Encyclopedia of Information Science and Technology, Fourth Edition* (pp. 2512-2520). IGI Global.
- Bernard, R. M., Brauer, A., Abrami, P. C., & Surkes, M. (2004). The development of a questionnaire for predicting online learning achievement. *Distance Education*, 25(1), 31-47.
- Berger, J., Ramirez, G. B., & Lyon, S. (2012). Past to Present: A Historical Look at Retention. In A. Seidman (Ed.), *College student retention: Formula for student success* (pp. 7-34). Rowman & Littlefield.
- Bork, R. J. H., & Rucks-Ahidiana, Z. (2013). *Role ambiguity in online courses: An analysis of student and instructor expectations*. New York, NY:Community College Research Center, Teachers College, Columbia University.
- Bowen, W. G., Chingos, M. M., Lack, K. A., & Nygren, T. I. (2013). Online learning in higher education: Randomized trial compares hybrid learning to traditional course. *Education next*, 13(2), 58-65.
- Bunn, J. (2004). Student persistence in a LIS distance education program. *Australian Academic Research Libraries*, 35(3), 253-270.
- Carlson, S., & Carnevale, D. (2001). Debating the Demise of NYUonline. *Chronicle of Higher Education*, 48(16).
- Castillo, M. (2013). At issue: Online education and the new community college student. *The Community College Enterprise*, 19(2), 35-46.

- Clinefelter, D. L., Aslanian, C. B., & Magda, A. J. (2019). *Online college students 2019: Comprehensive data on demands and preferences*. Louisville, KY: Wiley edu, LLC
- Coca-Perraillon, M. (2007, April). Local and global optimal propensity score matching. *In SAS Global Forum* (Vol. 185, pp. 1-9).
- Cole, R. A. (Ed.) (2000). *Issues in web-based pedagogy: a critical primer*. London: Greenwood Press.
- Covington, D., Petherbridge, D., & Warren, S. E. (2005). Best practices: A triangulated support approach in transitioning faculty to online teaching. *Online Journal of Distance Learning Administration*, 8(1), 3-14.
- Cox, R. D. (2005). Online education as institutional myth: Rituals and realities at community colleges. *Teachers College Record*, 107(8), 1754.
- Creswell, J. W. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- Dray, B. J., Lowenthal, P. R., Miskiewicz, M. J., Ruiz-Primo, M. A., & Marczyński, K. (2011). Developing an instrument to assess student readiness for online learning: A validation study. *Distance Education*, 32(1), 29-47.
- Dumont, G., & Raggio, P. (2018). Faculty perspectives about distance teaching in the virtual classroom. *The Journal of Nonprofit Education and Leadership*, 8(1).
- Encyclopedia Britannica (2012). *Correspondence education*. Retrieved from: <http://www.britannica.com/EBchecked/topic/138674/correspondence-education>
- Falcone, T. M. (2011). Toward a new model of student persistence in higher education. *Online Submission*.

- Figlio, D. N., Rush, M., & Yin, L. (2010). Is it live or is it internet. *Experimental Estimates of the Effects of Online Instruction on Student Learning: National Bureau of Economic Research*.
- Fozdar, B. I., & Kumar, L. S. (2007). Mobile learning and student retention. *International Review of Research in Open and Distance Learning*, 8(2), 1-18.
- Ganga, E. C., Mazzariello, A. N., & Edgecombe, N. D. (2018). *Developmental Education: An Introduction for Policymakers*.
- Gertler, P. J., Martinez, S., Premand, P., Rawlings, L. B., & Vermeersch, C. M. (2016). *Impact evaluation in practice*. The World Bank.
- Grant, D. M., Malloy, A. D., & Murphy, M. C. (2009). A comparison of student perceptions of their computer skills to their actual abilities. *Journal of Information Technology Education: Research*, 8(1), 141-160.
- Gratton-Lavoie, C., & Stanley, D. (2009). Teaching and learning principles of microeconomics online: An empirical assessment. *The Journal of Economic Education*, 40(1), 3-25.
- Grow, G. O. (1996). Teaching learners to be self-directed. *Adult Education Quarterly*, 41(3), 125 – 149.
- Guri-Rosenblit, S. (2009). Distance education in the digital age: Common misconceptions and challenging tasks. *Journal of distance education*, 23(2), 105-122.
- Hanson, B., Kilcoyne, M., Perez-Mira, B., Hanson, T., & Champion, S. (2011). Digital knowledge and application skills: A comparison study of entering freshman. *Journal of Research in Business Information Systems*, 4(4), 55-68.

