

THE RATIO OF FACE-TO-FACE CONTACT HOURS IN BLENDED COURSES EFFECTS  
ON COURSE GRADES AND COURSE COMPLETION

by

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**DEDICATION**

This is dedicated to my older brother, Jason, who believed in me and was very proud that one day I would become a doctor.

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## ABSTRACT

Distance learning has changed the landscape of higher education especially with regards to community colleges which are the leaders in offering online courses (CCRC, 2013). In years past the online educational platform has struggled to meet the same academic standards and retention rates of traditional face-to-face courses. Blended courses which are believed to be the “best of both worlds” bridge the community aspect of face-to-face courses with the online e-learning component. This study compared the three delivery methods: online, face-to-face, and blended by examining course grades and course completion rates at a Midwestern U.S. community college. It was hypothesized that face-to-face and blended courses would have higher course grades and course completion rates because of interactive qualities and community support that is lacking or absent in online learning – especially for community college students who tend to struggle more with the barriers of online learning (Jaggars & Bailey, 2010; Ryan et al., 2016). Unique to this study, blended courses were investigated by examining the ratio of face-to-face contact time within the blended courses. In the same vein as holding more campus community and interactive human connections, it was also hypothesized that courses with more face-to-face contact time would have higher course grades and higher course completion rates.

The results of this study do not support the hypothesis. The findings show that face-to-face courses did have higher course grades and course completion rates than online courses; however, the practical significance was negligible indicating that there was little difference between the two delivery methods. (Blended courses were not statistically significant.) The ratio of face-to-face contact within blended courses showed that students had higher course grades and higher course completion rates when there was either very little face-to-face contact or a lot of

face-to-face contact with the poorest course grades and course completion rates existing when there was an even ratio of online to face-to-face.

## **CHAPTER 1**

### **INTRODUCTION**

Online learning has become a popular alternative to face-to-face learning, and it has become a viable option for many college students. With its expanded growth and increase in accessibility and use, the question needs to be asked. Should online coursework work replace face-to-face coursework? Maybe not. There are strong arguments that some level of face-to-face contact should remain in post-secondary education. Additionally, does blended learning which incorporates online learning with traditional face-to-face instruction act as a happy medium between the two delivery methods? Community colleges which lead the industry in online learning (Hachey, Conway, & Wladis, 2013), are the optimal platform to investigate these concepts.

Community colleges uniquely differ from 4-year colleges and universities in many ways. Community colleges employ open admission policies that allow all who complete a high school diploma or General Education Diploma (GED) to enroll and register for courses while most 4-year institutions do not employ open admission policies (Provasnik & Planty, 2008). Community Colleges provide associate degrees, vocational programs, certificates, credit for courses designed to transfer to 4-year institutions, workforce development courses, and noncredit continual education courses (Gregory, & Lampley, 2016). Finally, the tuition at community colleges is notably less than at 4-year institutions (Cellini, 2012). All of these contributing factors make community colleges an attainable postsecondary educational option for nearly every type of student, especially those who have barriers such as low-income, nontraditional-aged, minority, and academically underprepared students (Provasnik & Planty, 2008; Bailey, Calcagno, Jenkins,

Kienzl, & Leinbach, 2005) which contribute to community colleges' high enrollment numbers (Cellini, 2012).

As enrollment has increased over the last few decades, community colleges needed to expand course offerings while also managing the rapid financial demands of building expansions (Gregory, & Lampley, 2016). With 97% of community colleges offering online courses (Allen & Seaman, 2015), community colleges became the leaders in online learning, because they were able to massively expand access to students in an inexpensive way, while still meeting their core mission of providing education to students with diverse needs (Hachey et al., 2013). More than 6.7 million college students enrolled in online courses in 2012. This was an increase that far exceeded the overall higher education enrollment, which translated to 1 in 3 students enrolled in online courses (Allen & Seaman, 2013). In 2015, the National Center for Education Statistics' (NCES) Integrated Postsecondary Education Data System (IPEDS) reported that 70.7% of all public institutions that provide degrees participated in some level of online course offering. The NCES data also noted that the highest offerings of online learning were at community colleges (NCES, 2015).

Online learning not only provides benefits to colleges through lowered expenses, assembling and/or disseminating instructional content more cost-efficiently, there are additional benefits to students. Students enrolled in online classes are given more flexibility by "attending class" or logging into their class at any time of day that is convenient to them (Means, Toyama, Murphy, & Baki, 2013). Flexibility in learning from a distance is a particular benefit when transportation or difficult commutes become an issue (Allen & Seaman, 2015; Hachey et al., 2013; Means et al., 2013; Wojciechowski & Palmer, 2005). Although students do not meet face-to-face in online courses, online can provide social networking, collaboration, and opportunities

for reflection to enhance learning (Rudestam & Schoenholtz-Read, 2010). “Online instruction offers many tools to facilitate communication, collaboration, and the exchange of information, and ultimately helps students to critically examine their assumptions, seek out additional perspectives, grapple with social issues, and create change” (Meyers, 2008, p. 223).

Although there are virtual ways in which online students can communicate, there are many studies that show that the lack of face-to-face interaction between instructor and student and the lack of campus community online is associated with isolation, depression, poor academic performance, and higher dropout rates (Gillett-Swan, 2017; Jaggars, 2014; Mays, 2016; Overbaugh & Nickel, 2010; Pigliapoco & Bogliolo, 2008). In addition to a lack of concrete community online, there are many other negative aspects that present barriers to student success. Online courses are usually structured in such a way that requires students to take more ownership of their learning and become more self-disciplined, goal-oriented, self-motivated, and independent (Kerr, Rynearson, & Kerr, 2006; Wojciechowski & Palmer, 2005). Online courses also demand a higher ability and comfort level with technology. However, many students who attempt online courses have issues with the online course technology as well as with more general issues of time management (Aragon & Johnson, 2008; Capra, 2011; Wojciechowski & Palmer, 2005). These challenges contribute to the fact that students taking online courses are at a higher risk of academic failure (failing classes, withdrawing from classes, or dropping out of college) compared to students taking traditional face-to-face courses (Traver, Bidjerano, & Shea, 2014; Xu & Jaggars, 2011a; Jaggars, & Xu, 2010; Yen & Liu, 2009). Community college students hold an even higher risk of failing, withdrawing from classes, and dropping out (Wladis et al., 2015); this is often associated with the barriers many community college students possess (Jaggars & Bailey, 2010; Ryan et al., 2016).

Although students taking online courses suffer from higher attrition due to the asynchronous aspect of online learning (Yen & Liu, 2009), the e-learning tools utilized in online courses can benefit students by helping them synthesize the material (Desplaces, Blair, & Salvaggio, 2015; Burgess, 2015). Hybrid courses, also known as blended courses are courses that implement both online components such as e-learning tools (through an online delivery in which the student has control over time, place, and pace) and face-to-face instruction, which are held at brick-and-mortar locations away from home (Horn & Staker, 2011). The introduction of blended courses has been shown to be the best of two worlds by combining the flexibility of online instruction with traditional face-to-face classroom interactivity and campus community (McGee & Reis, 2012; Lloyd-Smith, 2010; Simonson, Smaldino, Albright, & Zvacek, 2009; Watson, 2008, Rovai, Ponton, & Baker, 2008). “Blended learning should be viewed as a pedagogical approach that combines the effectiveness and socialization opportunities of the classroom with the technologically enhanced active learning possibilities of the online environment” (Moskal, Dziuban, & Hartman, 2013, p.17). Historically, blended courses have been shown to be more effective regarding learning outcomes than either fully face-to-face courses or fully online courses (Means et al., 2013; Roseth, Akcaoglu, & Zellner, 2013). Blended courses are seen as providing more flexible options for diverse populations of learners while also enhancing the design of the teaching and learning environments. This hybrid model has been hypothesized by many thinkers in the field as supporting students with varied learning preferences much more than traditional face-to-face classes (Futch, deNoyelles, Thompson, & Howard, 2016). Ten to fifteen years ago, blended courses provided lower attrition rates (Xu & Jaggars, 2011a; Oblender, 2002) while also providing what were seen as efficient and effective paths to graduation (Shea & Bidjerano, 2014).