- Harmon, O. R., & Lambrinos, J. (2006). Online Format vs. Live Mode of Instruction: Do Human Capital Differences or Differences in Returns to Human Capital Explain the Differences in Outcomes? *Economics Working Papers*.
- Harrell, I. L. & Bower, B. L. (2011). Student characteristics that predict persistence in community college online courses. *American Journal of Distance Education, 25*(3), 178-191.
- Hart, C. (2012). Factors associated with student persistence in an online program of study: A review of the literature. *Journal of Interactive Online Learning, 11*(1).
- Holder, B. (2007). An investigation of hope, academics, environment, and motivation as predictors of persistence in higher education online programs. *The Internet and Higher Education, 10*, 245-260.
- Holmberg, B. (1995). The evolution of the character and practice of distance education. *Open Learning: The Journal of Open, Distance and e-Learning, 10*(2), 47-53.
- Hu, H., & Driscoll, M. P. (2013). Self-Regulation in e-Learning Environments: A Remedy for Community College? *Educational Technology & Society, 16* (4), 171–184.
- Hung, M. L., Chou, C., Chen, C. H., & Own, Z. Y. (2010). Learner readiness for online learning: Scale development and student perceptions. *Computers & Education, 55*(3), 1080-1090.
- Jackowski, M. B., & Akroyd, D. (2010). Technology usage among community college faculty. *Community College Journal of Research and Practice, 34*(8), 624-644.
- Jaggars, S. (2012). Online learning in community colleges. In M. G. Moore (Ed.). *Handbook of distance education (3rd ed)*. New York, NY: Routledge.
- Jaggars, S. S. (2014). Choosing between online and face-to-face courses: Community college student voices. *American Journal of Distance Education, 28*(1), 27-38.

- Jaggars, S., & Bailey, T. (2010). *Effectiveness of fully online courses for college students: Response to a department of education meta-analysis*. New York, NY: Community College Research Center, Teachers College, Columbia University.
- Jaggars, S., Edgecombe, N., & Stacey, G. (2013). *What we know about online course outcomes*. Community College Research Center, Columbia University.
- Janice M. Hinson & Kimberely N. LaPrairie (2005) Learning to Teach Online: Promoting Success through Professional Development, *Community College Journal of Research and Practice*, 29 (6), 483-493.
- Jaschik, S., & Lederman, D. (2017). *Survey of college and university presidents: A study by Inside Higher Ed and Gallup*. Retrieved from:
<https://www.insidehighered.com/news/survey/community-college-presidents-surveyed-enrollmentrecruitment-pipeline?width=775&height=500&iframe=true>
- Johnson, S. G., & Berge, Z. (2012). Online education in the community college. *Community College Journal of Research and Practice*, 36(11), 897-902.
- Johnson, H. P., & Mejia, M. C. (2014). *Online learning and student outcomes in California's community colleges*. Public Policy Institute.
- Jones, K. R. (2013). Developing and implementing a mandatory online student orientation. *Journal of Asynchronous Learning Networks*, 17 (1), 43 – 45.
- Kentnor, H. E. (2015). Distance education and the evolution of online learning in the United States. *Curriculum and Teaching Dialogue*, 17(1), 21-34.
- Khandker, S., B. Koolwal, G., & Samad, H. (2009). *Handbook on impact evaluation: quantitative methods and practices*. The World Bank.

- King, J. B., McIntosh, A., Bell-Ellwanger, J., Schak, O., Metzger, I., Bass, J., ... & English, J. (2017). *Developmental Education: Challenges and Strategies for Reform*. US Department of Education, Office of Planning, Evaluation and Policy Development. Date Retrieved December, 27, 2017.
- Kim, K. J., Liu, S., & Bonk, C. J. (2005). Online MBA students' perceptions of online learning: Benefits, challenges, and suggestions. *The Internet and Higher Education*, 8(4), 335-344.
- Knowles, M. S., Holton III, E. F., & Swanson, R. A. (2012). *The adult learner*. Routledge.
- Koehnke, P. (2013) *The impact of an online orientation to improve community college student retention in online courses: an action research study (Doctoral Dissertation)*. Retrieved from: <http://www.cpcc.edu/pd/resources-1/doctoral-research-grou/dissertations/>
- Kozina, G., Dukić, G., & Dukić, D. (2012). A study of computer literacy among Croatian students as support in planning the higher education development. *Tehnički vjesnik*, 19(4), 735-742.
- Krajewski, S. J. (2015). *Retention of community college students in online courses (Doctoral dissertation)*. Retrieved from: <https://scholarworks.wmich.edu/dissertations/1180/>
- Lanier, M. M. (2006). Academic integrity and distance learning. *Journal of Criminal Justice Education*, 17 (2), 244-398.
- Lee, Y., Choi, J., & Kim, T. (2013). Discriminating factors between completers of and dropouts from online learning courses. *British Journal of Educational Technology*, 44(2), 328-337.
- Lehman, R. M., & Conceição, S. C. (2013). *Motivating and retaining online students: Research based strategies that work*. John Wiley & Sons.