The ratio of online to face-to-face time in blended courses can be proportioned in varying ways. Previous studies have defined blended courses as: 75% or more of the course time online (Truell, 2001), 50% online (Priluck, 2004), 65% of the content is delivered online (Oblender, 2002), or 30% -79% of the course is online (Allen & Seaman, 2008). There is no specific standard for the amount of time spent with online functions versus face-to-face functions in blended courses (Means et al., 2013); therefore, blended courses researched in previous studies have not been consistent with one another. Additionally, no studies have evaluated whether there is a better ratio of face-to-face time in blended courses which promotes higher course grades and course completion.

### **Statement of the Problem**

There is an absence of research showing the optimal proportion between face-to-face time and online time in blended courses. Previous research studies have only compared the success of students in blended courses which had a predetermined standardized ratio of online time to face-to-face time to the success of students in 100% face-to-face courses and/or 100% online courses. The purpose of this quantitative study was to determine the effects of different ratios of online to face-to-face contact hours on students' course grades and course completion rates in blended courses at the community college level. This study built upon previous research by determining whether differences still exist regarding student success in blended courses compared to 100% face-to-face and 100% online courses.

### **Purpose**

The purpose of this study was to determine if the method of instruction (online, face-to-face, or blended) of a Midwestern U.S. community college course affects course grades and course completion. An additional purpose was to determine how the ratio of the online delivery

assigned to blended courses affects the students' course grades and course completion. The hypothesis was face-to-face and blended courses will have higher course grades and course completion because of the interactive qualities and community support that is lacking or absent in online learning. In that same vein, it was also hypothesized that courses with a higher percentage of face-to-face time in blended courses would have higher course completion and higher course grades.

### **Research Questions**

The following research questions were used to examine course completion rates and course grades using data from a Midwestern U.S. community college in order to examine online, blended, and face-to-face courses within a three-year span (2015, 2016, and 2017).

1. Is there a statistically significant difference among final course grades and course delivery method (online, blended, or face-to-face)?
2. Does course delivery method predict course completion?
  - a. One hundred percent online courses
  - b. One hundred percent face-to-face courses
  - c. Blended courses
3. Do various ratios of face-to-face contact time in blended courses predict course grades?
4. Do various ratios of face-to-face contact time in blended courses predict final course completion rates?

### **Significance of the Study**

The results of this study will help determine whether there is an ideal method of delivery between online, face-to-face, or blended courses. This study will also help to identify the optimal ratio of face-to-face contact time in blended courses which could be helpful to students,

community colleges, and taxpayers. Community college students could benefit from knowing which type of instruction has been the most beneficial to other community college students. They could then choose courses using the method which has shown students to have a higher academic success rate and higher course completion. They could also pick blended classes that have the best ratio of face-to-face contact time in hopes of also improving their grades and completion within their courses. This study will also help community colleges determine which courses to provide to their students (online, face-to-face, or blended). This is beneficial because community colleges could maximize their students' course grades and course completion. It could also help with lowering costs to the college. Online sections tend to be more expensive because of the additional costs due to technology fees (Hachey et al., 2013). If students perform better in face-to-face or blended courses, it might be wise to offer more of those sections so to spread out the technology costs and reduce costs per student or per course. This could possibly translate to reduced costs to the students and possibly taxpayers since community colleges are state funded. It will also help community colleges determine if online courses which are rapidly gaining popularity are viable or beneficial for educating community college students. Additionally, the community could also benefit from this study. If students take courses they are more likely to succeed in, then they are more likely to get into more advanced courses and finish their degrees sooner. This could benefit communities by providing a greater number of educated or technically skilled individuals which could improve their communities and their economies.

### **Definition of Key Words and Acronyms**

**Blended Courses** – For the purpose of this study the definition of a blended course was not defined by the percentage of online versus face-to-face contact time. It was defined as any class

that has both face-to-face and online components. The percentage of face-to-face time utilized in a blended course was measured for the purpose of this study.

**E-learning Tools** – Learning tools that were used in online and blended classes. They were provided through the online shell that was utilized in online and blended courses. They included but were not limited to: practice online tests and quizzes, webinars, online videos, streamed TED talks, academic video games, blogs, wikis, and other virtual learning tools.

### **Summary**

Community colleges have more online offerings than any other post-secondary institutions (NCES, 2015). However, they also have students who require more academic support that online learning does not offer (Snart, 2017; Xu & Jaggars, 2011b). Although there are many benefits to online learning, there are also many negative aspects, which are exacerbated when provided to students who possess barriers many of which exist in community college students (Wladis et al., 2015; Xu, & Jaggars, 2013a). The campus community, which is present in face-to-face and blended courses, that is lacking in online learning could contribute to poor performance and higher dropout rates (Jaggars, 2014; Mays, 2016; McInnerney & Roberts, 2004; Overbaugh & Nickel, 2010). Blended learning offers the concept of the best of both worlds: beneficial learning tools of online learning with the supportive interactive involvement and community building of face-to-face learning. Additionally, blended courses have also been shown to promote a successful learning environment for community college students many of which have barriers to learning (Futch, deNoyelles, Thompson, & Howard, 2016).

The purpose of this study was to determine whether there was a preferred learning platform when looking at course grades and course completion within online, blended, and face-to-face courses at a Midwestern community college (which was dubbed Middle CC from this

point forth). With the incredible increased utilization of online learning in many community colleges, community colleges should determine whether online classes are the best learning environments for their students especially since many community college students face barriers that other college students do not. There are extant studies that investigated the academic success and retention of college students in online, face-to-face, and blended courses; however, most were not conducted at community colleges. Additionally, no research was found that investigates course completion and course grades of community college students regarding the amount or percentage of face-to-face time that is dedicated in blended courses. This study investigated whether the ratio of face-to-face contact time assigned to the blended courses impacted students' course completion and course grades.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **Overview**

The purpose of this literature review was to examine the recent literature that was pertinent to this study and to help determine whether there was a recommended learning platform when looking at course completion and course grades among the three delivery methods (online, blended, and face-to-face) at Middle CC. In preparation, this chapter reviewed the literature on the growth of online learning and community colleges' lead in online offerings; barriers community college students faced with regards to online learning; the benefits and drawbacks of online learning with special attention given to literature that pertained to community and communication; reasons as to why students do not perform well in online courses; blended learning and its many benefits, and the comparison of the three delivery methods along with their effects on community college students.

#### **Introduction of 21<sup>st</sup> Century Technology**

Online learning in higher education has gained ground quickly, rapidly gaining popularity in the field of higher education such that “students associate the internet with a genuine teacher” (Bacescu, 2014, p. 420). Research shows the rate of growth for online course enrollment for community colleges substantially exceeds that of face-to-face enrollments. Since 2010, online enrollments have increased 29% (Allen & Seaman, 2013; Community College Research Center (CCRC), 2013). Online courses are in postsecondary education’s future (Xu & Jaggars, 2013b) with approximately 30% of U.S. students taking or having taken at least one online class (Gregory & Lampley, 2016). Higher learning’s online enrollment for 2013 is estimated between 5.3 to 7.1 million online students with the majority of these students being community college

students (Shea & Bidjerano, 2014). Nearly all community colleges are utilizing online learning, with over 60% of community college students taking online courses (Gregory, & Lampley, 2016; Parsad, Lewis, & Tice, 2008; Wladis, Conway, & Hachey, 2015).

### **The Online Community College Student**

Doyle's (2009) indicated that online community college students were similar to other community college students enrolled in on-campus courses; however, there are some specific characteristics the online students shared. Community college students taking online courses tended to be older than their peers taking face-to-face courses. Also, two-thirds of online students took a mixture of online and traditional classes. Online students did not live far from their home campus, living less than 15 miles away. Eighty-five percent of online students were women and working adults who had busy lives and had a hard time balancing their schedules; therefore, online courses provided convenience in completing their degrees (Postsecondary National Policy Institute [PNPI], 2017). Online learning also benefits students who lived in rural, hard-to-reach areas. It increased the number of students who attended college, added flexibility for students, offered multiple demonstration and practice opportunities to reinforce comprehension, and reduced costs for both the community college and its students (Smith, Smith, & Boone, 2000).

Although community college students benefit from alternative offerings for classes through online learning, many struggle with retention and academic success in online courses (Carpenter, Brown, & Hickman, 2004; Jaggars & Xu, 2010; Xu & Jaggars, 2011a, 2011b; Zavarella & Ignash, 2009). This likely is associated with the fact that many community college students come from low social economic backgrounds, have inadequate support systems, lack self-efficacy, have limited technology access to technology, and/or have limited technology experience (Bambara, Harbour, Davies, & Athey, 2009; Futch, 2016; Snart, 2017; Wladis et al.,

2015). These obstacles in life are known as barriers, conditions into which individuals are born and likely cannot change by the time they attend college (NCES, 2015). Barriers make succeeding in online courses much more difficult (Brotton, 2005; Futch, 2016; Snart, 2017; Wladis et al., 2015; Xu & Jaggars, 2013a; Xu & Jaggars, 2011b).

### **The Pros and Cons of Online Education**

Research results have been mixed with regards to online learning finding both positive and negative aspects (Jahng, Krug, & Zhang, 2007; Sitzmann, Kraiger, Stewart, & Wisher, 2006; U.S. Department of Education, 2010). In 2014, Bacescu reported that although there are many benefits of online learning such as the growth of creative thinking, problem solving skills, an increase in reaction time, self-assessment opportunities, immediate feedback, and working at a student's own learning pace; there are also many drawbacks. Some concerns surrounding online learning state that computer based learning is still expensive and may exclude students from certain demographic groups. The lack of face-to-face and human interactions can stunt learning opportunities to debate or discuss problems, and it can also strain relationships by isolating students and force them into computer use. Certain subjects require "practical activity" which cannot be learned online, and online learning also does not work with every cognitive style (Bacescu, 2014).

### **Student Satisfaction with Online Learning**

Student engagement and satisfaction increased when instructors shifted from traditional lectures to media-based materials (Davis, 2016; Lim, Kim, Chen, & Ryder, 2008; Marcketti, 2011). In 2004, Finlay, Desmet, and Evans, surveyed 95 students on their satisfaction of a Composition II online course versus their other face-to-face courses. The researchers determined students enjoyed their online Composition II courses as much or more than their other face-to-

face courses. The researchers also found technology to have a statistically significant effect on student satisfaction and participation, when they controlled for the classroom environment and instructor behaviors. In their limitation section, Finlay et al. disclosed that these online courses were synchronous, and the instructors teaching these courses were considered to be above-average instructors. Also, the researchers identified that composition II lends itself to an online environment more so than other courses (Finlay, Desmet, & Evans, 2004).

Kendall (2001) also claimed that students prefer online courses, stating that online learning achieved learning outcomes and student satisfaction as much or more than face-to-face courses. Bacescu's (2014) findings echoed Kendall's (2001) conclusion that students prefer online learning because of the e-learning tools. Lim et al. (2008) also reported similar results: students in online and blended courses had statistically significant higher levels of academic achievement than students in face-to-face classes while students in blended courses also reported greater levels of satisfaction compared to those in face-to-face courses (Lim et al., 2008). Davis (2016) found that although students' satisfaction may be higher for online platforms, satisfaction was not a statistically significant predictor of learning outcomes. Students in face-to-face courses achieved better grades and higher test scores than students in online courses (Davis, 2016; Driscoll, Jicha, Hunt, Tichavsky, & Thompson, 2012).

### **Benefits of Online Communication**

Arasaratnam-Smith and Northcote (2017) found that online classes offer a different type of community online. They argued that it is not practical nor logical to replicate face-to-face communication interactions online. Instead online should be assessed differently, identifying the unique communication advantages and viable alternatives to in class interactions (Arasaratnam-Smith & Northcote, 2017). "Online instruction offers many tools to facilitate communication,

collaboration, and the exchange of information, and ultimately helps students to critically examine their assumptions, seek out additional perspectives, grapple with social issues, and create change” (Meyers, 2008, p. 223).

Almost two decades ago, Smith et al. (2000) studied the difference in academic outcomes between online and traditional courses. As a secondary finding, Smith et al. found notable differences between participation in discussion activity. Only 77% in one section and 82% in other section of traditional instruction were activity engaged compared to 100% in both online sections. This was attributed to increased opportunity for students to compose their thoughts and formulate ideas. It was also discussed that in traditional instruction, dominating personalities of some students could override quieter students’ opportunities to participate (Smith et al., 2000).

Mentioned earlier in this review, Nollenberger’s (2017) study of student preferences of online, face-to-face, or blended courses indicated students preferred online communications rather than in the classroom. Thirty-two percent of the students surveyed were more comfortable using online communication tools to respond to their classmates, while less than half, 42% were more comfortable speaking up in a face-to-face classroom setting. Nollenberger noticed that there were many advantages on both sides of online versus face-to-face communication. The most significant response was that online communication allowed busy students to interact asynchronously (Nollenberger, 2017). Also, students taking online or blended courses have the advantage of communicating with students and faculty over long distances (Palmer et al., 2014). However, because of the multiple methods of communication that were offered (online and in-person), blended courses were the preferred method of instruction (Nollenberger, 2017; Palmer et al., 2014).

Kanevsky, Xin, and Ram (2016) studied one specific reading class and found that students preferred a blended format using an annotation tool, Marginalia. The students reported that using Marginalia to make comments back and forth with their classmates which helped them understand and learn in greater detail with their assigned readings. The instructor also reported positive results from using Marginalia claiming the online discussions contributed to greater learning, and it helped develop a community of learners between face-to-face classes. Additionally, the instructor reported that reading the students' discussions before each face-to-face class helped the instructor prepare more meaningful in-class activities (Kanevsky et al., 2016). Gasparic and Pecar (2016) conducted a similar study; however, they looked at a teaching program's use of asynchronous online discussion. Their aim was to analyze where students benefited from online discussions compared to other students utilizing traditional face-to-face meetings. They found that students participating in online discussions failed to develop the level of interpersonal relations compared to the students attending face-to-face meetings. Although, the level of interpersonal relationships were lower, students participating in online discussions reported having more success planning their lessons and self-assessing their own teaching (Gasparic & Pecar, 2016).

Estelami (2012) compared 177 students' experiences and learning outcomes in online courses and blended courses. He determined although pure online courses showed many benefits, blended courses were perceived to be a better alternative and performance scores were higher. Estelami (2012) attributed this to the communication between instructors as students. If online courses were to bridge this gap, online courses could possibly be the best delivery method. However, this would require a great deal of foresight in the online design as well as sufficient time from instructors to engage their students.

### **Lack of Community Online**

Researchers claim that students taking online classes miss out on a much needed campus community (Jaggars, 2014; Mays, 2016; McInnerney & Roberts, 2004; Overbaugh & Nickel, 2010; Pigliapoco & Bogliolo, 2008). Students also prefer face-to-face interactions with faculty and peers, the deeper relationships they developed in and outside of the classroom, and a stronger sense of belonging when they took classes face-to-face (McInnerney & Roberts, 2004, Moon-Heum, & Moonkyoung, 2017; Overbaugh & Nickel, 2010; Pigliapoco & Bogliolo, 2008).

In 2014, Jaggars conducted a qualitative study in order to address the reasons as to why community college students chose online or face-to-face courses. It was determined that most students felt as if they were their own instructors, since they needed to self-learn the material. They also claimed they did not learn the material as well as if they would have taken the class face-to-face (Jaggars, 2014). Students believed they had a richer experience in face-to-face classes, felt it was important to maintain a connection to their campuses and their peers, and wanted a stronger student-instructor relationship. The students reported having a much higher level of communication with their instructors in their face-to-face courses. Jaggars (2014) recommended that in order to meet students' needs, colleges need to explicitly build an instructor presence while participating in stronger one-on-one guidance in online classes, or colleges should continue to provide ample face-to-face sections of courses for those students who prefer them. Books and Young (2016) also found instructors were less receptive and encouraging to students in online classes compared to students taking blended and face-to-face classes. Instructors reported being more likely to reach out to students for out-of-class communications when the students are taking face-to-face or blended courses (Brooks & Young, 2016).