- Lewis, L., Alexander, D., & Farris, E. (1997). *Distance education in higher education institutions*. US Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics.
- Lewis, C. C., & Abdul-Hamid, H. (2006). Implementing effective online teaching practices: Voices of exemplary faculty. *Innovative Higher Education*, 31(2), 83–98.
- Linden, A. (2015). Conducting interrupted time-series analysis for single-and multiple-group comparisons. *Stata J*, 15(2), 480-500.
- Liu, S. Y., Gomez, J., & Yen, C. J. (2009). Community college online course retention and final grade: Predictability of social presence. *Journal of Interactive Online Learning*, 8(2).
- Lokken, F., & Mullins, C. (2014). *Trends in elearning: Tracking the impact of eLearning at community colleges. 2013 Distance Education Survey Results*. Washington, DC: Instructional Technology Council.
- Lokken, F.(2019). *Trends in elearning: Tracking the impact of eLearning at community colleges. 2019 ITC Annual National eLearning Report Survey Results*. Washington, DC: Instructional Technology Council.
- Ma, J., & Baum, S. (2016). Trends in community colleges: Enrollment, prices, student debt, and completion. *College Board Research Brief*, 4, 1-23.
- Martin, S. E. (2019). *Part-time Community College Faculty Perceptions of Assessment*. (Doctoral dissertation, North Carolina State University, Raleigh, USA). Retrieved from: <https://repository.lib.ncsu.edu/handle/1840.20/36639>
- McCleary, R., Hay, R. A., Meidinger, E. E., & McDowall, D. (1980). *Applied time series analysis for the social sciences* (p. 331). Beverly Hills, CA: Sage Publications.

- McDonald, J. H. (2009). *Handbook of biological statistics*. Baltimore, MD: sparky house publishing.
- McVay, M. (2000). *Developing a Web-based distance student orientation to enhance student success in an online bachelor's degree completion program*. Unpublished practicum report presented to the Ed.D. Program, Nova Southeastern University, Florida.
- Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence based practices in online learning: A meta-analysis and review of online learning. *Center for Technology in Learning, US Department of Education*. Retrieved from: <http://www.ed.gov/about/offices/list/oeped/ppss/reports.html>
- Meyer, B. D. (1995). Natural and quasi-experiments in economics. *Journal of business & economic statistics*, 13(2), 151-161.
- Meyer, K. A., & Xu, Y. J. (2009). A causal model of factors influencing faculty use of technology. *Journal of Asynchronous Learning Networks*, 13(2), 57-67.
- Meyer, K. A. (2014). How community college faculty members may improve student learning productivity in their online courses. *Community College Journal of Research and Practice*, 38(6), 575-587.
- Miller, G., Benke, M., & Chaloux, B. (2013). *Leading the e-learning transformation of higher education: meeting the challenges of technology and distance education*. Retrieved from <https://ebookcentral.proquest.com>
- Miller, A., Topper, A. M., Richardson, S., Suggestions for improving IPEDS distance education data collection. (NPEC 2017). U.S. Department of Education. Washington, DC: National Postsecondary Education Cooperative. Retrieved from <http://nces.ed.gov/pubsearch>

- Moore, M. G., & Kearsley, G. (2011). *Distance education: A systems view of online learning*. Cengage Learning.
- Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). e-Learning, online learning, and distance learning environments: Are they the same? *The Internet and Higher Education*, 14(2), 129-135.
- Moore, M. G. (Ed.). (2013). *Handbook of distance education*. Routledge.
- Müller, T. (2008). Persistence of women in online degree-completion programs. *International Review of Research in Open and Distance Learning*, 9(2), 1-18.
- Muse, H. E. (2003). The web-based community college student: An examination of factors that lead to success and risk. *The Internet and Higher Education*, 6, 241-261.
- National Center for Education Statistics. (2013). *2011-12 National postsecondary student aid study (NPSAS: 12)*.
- Navarro, P., & Shoemaker, J. (2000). Performance and perceptions of distance learners in cyberspace. *American Journal of Distance Education*, 14(2), 15–35.
- Nguyen, T. (2015). The effectiveness of online learning: Beyond no significant difference and future horizons. *MERLOT Journal of Online Learning and Teaching*, 11(2), 309-319.
- North Carolina Community College System. (2016, August 9). *Get the Facts*. Retrieved from: <https://www.nccommunitycolleges.edu/get-facts>
- Online Learning Consortium. (2020, January). *OLC Quality Scorecard – improve the quality of online learning & teaching*. Retrieved from: <https://onlinelearningconsortium.org/consult/olc-quality-scorecard-suite/>