Jaffer et al. (2016) conducted a qualitative study and found students valued face-to-face contact both for peer interactions and to have better access to their instructors. Students claimed “discussions were more real than that of online peers” (p.213), and they mentioned that inquiries, common challenges, and peer suggestions were much more attainable face-to-face (Jaffer et al., 2016). Literature also supports students preferring face-to-face discussions over online discussions (Bruff, Fisher, McEwen, & Smith, 2013; Chen & Chen, 2015, Macdonald, 2008; Moon-Heum, & Moonkyoung, 2017; Shonecker, 2009).

Moon-Heum, and Moonkyoung’s (2017) qualitative study echoed the previous studies. They found students preferred to have face-to-face meetings with their classmates, be in a regular classroom to receive immediate feedback, and have more face-to-face interactions with their instructors in a physical classroom. One student in particular mentioned that he never realized the degree in which he relied on his peers in order to learn. “Students seemed to seek comfort about their learning by observing and interacting with classmates” (Moon-Heum, & Moonkyoung, 2017, p. 185). Similarly, Schoenacher (2009) found that students taking online classes missed interacting with their classmates face-to-face, and they felt the level of relationship building was much lower online. He also discovered the degree of building trust and the level of working collaboratively with instructors and peers was much lower online which could lead to academic struggles, lower retention, and lower student satisfaction (Shonecker, 2009).

Mays (2016) conducted a qualitative study interviewing 19 students who lived off campus who were taking both online and face-to-face classes. After Mays investigated the experiences students had regarding their online and face-to-face courses, he found there was a lack of community and likely one would never develop in online courses. The participants also

reported fewer connections in online classes compared to face-to-face courses. Because most of the participants indicated that networking was an important part of the college experience, Mays recommended that colleges should restructure online classes to build more community virtually. Mays conducted his study stating, student interaction and connections are important factors with regards to student retention for online learning is becoming a common staple at most post-secondary institutions (Mays, 2016).

**Online communities are not for everyone.** Gillett-Swan (2017) argued that online learnings is not for every student. The universal approach to online learning is not affective for students who do not or cannot perform well in a virtual learning environment. Many students are considered “isolated learners”, meaning they experience anxiety associated with using technology, especially with online group assignments (Gillett-Swan, 2017). “Teaching with technology is not a one size fits all approach as it depends on the types of technology in use at the time and also the curriculum content being taught” (Orlando & Attard, 2015, p. 119). Gillett-Swan (2017) found that many students fail to do well online because of the nature of their learning style, and not all courses can be effectively taught online because of the nature of the material and type of curriculum. Even though online learning is the wave of the future, for the sake of many different types of learners, it should not be the only method of instruction. “The importance of continued critically reflective academic practice to assure the best learning outcomes possible for all student cohorts is also emphasized in focusing on social relationships and community building” (Gillett-Swan, 2017, p. 28).

### **Outcomes and Academic Success**

In 2000, Smith et al. analyzed two interventions that utilized a pretest and posttest to determine whether online instruction was as effective as traditional instruction. Both groups

(online and face-to-face) had similar results in the pretests and posttests in both interventions, and no significant differences were found between traditional and online instruction groups (Smith et al., 2000). More recently, however, Xu and Jaggars (2013b) found the opposite to be true. Xu and Jaggars investigated students' academic outcomes in online, blended, or face-to-face formats using data over a five year period from multiple community colleges in the state of Washington. They found that courses taught online as opposed to face-to-face had a significant negative impact on both course persistence and course grades (Xu & Jaggars, 2013b).

Gregory and Lampley (2016) also examined students' academic achievements by comparing the grades ("A", "B", "C", "D", "F", or "W") of students in a multidiscipline face-to-face course to the same course online. They used secondary data from a community college in Tennessee which provided data on 4,604 students. They found mixed results: students taking online classes were more likely to receive A's in their online classes (21%) compared to those taking face-to-face courses (18.8%) but were also more likely to fail in online (11.3%) compared to face-to-face (10.2%). The overall grades for students in face-to-face were higher, however, for students were more likely to receive B's, C's, and D's at a greater rate (24.1% compared to online at 20.3%) (Gregory & Lampley, 2016).

### **Online Completion**

Research shows that students were significantly more likely to drop out of their online courses compared to face-to-face classes (Allen & Seaman, 2015; Gregory & Lampley, 2016; Hachey et al., 2013; Harrell & Bower, 2011; Jaggars & Bailey, 2010; Xu & Jaggars, 2011a, 2013). In 2016, Huston and Minton studied 176 sections of an Intermediate Algebra course in three separate semesters. Using a two-way ANOVA, the researchers found that students taking

face-to-face courses were statistically significantly more likely to complete their courses (Huston & Minton, 2016).

Hachey et al. (2013) found that students with a GPA of 2.0-3.5 were twice as likely to drop online classes than face-to-face courses. Features of the online learning experience impacted average students more strongly than those students at the top or bottom of the GPA scale (Hachey et al., 2013). Students under a 2.0 may not have dropped the class, but failed it. Hachey et al. recommend that in order to ensure that students would do well in online classes, colleges should restrict students to a 3.0 GPA. However, this would prevent 58% of all online students who do not have a 3.0+ GPA from enrolling in online courses, which most colleges would agree is not worth the loss of revenue (Hachey et al., 2013).

Alternatively, Shea and Bidjerano (2014, 2016) found that students taking a combination of online and face-to-face classes were more likely to graduate than students taking only face-to-face courses. In 2014, Shea and Bidjerano used national data (US Department of Education Beginning Postsecondary Student Survey, 2004-2009) to examine whether community college students enrolled in for-credit online courses were more likely to complete their degrees. They found online courses provided a more effective and efficient path to graduation, and online students were more likely to complete a four-year degree than students taking traditional courses (Shea & Bidjerano, 2014). In 2016, Shea and Bidgerano conducted an additional study using the same survey to examine three outcomes for online community college students: attainment of first associate degree, transfer, and dropout. They concluded that community college students who took online courses had a significantly higher six-year degree completion rate and no significant differences in dropout rates compared to community college students who did not participate in any online courses. The researchers attributed high completion rates in online

classes to “higher levels of interaction, embedded support for meta-cognitive strategies, and asynchronous formats” (Shea & Bidjerano, 2016, p. 23). They encouraged future research to look into these factors in greater depth. There was however, one limitation to both studies; they included every student who took one or more online course. Therefore students who took an entire program face-to-face with the exception of one online course would have been included in the online groups’ results (Shea & Bidjerano, 2014, 2016).

### **Reasons for Poor Online Performance and Withdraws**

**Lack of self-discipline.** “Students believe that a DL [distance learning] class will be easier and require less time than its traditional counterpart. When they discover that this is not the case, they become angry and drop the class” (Bowman, Dyrud, & Worley, 2001, p. 88). Students underestimate the time commitment and independent learning of online courses. Since the online courses do not have face-to-face contact hours additional self-directed assignments and homework are required. Students need to be highly self-motivated and disciplined to complete online courses successfully (Bowman et al., 2001).

In 2014, Jaggars conducted a qualitative study in order to address the reasons why students chose online over face-to-face courses. It was determined that most students felt as if they needed to “teach themselves” their online material, and they did not learn the material as well as if they would have taken it face-to-face (Jaggars, 2014).

Researchers agree that in order for students to be successful online, they must be self-motivated, organized, responsible, self-disciplined, and goal-oriented (Johnson & Berge, 2012; Kenner & Weinerman, 2011; Kerr et al., 2006; Wojciechowski & Palmer, 2005). Researchers also agree that students who were more proficient on the computer and online platforms or have

taken online courses previously were more successful in online classes (Hachey et al., 2013; Harrell & Bower, 2011; Kerr et al., 2006).

**Poor instruction.** One reason for poor retention in online courses could be due to a new form of the “digital divide” (Stumpf, McCrimon, & Davis, 2005). Stumpf et al argued that students could very well have the technological savvy to perform better in online courses, but faculty do not have the technology know-how to provide the necessary resources in their online instruction. A major obstacle in online education is that “faculty tend to be teacher-centered rather than student-centered and tend to view technology as an aid for current teaching strategies rather than as a vehicle for developing new approaches” (Burke, 2002, p. 10).

Brooks and Young (2016) surveyed 495 students at a large public southwestern university regarding the frequency in which students converse with their instructors in and outside of class time. They found that instructors were less encouraging and receptive in online courses compared to blended and face-to-face courses. Instructors and students were also much less likely to reach out to one another in an online environment. Out-of-class communications were significantly more frequent when students took face-to-face or blended courses.

**Lack of community and isolation online.** The literature shows that students taking online classes miss out on a much-needed sense of campus community (Gillet- Swan, 2017; Jaggars, 2014; McInnerney & Roberts, 2004; Overbaugh & Nickel, 2010; Pigliapoco & Bogliolo, 2008). Students also preferred a stronger sense of belonging, the interactive communications with faculty and peers, and the deeper relationships they developed in and outside of the classroom when they took classes face-to-face (McInnerney & Roberts, 2004; Moon-Heum, & Moonkyoung, 2017; Overbaugh & Nickel, 2010; Pigliapoco & Bogliolo, 2008).

In Mays's (2016) qualitative study, mentioned earlier in this literature review, students who lived off campus and were taking both online and face-to-face classes were interviewed. The study's purpose was to investigate the experiences students had regarding their online versus face-to-face courses. Mays found that his participants reported fewer connections in online classes compared to face-to-face and there was a lack of community that was likely to never develop in online courses. Mays recommended that colleges look into restructuring online classes to build more community virtually because most of the participants indicated that networking was an important part of the college experience (Mays, 2016).

Jaggars in 2014 also found that community is lacking online. In this study, students reported receiving a richer experience in face-to-face classrooms. They also desired a maintained connection to their campuses and peers, and they wanted a stronger student-instructor relationship (Jaggars, 2014). "To meet students' needs, then, colleges need to either more explicitly build instructor presence and guidance into online courses or continue to provide ample face-to-face sections of courses for those students who prefer them" (Jaggars, 2014, p. 27).

**Barriers.** Barriers are defined by the National Center of Education Statistics (2015) as conditions into which individuals are born and likely cannot change by the time they attend college (Gillet- Swan, 2017; Xu & Jaggars, 2011b). Examples of such barriers are low social economics, inadequate support, lack of community, lack of self-efficacy, and limited technology experience (Aragon & Johnson, 2008; Bambara et. al, 2009; Capra, 2011; Futch, 2016; Gillet-Swan, 2017; Snart, 2017; Wladis et al., 2015; Wojciechowski & Palmer, 2005). Students with these barriers not only have a harder time in face-to-face classes, they have greater difficulty of succeeding in online classes (Brotton, 2005; Wladis et al., 2015; Xu & Jaggars, 2013a) leading to

lower grades and a higher attrition (Ryan, Kaufman, Greenhouse, She, & Shi, 2016). “Gaps between male and female students, and gaps between White and ethnic minority students are exacerbated in online courses” (Xu & Jaggars, 2013a, p. 23).

***Community college students.*** Community colleges have significantly more minorities, females, and non-traditional students. For example, at four-year institutions 58.1% of their students had one or more barriers (as defined by the National Center of Education Statistics, 2012) and only 16.7% had four or more barriers. However, 87.9% of students at community colleges had one or more barriers, and almost one third of community college students had four or more.

In 2010, Jaggars and Bailey found that the majority of studies comparing online learning to face-to-face learning used students who were from four-year institutions or post-graduate programs and known to be “well-prepared” and motivated students, not students who were underprepared and from low-income backgrounds. There are minimal rigorous studies that examine community college students with barriers who struggle with many social economic issues, particularly students attending community colleges (Jaggars & Bailey, 2010; Ryan et al., 2016; Wladis et al., 2015; Xu & Jaggars, 2011b).

Research shows that community college students have not been as successful in 100% online courses versus 100% face-to-face courses compared to students at four-year colleges, even when controlling for different student characteristics such as amount of time studying and quantity of logging into the online courses (Carpenter, Brown, & Hickman, 2004; Jaggars & Xu, 2010; Xu & Jaggars, 2011a, 2011b; Zavarella & Ignash, 2009). Recent studies have concluded that unfavorable student outcomes among community college students in online only courses likely were associated with barriers that many community college students faced: a relative lack

of structure, lack of support, sense of isolation, and simple technical difficulties (Futch, 2016; Snart, 2017; Wladis et al., 2015; Xu, & Jaggars, 2013a; Xu & Jaggars, 2011b).

### **Blended Courses**

Many researchers have advocated that the best course type is combining the advantages of face-to-face with the benefits of online learning also known as blended or hybrid courses (Carnevale, 2002; Crawford, Baker, & Seyam, 2014; Graham & Robison, 2007; Oblender, 2002; Snart, 2017; Ward, 2004; Young, 2002). Hybrid and blended learning are used interchangeably and there are many different definitions that exist, for the purpose of this study, Staker and Horn's (2012) definition is used:

A formal education program in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path, and/or pace and at least in part at a supervised brick-and-mortar location away from home. (p. 3).

As early as 2003, the American Society for Training and Development identified blended learning as one of the top 10 trends in the knowledge delivery industry (Rooney, 2003) and the North American Council for Online Learning predicted that blended courses will eventually become more common than face-to-face instruction as well as courses entirely online (Watson, 2008). Bill Gates also saw the relevance of blended learning and stated, "the benefits of using large-scale online education programs with individualized instruction could ultimately improve student learning outcomes" (Brahimi & Sarirette, 2015, p. 605).

Known as the best of both worlds (Snart, 2017; Vininsky & Saxe, 2016), blended learning offers students the benefits of traditional face-to-face interaction while also utilizing technology as an effective tool to increase student engagement in academics (Zielinski, 2017) by

facilitating richer exchanges between faculty and students (Estelami, 2012). Students learning experiences can be significantly improved when classroom involvement and online learning components are being utilized simultaneously (Estelami, 2012; Vininsky & Saxe, 2016).

### **Preferred Method of Instruction**

**Faculty.** Zielinski (2017) found that professors and instructors prefer interaction in the classroom, claiming it to be a vital part of learning. Students tend to be more engaged in class and active participants in their own learning when they participate in entire classroom discussions or small group activities. Although Zielinski found that interactions were key to learning, it was also discovered that blended courses amplified the learning experience. Zielinski (2017) additionally discovered faculty truly value the use of online instructional tools such as Blackboard to assist students in their learning. The faculty in their study used Blackboard to communicate their expectations with their students while also providing course content and discussion boards to assist in mastering the material. The faculty also encouraged students to use Blackboard to tailor their own learning experience by utilizing the additional resources that were not required but available for further learning (Zielinski, 2017).

**Students.** In 2017, Nollenberger surveyed master level students who took all three modalities within a two year period to determine their learning preferences when it came to the three different modalities (online, blended, and face-to-face). The results identified that 54% of the students preferred the face-to-face classroom setting. However, 79% of the students appreciated the flexibility of their online courses. There were also many students (32%) who were more comfortable using online communication tools to respond to their classmates, while 42% were more comfortable speaking up in a face-to-face classroom setting. Nollenberger noticed that there were many advantages on both sides of online compared to face-to-face.

However, 72% of the students preferred a blended format, while 27% preferred all face-to-face courses, and only 1% preferred all online courses. Students preferred the face-to-face classroom interactions, collaboration, and communication with their professors and fellow students.

Blended courses benefited both the students who may be shy and take comfort in posting on discussion boards or prefer to spend more time critically thinking before responding and the students who prefer in-person interaction with their professors and classmates (Bambara et al., 2017). Palmer, Shaker, and Hoffmann-Longtin (2014) conducted a mixed-method study similar to Nollenberger (2017), and they also found similar results. The vast majority of the students indicated the quality of the face-to-face interactions they had with their peers and instructors was very beneficial for the learning experience. However, the online aspect allowed an additional communication tool that allowed students to communicate within long distances. Ultimately, blended courses were the students' preferred method of instruction (Palmer et al., 2014). Jaffer, Govender, and Brown's (2017) qualitative study provided the same findings stating, "students expressing strong appreciation for the face-to-face contact in addition to online learning" (p. 207).

### **The Successes of E-Learning Tools**

Several studies have found that e-learning tools have assisted with students' academic success, academic satisfaction, and over all learning experience (Bacescu, 2014; Burgess, 2015; Gonzalez-Gomez, Jeong, Rodriguez, & Canada-Canada, 2016; Hibbard, Sung, & Wells, 2016; Means et al., 2013). The literature also indicates that e-learning tools assist with students' learning and memory retention of course material (Gonzalez-Gomez et al., 2016; Hibbard et al., 2016; Narguizian, Beltz, and Desharnais, 2016; Rivera, 2016).