- Ortagus, J. C. (2017). From the periphery to prominence: An examination of the changing profile of online students in American higher education. *The Internet and Higher Education*, 32, 47-57.
- Palloff, R. M., & Pratt, K. (2013). *Lessons from the virtual classroom*. San Francisco.
- Parkes, M., Stein, S., & Reading, C. (2015). Student preparedness for university e-learning environments. *The Internet and Higher Education*, 25, 1-10.
- Parsad, B., & Lewis, L. (2008). Distance Education at Postsecondary Institutions: 2006-07. First Look. *NCES 2009-044. National Center for Education Statistics*.
- Pascarella, E., Pierson, C., Wolniak, G., & Terenzini, P. (2004). First-generation college students: Additional evidence on college persistence and outcomes. *The Journal of Higher Education*, 75(3), 249–284.
- Patterson, B., & McFadden, C. (2009). Attrition in online and campus degree programs. *Online Journal of Distance Learning Administration*, 12(2), 1-8.
- Pearce, J. L. (1981) Bringing some clarity to role ambiguity research. *Academy of Management Review*, 6, 665-674.
- Pittman, V. V. (2003). *Correspondence study in the American university: A second historiographic perspective*. In M. G. Moore & W. G. Anderson (Eds.), *Handbook of distance education*. Mahwah, NJ: Lawrence Erlbaum.
- Prensky, M. (2001). Digital natives, digital immigrants. *On the horizon*, 9(5).
- Quality Matters. (2020, January). *QM Rubrics & Standards*. Retrieved from: <https://www.qualitymatters.org/qa-resources/rubric-standards>
- Rendon, L. I. (1994). Validating culturally diverse students: Toward a new model of learning and student development. *Innovative Higher Education*, 19(1), 33-51.

- Rendon, L. I. (2002). Community college puente: A validating model of education. *Educational Policy, 16*(4), 642-667.
- Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). New York: The Free Press.
- Roffe, I. (2004). *Innovation and e-learning: E-business for an educational enterprise*. Cardiff, UK: University of Wales Press.
- Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika, 70*(1), 41-55.
- Rovai, A. P. (2003). In search of higher persistence rates in distance education online programs. *The Internet and Higher Education, 6*(1), 1-16.
- Rumble, G. (1986). *The planning and management of distance education*. London: Croom Helm.
- SAS Institute Inc. (2016). *SAS/STAT®14.2 User's Guide*. Cary, NC: SAS Institute Inc.
- Schuetz, P., & Barr, J. (2009). *Are community colleges underprepared for underprepared students?* (No. 144). Jossey-Bass Inc Pub.
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton Mifflin.
- Shea, P., & Bidjerano, T. (2014). Does online learning impede degree completion? A national study of community college students. *Computers & Education, 75*, 103-111.
- Shulock, N., & Callan, P. M. (2010). Beyond the rhetoric: Improving college readiness through coherent state policy. *National Center for Public Policy and Higher Education*.
- Smith, P. J., Murphy, K. L., & Mahoney, S. E. (2003). Towards identifying factors underlying readiness for online learning: An exploratory study. *Distance education, 24*(1), 57-67.
- Snart, J. (2017). Hybrid learning at the community college. *New Directions for Teaching and Learning, 2017*(149), 59-67.

- Stanford-Bowers, D. E. (2008). Persistence in online classes: A study of perceptions among community college stakeholders. *Journal of Online Learning and Teaching*, 4(1). Retrieved from <http://jolt.merlot.org/vol4no1/stanford-bowers0308.pdf>
- Stahl, V. V., & Pavel, D. M. (1992). *Assessing the Bean and Metzner Model with Community College Student Data*.
- Stuart, E. A., Huskamp, H. A., Duckworth, K., Simmons, J., Song, Z., Chernew, M. E., & Barry, C. L. (2014). Using propensity scores in difference-in-differences models to estimate the effects of a policy change. *Health Services and Outcomes Research Methodology*, 14(4), 166-182.
- Si, W. (2011). *Education and earnings for poverty reduction: short-term evidence of pro-poor growth from the Mexican oportunidades program*. (Doctoral dissertation or Master's thesis, Dalarna University, city, country). Retrieved from <http://www.diva.portal.org/smash/get/diva2:519220/FULLTEXT01.pdf>
- Sieman, A. (2018). *Online learning: Trends and analysis*. Retrieved from: https://www.nccommunitycolleges.edu/sites/default/files/state-board/planning/plan_03_-_online_learning_0.pdf
- Spady, W. G. (1970). Dropouts from higher education: An interdisciplinary review and synthesis. *Interchange*, 1(1), 64-85.
- Stewart, B. L., Goodson, C. E., Miertschin, S. L., Norwood, M. L., & Ezell, S. (2013). Online student support services: A case based on quality frameworks. *Journal of Online Learning and Teaching*, 9(2), 290-303.
- Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago: University of Chicago Press.