Desplaces et al. (2015) examined whether the utilization of e-learning tools in students' classes would impact the students' abilities to synthesize course material. With a sample of 91 students enrolled in the same course (but with different deliveries: online, blended, or face-to-face) at a university in southeastern part of the United States, Desplaces et al. compared the success of these students. The researchers conducted an ANOVA and a multiple regression to determine whether the utilization of e-learning tools enhanced students' abilities to synthesize information regardless if it was delivered in a pure online class or in a blended course. Desplaces et al. (2015) also conducted a brief follow up survey for those students who used e-learning tools. They found that 82% of students believed e-learning tools helped them manage the material better and ultimately helped them learn more, and 88% recommended utilizing these tools in future classes. Student engagement and completion of projects increased when instructors shifted from traditional lectures to more media-based materials (Marcketti, 2011).

### **Blended Science Courses**

Science courses, and particularly ones that require a lab, were originally thought to never be able to be offered online. It was unheard of to provide hands-on course work over the internet. However, blended courses have changed that idea and have actually provided a better learning environment for some programs such as medical programs requiring lab instruction being one of them (Andruseac, Costuleanu, Boldureanu, Murgu, & Boldureanu, 2017). Andruseac et al. (2017) found that there were many online modalities that improved learning outcomes, added consistencies, and increased learner satisfaction in medical education. However, because of the hands-on nature and the critical need for correctness in the medical field, face-to-face instruction is necessary. Blending online modalities and face-to-face instruction tends to show significant success in medical education (Andruseac et al., 2017). Son, Narguizian, Beltz, and Desharnais

(2016) also conducted a study comparing biology courses taught face-to-face and blended. They discovered that not only did students perform better in the blended courses, but it was a less expensive alternative and twice as many sections could be taught since the blended courses opened up the availability of biology lab classrooms.

Elmer, Carter, Armga, and Carter (2016) also found physiology courses could be taught in a blended format. Using a randomized, crossover design with four different laboratory classrooms, they discovered that students' scores were not statistically significantly different between face-to-face and blended courses. They did however notice that students strongly preferred the blended courses, and the students reported better retention of the material. Elmer et al. additionally learned that students appreciated the online teaching tools which helped them learn at their own individual pace (Elmer et al., 2016). Rivera (2016) also agreed that blended courses offer great opportunities in the field of science. "When considering the optimal learning environment for science majors, educators have discovered the blended classroom may provide the perfect opportunity to combine the benefits of face-to-face instruction and feedback with reinforcement of scientific theory through technology integration" (p. 209).

### **Flipped Classrooms**

Flipped classrooms are blended classrooms in which the traditional lecture is online while the face-to-face time is used to solve problems, collaborate with other students, and ask the instructor questions. Gonzalez-Gomez et al. (2016) found when students were given materials online before class, even with half the traditional class time, students performed significantly better. Gonzalez-Gomez et al. compared two groups, one traditional face-to-face and one flipped class. The flipped class had online assignments before coming to class: video lessons, reading materials, and online questionnaires. These materials provided the students with exposure to the

content before learning the material in greater depth during class time. The students also had a favorable perception of the flipped classroom, appreciating the access to go back to the online learning materials at any time if they needed to relearn or learn more (Gonzalez-Gomez et al., 2016). Hibbard et al. (2016) came to the same conclusion as Gonzalez-Gomez et al. (2016). They conducted a five-year cross-sectional study to assess the difference between a chemistry class taught in the traditional face-to-face method and a flipped classroom method. Using a standardized chemistry test the researchers analyzed student scores using a one-way ANOVA. They also administered a survey at the end of each semester. The researchers found that students performed significantly better in the flipped classrooms, and the majority of the flipped classroom students' surveys were positive and reflected motivation to succeed (Hibbard et al., 2016).

### **Blended Compared to Face-to-Face and Online**

Jaggars and Bailey (2010) completed an empirical analysis of a meta-analysis provided by the Department of Education (2009). The Department of Education claimed that the learning outcomes of online and blended courses were equal to or better than traditional face-to-face courses. In the conclusion, however, the report stated there was a stronger positive effect for online learning outcomes in blended courses than there was for the learning outcomes in online courses when both were compared to the face-to-face courses. This meta-analysis included courses that were not traditional semester long courses nor did they exclude businesses and other institutions that were not traditional post-secondary institutions. After excluding institutions that were not in higher education, there were only seven colleges that qualified. Within those seven schools, students in online courses had equal learning outcomes to face-to-face courses but a much greater withdraw rate. The students in these courses were also known to be "well-

prepared” and motivated students not students known to be underprepared or from low-income backgrounds. Finally, Jaggars and Bailey (2010) recommended further research that accurately measures true college students, provides statistically significant data, and examines underrepresented students who struggle because of barriers. Jaggars and Bailey’s recommendation matches literature which claims there are minimal rigorous and accurate studies that examine online learning (Bowen, Chingos, Lack & Nygren, 2012; Means et al., 2013; Mollenkopf, Vu, Crow, & Black, 2017) especially since it is rapidly growing and many institutions utilize online learning (Mollenkopf, Vu, Crow, & Black, 2017).

One year after Jaggars and Bailey’s (2010) study, Ashby, Sadera, and McNary (2011) explored the academic successes of 167 students taking a developmental math course from the three different learning environments (face-to-face, blended, and online). Thirty-five percent enrolled in face-to-face classes, 38% took online classes, and 28% selected blended courses. The researchers used a one-way ANOVA to determine which method of delivery had the higher percentage of student success. Using a 70% pass rate as the defining level of academic success, the researchers discovered students performed better in face-to-face courses. However, after they adjusted their sample for attrition, students had greater academic success in online courses. Blended courses had the lowest success rate. Ashby et al. (2011) noticed that students were less likely to complete necessary assignments in blended courses causing lower grades and possible withdraws from the course which amounted to an attrition rate of 30%. In online classes, students were also more likely to drop the course (24%) compared to the students taking the face-to-face class (7%).

Mollenkopf et al. (2017) studied online course effectiveness and student performance among student teachers. They found there to be no statistically significant differences between

the online and face-to-face groups of student teachers (Mollenkopf et al., 2017). It is important to note, however, this study did not include participants who did not successfully finish the courses.

Means et al. (2013) also learned that the e-learning tools in online and blended courses are beneficial to student outcomes. Means' et al. widely-cited study (Mollenkopf et al., 2017; Nollenberger, 2017; Ryan et al., 2016; Snart, 2017) was a meta-analysis comparing online, blended, and face-to-face instruction methods and included 50 effect sizes from 45 studies. Means et al. found that online learning, whether 100% online or blended learning, leads to greater academic success for students on average compared to 100% face-to-face instruction. Their study showed a weighted mean effect size (Hedge's  $g$ ) of 0.20,  $p < .001$ , for all 50 constructs when comparing face-to-face and online learning. Means et al. also determined that the 100% online versus the face-to-face contrast mean effect size did not differ significantly from zero; however, the mean effect size for the blended versus face-to-face contrasts was significantly different from zero. This led Means et al. to conclude that 100% online instruction and 100% face-to-face instruction had similar outcomes; however, blended deliveries showed to be a more effective instruction method compared to 100% face-to-face. Means et al. attributed this to a combination of attributes blended courses employ: more learning time and additional instructional resources from online learning tools along with the face-to-face interactions with instructors and peers. They recommended redesigning face-to-face courses to include online learning tools.

The studies used in Means et al.'s (2013) meta-analysis included both two-year and four-year institutions. Their findings cannot truly be generalized to community college students and their learning outcomes regarding blended, online, and face-to-face instruction. Unfortunately, the majority of studies which addressed the differences in face-to-face, blended, and online

instruction in post-secondary education included only well-equipped university students. These studies have placed less emphasis on students from community colleges who were not as well-prepared and struggled with social economic issues and other barriers that many students from four-year institutions did not (Xu & Jaggars, 2011b).

### **Community College Students**

Snart (2017) determined that blended learning is the best of both worlds especially for diverse and first generation college students. Blended courses provide an ideal mix of learning opportunities that can serve the open access of community colleges. Many community college students are part of underrepresented populations and this provides an impact opportunity for blended classes. Blended courses provide immediate interaction to instructors and peers in a face-to-face format while also meeting the technological advancements that many classes now expect (Snart, 2017).