- Travers, S. (2016). Supporting online student retention in community colleges: what data is most relevant? *Quarterly Review of Distance Education*, 17(4), 49-62.
- Truman-Davis, B., Futch, L., Thompson, K., & Yonekura, F. (2000). Support for online teaching and learning. *Educause Quarterly*, 23(2), 44-51.
- U.S. Department of Education. (2014). *Number and percentage of undergraduate students taking distance education or online classes and degree programs, by selected characteristics: Selected years, 2003-04 through 2011-12*. Retrieved from:
https://nces.ed.gov/programs/digest/d14/tables/dt14_311.22.asp
- U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS). (2017). *Fall Enrollment component (provisional data)*. Retrieved on December 13, 2018,
<https://nces.ed.gov/ipeds/trendgenerator/#/buildtable/2/3?rid=1&cid=16>
- Verduin, J. R., & Clark, T. A. (1991). *Distance education: The foundations of effective practice*. Jossey-Bass Inc Pub.
- Virtual Learning Community (VLC). (2020). *About us*. Retrieved from:
<http://vlc.nccommunitycolleges.edu/about-us/>
- Warton, E., Parker, M., & Karter, A. (2016, September). How did you do that? Basic difference in-differences models in sas®. In *Proceedings of the Western Users of SAS Software 2016 Conference*.
- Warton, E. M., & Parker, M. M. (2018). Oops, I D-I-D It Again! Advanced Difference-in Differences Models in SAS. *Kaiser Permanente Division of Research*. Retrieved from:
<https://www.dropbox.com/home/dissertation/PPT/final%20defense/saspaper?preview=advanced+DID.pdf>

- Webb, M. (1989). A theoretical model of community college student degree persistence. *Community College Review*, 16(4), 42-49.
- Wiley. (2019, July 24). *Using Student Feedback to Create Effective Online Learning Experiences*. Retrieved from <https://edservices.wiley.com/how-student-feedback-creates-better-online-learning/>
- Wojciechowski, A., & Palmer, L. B. (2005). Individual student characteristics: Can any be predictors of success in online classes. *Online journal of distance learning administration*, 8(2), 13.
- Wolf-Wendel, L., Ward, K., & Kinzie, J. (2009). A tangled web of terms: The overlap and unique contribution of involvement, engagement, and integration to understanding college student success. *Journal of College Student Development*, 50(4), 407-428.
- Workman, J. J., & Stenard, R. A. (1996). Student support services for distance learners. *Education at a Distance*, 10(7), 18-22.
- Xu, D., & Jaggars, S. S. (2011a). *Online and hybrid course enrollment and performance in Washington state community and technical colleges*. CCRC Working Paper No. 31. Community College Research Center, Columbia University.
- Xu, D., & Jaggars, S. S. (2011b). The effectiveness of distance education across Virginia's community colleges: evidence from introductory college-level math and english courses. *Educational Evaluation and Policy Analysis*, 33(3). Retrieved from <http://www.jstor.org/stable/41238556>
- Xu, D., & Jaggars, S. S. (2014). Performance gaps between online and face-to-face courses: Differences across types of students and academic subject areas. *The Journal of Higher Education*, 85(5), 633-659.

Xu, D., & Xu, Y. (2019). The Promises and Limits of Online Higher Education: Understanding How Distance Education Affects Access, Cost, and Quality. *American Enterprise Institute*.

APPENDICES

Appendix A

Data Structure Explanations for Research Question One

Student Sample

This study only using students that kept enroll through fall 2015. For example, Amy started her study from fall 2014 and graduate in fall 2016 so she is in the dataset; Diana started her study in fall 2015 and graduate spring 2017 she would not in the dataset; Mary started her study in spring 2013 and graduate in fall 2014 so she is not in the dataset. Their demographic characters, which used in my propensity score matching to determine the probability of receiving the treatment do not change over time. As a result, the probability of receiving treatment of this student doesn't change over time, no matter pre or post 2015.

A simplified dataset is displayed as an illustration as following:

- The first criterion of the student sample is that all the students in the sample have both pre and post academic records (i.g. GPA or course completion rate).
- Among those students, some of them got treatment after 2015, but the rest did not. Therefore, this dataset included students who got the treatment and students who did not get the treatment.

Hence, there are two groups of students in the sample:

- group 1: students got treatment
- group 2: students did not get treatment

Please note that both groups of students have double records (pre and post) (i.e. GPA or course completion rate).