Xu and Jaggars are leaders in online and community college research (Gregory & Lampley, 2016; Ryan et al., 2016; Snart, 2017; Wladis et al., 2015). They have conducted many studies examining academic outcomes and retention for students in online, blended, and face-to-face courses. In 2011, Xu and Jaggars analyzed data over a five-year period from multiple community colleges in the state of Virginia regarding their students' academic outcomes in online, blended, or face-to-face entry-level English and mathematics courses. They found that the community college students who took a majority of online classes were less likely to complete their degrees or to transfer to a university compared to those who took face-to-face or blended courses (Xu & Jaggars, 2011b). Two years later, Xu and Jaggars (2013b) expanded this study pairing multiple subjects in addition to English and mathematics. They assessed course completion (completing the classes) and final course grades. They concluded by reporting that

courses taught online as opposed to face-to-face had a significant negative impact on both course completion and course grades (Xu & Jaggars, 2013b).

Additionally in 2011, Xu and Jaggars used data from some community colleges in the state of Washington to compare the academic success outcomes for students in online, blended, and face-to-face courses. One year prior they conducted a similar study using data from some community colleges in Virginia (Jaggars & Xu, 2010). In both studies, they discovered that the students in online courses were more likely to withdraw or fail their courses than their classmates who were taking face-to-face courses even after they controlled for different student characteristics. With students taking blended courses, however, they found no significant differences in success outcomes when they compared the students to their peers taking face-to-face courses. In both studies Xu and Jaggars concluded blended courses present fewer challenges than online courses for community college students (Jaggars & Xu, 2010; Xu & Jaggars, 2011a).

Ryan et al. (2016) also researched the effectiveness of blended learning at the community college level. They provided pre-test and post-test to 1,602 students (in either blended courses or face-to-face courses) while also surveying these students. Only 634 students completed all parts of the study; therefore they only utilized the data for 634 students. The pre-tests and post-tests examined the academic success for the students while the survey was used to determine student characteristics such as demographics, education level, family income, degree plans, study habits, time spent on the class, and familiarity with online instruction. Ryan et al. (2016) determined that on average students taking blended courses had similar or greater gains compared to students taking pure face-to-face courses while controlling student characteristics. The researchers attributed these successful outcomes in blended courses to interaction between students and faculty in a physical setting and greater student engagement in the online content. The results

from Ryan et al. suggested future empirical inquiry should pursue the hypothesis that the more time taken away from face-to-face instruction the less integrated community college students will be at their campuses, which ultimately will cause issues with course grades and course completion.

### **Summary**

Although online education is expediently growing and community colleges are the leaders in online offerings (CCRC, 2013), community college students may not be the best recipients of online learning (Xu & Jaggars, 2011a, 2011b; Zavarella & Ignash, 2009). Research shows there are both pros and cons of online education. Students enjoy online, they benefit from the e-learning tools and the virtual communication; however, online learning lacks a campus community which some researchers believe to be a fundamental aspect of higher learning (Jaggars, 2014; Mays, 2016; McInnerney & Roberts, 2004; Overbaugh & Nickel, 2010; Pigliapoco & Bogliolo, 2008).

Research also shows mixed results for learning outcomes and academic success in online courses. The majority of research indicates that online students suffer academically and are more likely to withdraw from their classes and even drop out of college compared to students taking face-to-face or blended classes (Gregory & Lampley, 2016; Hachey et al., 2013; Harrell & Bower, 2011; Xu & Jaggars, 2011a, 2013). Reasons for poor academic success and dropping online courses are covered (lack of self-discipline, poor instruction, lack of community, and barriers many community college students face). More recently however, newer studies are showing that there is little to no difference in delivery methods while also supporting that a combination of online and face-to-face is most beneficial (Nollenberger, 2017; Shea & Bidjerano, 2016; Shea & Bidjerano, 2014).

Blended learning is also highly regarded as the best of both worlds – utilizing supportive e-learning tools while also keeping the highly regarded face-to-face interaction. Blended learning is popular with both faculty and students, and it also supports learning formats that are typically not conducive to online learning such science courses and flipped classrooms. Research also supports the benefits for students' academic success (Crawford et. al, 2014; Graham & Robison, 2007; Snart, 2017; Ward, 2004) while also supporting the benefits that specifically impact community college students (Jaggars & Xu, 2010; Ryan et al., 2016; Xu & Jaggars, 2013b; Xu & Jaggars, 2011a).

## **CHAPTER 3**

### **METHODOLOGY**

This chapter provides an examination of the research design and methodological approach used in this study. The purpose of the study, research questions, and variables are detailed. The dataset, participants of the study, and data analysis procedures are all described. This chapter concludes with the delimitations and limitations of this study.

#### **Research Design**

Crotty (1998), who believed there is an objective truth from one reality, suggested that the objective, true realities are waiting to be discovered, and “careful research can attain that objective truth and meaning” (p.6). Using quantitative approaches of measurement and scientific method, these objective realities can be discovered (Creswell, 2014; Crotty, 1998). While grounded in post-positivism/objectivism theoretical perspective, this study is a quantitative research study using a one-way ANOVA, logistic regression, and multiple regression methodology where the independent variables are not manipulated. Aligning with the post-positivism/objectivism theoretical approach, ANOVA testing examined variables using causal comparative research while the regression testing examined variables using correlational research with presumed prediction relationships.

Post-positivists hold a deterministic philosophy in which causes determine effects and outcomes (Creswell, 2014). According to Fraenkel and Wallen (2009), causal comparative research is used to determine causality of differences that exist between or among groups. A one-way ANOVA is used by researchers to statistically examine the differences in variation between multiple independent variables’ effect on one independent variable by testing the significant differences among the mean response values of the joint interaction effects and the separate main

effects of the independent variables (American Psychological Association [APA], 2014). Regressions using correlational research designs are utilized by researchers to statistically describe and measure the degree of relationship between two or more variables or sets of scores (Creswell, 2012). Relationships between a number of facts are sought and interpreted to recognize patterns and trends in data; however, it does not prove causes for these observed patterns. This type of observational research is not cause and effect for only the data, relationships, and predictions of independent variables are studied. No variables are manipulated; they are merely identified and studied as they occur in their natural setting (Creswell, 2012).

In addition to an ANOVA and multiple regression, as mentioned, this study used logistic regression which measured the relationship between the categorical dependent variable and one or more independent variables by estimating probabilities using a logistic function (Kleinbaum & Klein, 2010). By providing odds and probabilities, and the percentage increase of those odds and probabilities, logistic regression determined whether a greater percentage of face-to-face contact time in blended courses supported higher course completion and higher course grades. The odds ratio also provided the optimal level of face-to-face contact time in blended courses and the point/percentage in which less face-to-face contact led to lower course completion and lower course grades.

This study also explored the relationship between the independent categorical variables of instructional delivery (online, blended, or face-to-face) and the dependent continuous variable, grades, the categorical variable course grades (receiving a C- and above or D+ and below), and the categorical variable course completion (completed course or withdrawn). The researcher sought to specify the probability to which type of course (online, blended, or face-to-face) predicted a higher percentage of course completion. This study additionally explored the

relationship between the independent continuous variable, face-to-face contact time within blended and the dependent continuous variable course grades, the categorical variable course grades - dichotomous (receiving a C- and above or D+ and below) and the categorical variable course completion (completed course or withdrawn). Using these variables the researcher specified the probability to which type of blended course (measuring face-to-face contact time) predicted higher course grades and a higher percentage of course completion. These findings could help predict likely outcomes for students taking online, blended, or face-to-face courses.

### **Methodological Approach**

This study relied on the quantitative approach to research methods of instruction (online, face-to-face, or blended); therefore a secondary data source was utilized because it was representative of the community college population this study examined. Using the same research principles as studies utilizing primary data, secondary data were data collected by an alternative source for another primary purpose (Johnston, 2014). The utilization of this existing data provides a viable option for researchers and has become much more prevalent recently with the vast amounts of empirical data that has become assessable (Andrews, Higgins, Andrews, Lalor, 2012; Schutt, 2011; Smith, 2008; Smith et al., 2011). Secondary data analysis offers methodological benefits while generating new knowledge and insight through research studies (Heaton, 2008, Johnston, 2012; Smith, 2008). The purpose of this study was to investigate delivery methods and their effects on course completion and course grades. One of the best ways to assess this investigation was by utilizing secondary data which completely encompassed all variables of this study. When secondary data are reliably recorded and meet a study's purpose and framework, it can be one of the best data collection methods (Johnston, 2014).