For example, the data structure looks like:

Student ID	Race	Treatment	Post	GPA
1	White	1	1	2.6
1	White	1	0	2.3
2	African American	0	1	2.4
2	African American	0	0	2.4
3	Asian	1	1	2.5
3	Asian	1	0	2.6
4	White	0	1	2.7
4	White	0	0	2.8

Note: Treatment used as an index to identify whether student gets treatment. Even though the treatment did not happen before 2015, the treatment variable gives the identity of the students whether he/she receives the treatment at all. This is used to separate the treatment/comparison groups. – this is the required data structure for Difference-in-difference.

Data Structure in Analysis

There are two steps in research question one analysis: Propensity Score Matching and Difference-in-Difference analysis.

Propensity Score Matching. The propensity score matching is only used to match the samples from the treatment group to the comparison group with similar scores. Propensity score stratification, which is not applied in my analysis, gathers the samples with similar scores into several strata. In this stage, “pre or post” concept didn’t kick in. Because the student in the analysis pre or post 2015 is the same person.

When doing the propensity score matching, the data set we need looks like (post indicator not useful in this step):

Student ID	Race	Treatment
1	White	1
2	African American	0
3	Asian	1
4	White	0

Therefore, after calculating the propensity score, in this example, we need to match students from treatment group (student ID =1, 3) with students in the comparison group (student ID = 2,4), but only student ID = 1 has a match of student ID = 4, because he/she has the same race.

As described in chapter 3, PROC PSMATCH (SAS Institute Inc., 2016) was used to get the propensity scores by establishing a logistic regression model using the treatment indicator as the binary dependent variable, and race, gender, low-socioeconomics and age group were used as the explanatory variables. The matching method used was the one-to-one greedy nearest neighbor matching method with caliper equals 0.25.

Propensity score used here only to balance my sample to make the two groups' backgrounds similar. And that's all for the matching technique used in my paper. Then, the matched samples were used to do the DD regression analysis. Since this is a one-to-one match, no weight variable needs to go in to the DD analysis. That's why the matching will not show up in the regression, because the matching only used to prepare the sample to apply for the DD regression.

Appendix B

Difference-in-Difference Steps

For the treatment group, the academic outcome of students who have received the treatment (i.e. GPA or course completion rate) is represented by $a_{post}^{treated}$ (time= 1 for post, treated=1); and $a_{pre}^{treated}$ (time= 0 for pre, treated=1). The change (or difference) of treated student academic outcomes before and after the treatment (the ELI program) is:

$$\Delta a_{post}^{treated} = a_{post}^{treated} - a_{pre}^{treated}. \quad (1.1)$$

What not knowing is what would be the academic outcome of the same group of treated students if they do not receive the treatment (counterfactual), and this is represented by $a_{post}^{untreated}$ (time= 1 for post, treated=0); and $a_{pre}^{untreated}$ (time= 0 for pre, treated=0). The change of treated student academic outcome before and after the same time period for the counterfactual is:

$$\Delta a_{post}^{untreated} = a_{post}^{untreated} - a_{pre}^{untreated}. \quad (1.2)$$

To address the question of how the treated student's performance (i.e. GPA change) compares to the untreated performance, which is the difference:

$$\Delta a_{post}^{treated} - \Delta a_{post}^{untreated}. \quad (1.3)$$

However, only what the treated students receive $\Delta a_{post}^{treated}$ can be observed, not $\Delta a_{post}^{untreated}$ (counterfactual). Therefore, a comparison group of students who are not treated (not participated in the ELI program) and had the same exposure of context has been choose:

$\Delta b_{post}^{untreated}$. The change (or difference) of untreated students' academic outcomes before and after is:

$$\Delta b_{post}^{untreated} = b_{post}^{untreated} - b_{pre}^{untreated}. \quad (1.4)$$

The key assumption here is that the trends (the difference) would be the same in both group a and b in the absence of treatment (Angrist & Pischke, 2008):

$$\Delta a_{post}^{untreated} = \Delta b_{post}^{untreated} . \quad (1.5)$$

It is important to notice that the treatment group and the comparison groups do not require to have the same postintervention conditions, which means the two groups do not need to be the same and have the same characteristics before the treatment (Gertler et al., 2016). This assumption is the so-called “parallel trend” assumption for DD method, which means the comparison group trend should represent the trend in outcome change that would be experienced by the treatment group in the absence of treatment. Even though it is not required, propensity score matching technique is used to match the comparison group with the similar characteristics of the treatment group to increase the credibility of the DD method.

Then the differences equation could be calculated between student who took ELI program compared to student who did not is:

$$\Delta a_{post}^{treated} - \Delta b_{post}^{untreated} . \quad (1.6)$$

When substituting in the previous equations, the Difference-in-Difference (DD) estimator is below:

$$\Delta a_{post}^{treated} - \Delta b_{post}^{untreated} = (a_{post}^{treated} - a_{pre}^{treated}) - (a_{post}^{untreated} - a_{pre}^{untreated}) . \quad (1.7)$$

Figure 8 is a visualization of the Difference-in-Difference (DD) Methodology, which gives an intuitive sense of the DD approach. The solid line above represents the student academic outcome (i.e. GPA) of the comparison group, which represents students who did not take in the ELI program. The solid line below represents the student academic outcomes of the treatment group, which is students who have enrolled in the ELI program. There are two timelines shown in this figure 8: pre (before ELI starts) is the measurement for student academic

outcome (i.e., GPA) before the treatment starts; post (after ELI starts) is the measurement student outcome after the treatment. The before and after outcome variables for the treatment group are A and B in pre, while the outcome for the comparison group goes from C, before the program, to D after the program was implemented in post.

Therefore, the difference-in-difference estimator $\beta_1 = \Delta a_{post}^{treated} - \Delta b_{post}^{untreated}$ is the causal effect of interest, because this is the difference in student academic change due to the ELI program. The first differences in Figure 8. are the two differences: (B - A) for treatment group and (D - C) for comparison group, which eliminates the effect of variables that do not change over time for individual students (like gender, race, etc.).

Then, the difference between the differences in the above outcomes is calculated, which is “difference-in-differences” between the treatment group and the comparison group: (B - A) - (D - C), which removes the effect of time trend for these two groups. Thus, difference-in-difference eliminates selection bias by individual variables that do not change over time and the common time effect (Gertler et al., 2016).

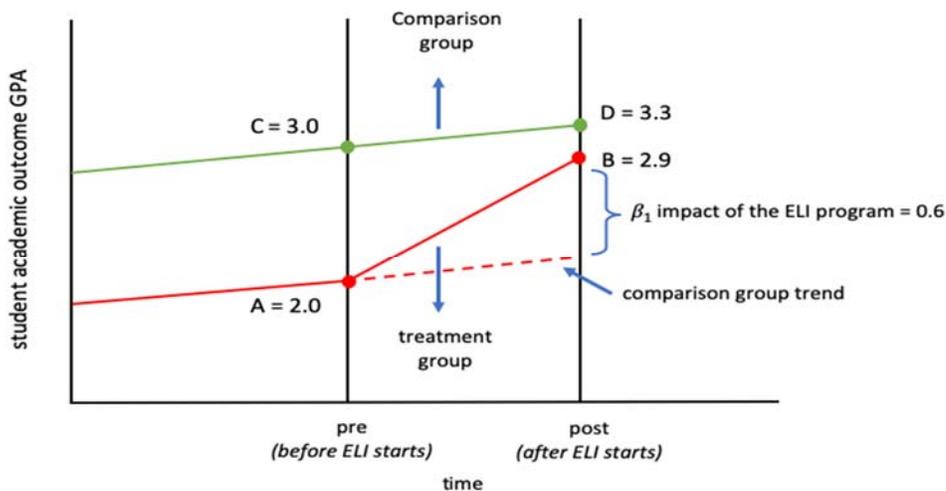


Figure 8 Difference-in-difference concept display

Table 13 lists the difference-in-difference measurement. The difference in outcomes between the two groups before the program is A - C, and the difference in the outcomes after the intervention between the treatment group and comparison group is B - D.

Table 13 The difference-in-difference measurement.

	After	Before	Difference
Treatment/ELI program	B	A	B - A
comparison/non-ELI	D	C	D - C
Difference	B - D	A - C	DD = (B - A) - (D - C)

	After	Before	Difference
Treatment/ELI program	2.9	2.0	0.9
comparison/non-ELI	3.3	3.0	0.3
Difference	-0.4	-1.0	DD = (0.9) - (0.3) = 0.6

Appendix C

Relevant SAS Code

PROC PSMATCH was used to calculate the propensity score matching to create the balanced matched sample set. The matching technic used here was one-to-one greedy nearest matching without replacement, with a caliper = 0.25.

PROC MIXED was used here to construct the difference-in-difference regression model.

For variable notations, please refer to chapter 3.

```
proc psmatch data=yaxin.want2post region=cs;
class age_group program Gender race lowsces;
psmodel program(Treated="1")= age_group Gender race lowsces;
match method=greedy(k=1) stat=lps caliper=.25;
assess lps var=(Gender lowsces race ) / weight=none plots=(boxplot barchart);
output out(obs=match)=yaxin.Out_test lps=_Lps matchid=_MatchID;
run;
```

```
PROC MIXED DATA = yaxin.Out_test;
CLASS post program(ref=last) Gender race lowsces(ref=first)
age_group(ref="18 TO 21");
MODEL termGPA=post|program age_group Gender race certifiedrate lowsces/
SOLUTION;
LSMEANS program |POST / DIFF;
/*ESTIMATE 'D-I-D' treated*POST 1 -1 -1 1;*/
RANDOM INT/SUBJECT=Student_ID_random TYPE=UN ;
FORMAT program treated. POST POST. race race.;
TITLE2 "RANDOM INTERCEPT MODEL FOR PRE/POST ADHERENCE by ONLINE PROGRAM
GROUP";
TITLE3 "UNADJUSTED: INCLUDING LEAST-SQUARES MEANS ESTIMATES";
RUN;
```

```
PROC MIXED DATA = yaxin.Out_test ;
CLASS post program(ref=last) Gender race lowsces(ref=first)
age_group(ref="18 TO 21");
MODEL completeRate=post|program Gender race certifiedRate lowsces age_group/
SOLUTION ;
LSMEANS program |POST / DIFF;
/*ESTIMATE 'D-I-D' treated*POST 1 -1 -1 1;*/
RANDOM INT/SUBJECT=Student_ID_random TYPE=UN ;
FORMAT program treated. POST POST. race race.;
TITLE2 "RANDOM INTERCEPT MODEL FOR PRE/POST ADHERENCE by ONLINE PROGRAM
GROUP";
TITLE3 "UNADJUSTED: INCLUDING LEAST-SQUARES MEANS ESTIMATES";
RUN;
```

Appendix D

Simple Pre and Post Comparison

Before applying the DD model, a simple OLS regression comparison only focuses on the students who participated in the ELI program on and after fall 2015 without additional controls. By comparing these students' GPA and online completion rate before and after the ELI program, the results indicate the differences in student learning outcomes between these two time periods for these students. Table 12 displays the results of a of pre and post comparison for students who participated in the ELI program (like a self-comparison) to see whether there's a difference in their GPA and completion rate after taking the ELI program. Specifically, this comparison model examined whether the presence of the ELI program had an impact on students who received the ELI treatment.

If a student participated in the ELI program, his or her GPA will have a significant improvement of 0.236 points ($\beta=0.236, p<0.001$), and course completion rate should rise by almost 10% ($\beta=0.099, p<0.001$).

Table 14. Term Combined Pre and Post Comparison Results for ELI group

	GPA: Term Combined	Completion: Term Combined
ELI*Time	0.236*** (0.038)	0.099*** (0.011)

* $p<.05$, ** $p<.01$, *** $p<.001$

Note. 1. Only students participated in the ELI program were analyzed in this pre and post comparison.

Appendix E

A series of pseudo-time checking (time periods that should not be impacted by the ELI program: fall 2012 to spring 2015) were performed to illustrate there were no significant differences in the trend among treatment and comparison groups prior to the ELI program intervention. Two models were structured for two dependent variables in question 1 respectively. Term by term comparison were conducted using the same DD model which included the previous set of variables with student and time fixed effects.

In the comparisons from fall 2012 to spring 2015 prior to the ELI program for both dependent variables, and only 2 (out of 30 comparisons) were significantly different for course completion rate. Notably, there were no significant findings between the treatment and comparison group trends in the term GPA comparison prior to the ELI program. Overall, it is fair to conclude that the treatment and comparison groups were on similar trajectories prior to the start of the ELI program. Table 14 displayed the coefficients of the interaction term ELI*Post for each compared semester.

Table 15. Time trend assumption for research question 1 dependent variables

	Term GPA	Course Completion Rate
fall 2012 vs spring 2013	-0.141 (0.398)	0.056 (0.150)
fall 2012 vs fall 2013	-0.514 (0.521)	-0.191 (0.097)
fall 2012 vs spring 2014	-0.111 (0.349)	-0.092 (0.086)
fall 2012 vs fall 2014	0.188 (0.517)	0.135 (0.095)
fall 2012 vs spring 2015	0.067 (0.350)	0.093 (0.097)
spring 2013 vs fall 2013	-0.411 (0.375)	-0.151 (0.076)
spring 2013 vs spring 2014	-0.197 (0.312)	-0.081 (0.071)
spring 2013 vs fall 2014	0.048 (0.506)	-0.083 (0.074)
spring 2013 vs spring 2015	0.152 (0.332)	0.103 (0.086)
fall 2013 vs spring 2014	-0.151 (0.201)	0.027 (0.045)
fall 2013 vs fall 2014	0.243 (0.303)	-0.05 (0.045)
fall 2013 vs spring 2015	-0.299 (0.240)	0.2* (0.044)
spring 2014 vs fall 2014	0.137 (0.187)	0.053 (0.040)
spring 2014 vs spring 2015	-0.096 (0.172)	0.123* (0.040)
fall 2014 vs spring 2015	0.259 (0.116)	0.055 (0.027)
Controls	Yes	Yes
Program & Time Fixed Effects	Yes	Yes

* p<.05, ** p<.01, *** p<.001

Note. This table presents the findings of the time-trend assumption across both dependent variables for research question 1 before ELI program started.