Data from Middle CC has been collected since 1996, and collection of online and blended courses started in 2001 with the introduction of those courses. As of 2018, they used Software and Services (SAS) Visual Analytics, the largest independent vendor in the business intelligence market. Middle CC collected data for quality control and institutional improvements. Access to the community college's SAS Visual Analytics data source was obtained through completing an official college request form. After approval from by Middle CC's IRB, the data was uploaded into Statistical Package for the Social Sciences Program (SPSS) version 25 by the researcher.

Many variables were collected on every student recorded for every course taught at Middle CC. For the purpose of this study a dataset was created to include a mere handful of variables: demographic information such as gender, age, and race/ethnicity; grades; classes that students dropped, and the face-to-face contact time for blended courses. These few variables matched the purpose of this study, measuring course grades and course completion for blended, online, and face-to-face courses; therefore, there was no additional information given to the researcher. Each of the 33,092 participants was provided to the researcher without names, remained anonymous, and assigned an identification number by the researcher immediately after receiving the dataset

### **Purpose and Research Questions**

The purpose of this study was to determine if the method of instruction (online, face-to-face, or blended) of a Midwestern U.S. community college course affected students' course grades and/or course completion. Additionally, this study used the same dataset to determine whether the ratio of the online delivery assigned to blended courses affected the students' course completion and/or course grades.

Based on the purpose of this study the following research questions were addressed:

1. Is there a statistically significant difference among final course grades and course delivery method (online, blended, or face-to-face)?
2. Does course delivery method predict course completion?
  - a. One hundred percent online courses
  - b. One hundred percent face-to-face courses
  - c. Blended courses
3. Do various ratios of face-to-face contact time in blended courses predict course grades?
4. Do various ratios of face-to-face contact time in blended courses predict final course completion rates?

### **Participants**

A second dataset was created from the secondary data from Middle CC which included only demographic information assigned to each participant. After testing for normality, this dataset included a total of 33,092 students who took 47,264 courses in 2015, 42,876 courses in 2016, and 41,009 courses in 2017 totaling 131,149 courses. The average age of the students was 24.51, with 55.8% female and 44.2% male. The race/ethnicity of the students were as follows: 77.9% Caucasian/White and, 7.1% Hispanic, 8.9% African American/ Black, 4.8% Asian, and 1.3% Native American. The gender, race/ethnicity, and ages of the participants are listed below in Table 3.1.

Table 3.1

*Frequency Distribution for Participants Demographics – Gender, Race/Ethnicity, and Age Level n = 33,092*

	<i>n</i>	% of Sample
<b>Gender (n = 33,092)</b>		
Female	18465	55.8
Male	14627	44.2
<b>Race/Ethnicity (n = 33,092)</b>		
Caucasian/White	26004	78.5
Hispanic	2252	6.8
African American	2948	8.9
Asian	1457	4.4
Native American	431	1.3
<b>Age Level (n = 33,092)</b>		
18-19 years old	11907	36.0
20-22 years old	8171	24.7
23-28 years old	6052	18.3
29-34 years old	2851	8.6
35+ years old	4111	12.4

### **Data Collection Procedures**

Data was collected using secondary data from a Middle CC's data collection system for years 2015, 2016, and 2017. This Middle CC's IRB approved the utilization of this data. The data the researcher received did not include student names, student IDs, or any other personal identifiers. Each student in the sample was assigned an anonymous identification number after the researcher received the data. The dataset included age; race; gender; grades, withdraws, and percentage of face-to-face instruction assigned to each of the 33,092 participants. The data was

then converted into SPSS v. 25 and analyzed according to the appropriate process for each research question.

## **Data Analysis Procedures**

### **Descriptive Statistics**

SPSS v. 25, descriptive statistical analysis was utilized in this study to provide a description of study participants in regards to the demographic variables: age, gender, and race/ethnicity.

### **Inferential Statistics**

While also utilizing SPSS v. 25, a one-way ANOVA was used to address research question one; logistic regression (and chi-squared pre-test) was used to address research question two; linear regression (and correlation pre-test), logistic regression (and independent samples *t*-test as a pretest), and a one-way ANOVA was used to address research question three; and logistic regression (and independent samples *t*-test as a pretest) along with a chi-squared test was used to address research question four. According to the American Psychological Association (APA) a one-way analysis of variance (ANOVA) is statistical method of causal comparative research that compares the differences in means between or among two or more categorical independent variables' effects on one continuous dependent variable. Alternatively to comparing differences among variables, regression interprets relationships. Linear regression is a form of regression that examines the linear relationship between a continuous dependent variable and a continuous or dichotomous independent variable. Unlike linear regression's utilization of a continuous dependent variable, logistic regression's dependent variable must be categorical; however, the independent variables can be categorical or continuous (APA, 2014).

**Research question one.** For question one (Is there a statistically significant difference among final course grades and course delivery method (online, blended, or face-to-face)?), a one-way ANOVA determined whether the independent variables (100% face-to-face courses, 100% online courses, and blended courses) predicted the continuous variable (course grades).

**Research question two.** For question two (Does course delivery method predict course completion in a) 100% face-to-face courses b) 100% online courses and c) blended courses?), logistic regression determined whether the predictor variables (100% face-to-face courses, 100% online courses, and blended courses) predicted the categorical variable (course completion, yes = completed and passed/failed the course or no = dropped the course). To ensure the variables were statistically significant, Pearson's chi-squared test was run on the variables before logistic regression.

**Research question three.** For question three (Do various ratios of face-to-face contact time in blended courses predict course grades?), linear regression determined whether the predictor variable, the ratio of face-to-face contact hours in blended courses, predicted the continuous variable, course grades. To ensure the variables do not share multicollinearity, a correlation was run on the variables before linear regression. A logistic regression was also determine whether the predictor variable, the ratio of face-to-face contact hours in blended courses, predicted the categorical variable, course grades (dichotomous). To ensure the variables were statistically significant, an independent samples *t*-test was run on the variables before the logistic regression. An ANOVA was also run to examine the effects of the independent ordinal variable, percentiles of face-to-face contact time within blended courses, on the continuous variable course grades.

**Research question four.** Finally for question four (Do various ratios of face-to-face contact time in blended courses predict final course completion rates?), logistic regression determined whether the predictor variable (the ratio of online contact hours in blended courses) predicted the categorical variable (course completion, yes = completed and passed/failed the course or no = dropped the course). To ensure the variables were statistically significant, an independent samples *t*-test was run on the variables before logistic regression. A chi-squared also was run to examine the effects of the independent ordinal variable, percentiles of face-to-face contact time within blended courses, on the categorical variable course completion.

### Variables

Independent and dependent variables were selected for the proposed study to better understand the relationship between the delivery method of a course (online, blended, and face-to-face) and demographics on course grades and course completion. Table 3.2 provides a list of the variables.

#### Independent Variables

**Delivery method.** The dataset contained 136,726 courses of which their delivery method varied. The types of delivery methods are listed as follows:

***One hundred percent face-to-face course.*** A course which was completely face-to-face and had no use of e-learning tools or any other online components is a 100% face-to-face course. This dichotomous variable will be coded as 1.00 in signifying 100% face-to-face.

***One hundred percent online course.*** A course which was completely online with no face-to-face components is a 100% online course. This variable will be coded as 1.00 in signifying 0% face-to-face and 100% online.

**Blended course.** A course which used e-learning tools or other online components while also having face-to-face contact time is a blended. This dichotomous variable will be coded as 1.00, with .00 being either of the other two delivery methods.

**Face-to-face contact within blended.** A course which used e-learning tools or other online components while also having face-to-face contact time is a blended. This variable is a continuous variable with a value between 0.01 and .99, signifying possessing both online and face-to-face components.

**Percentiles of face-to-face contact time within blended.** This variable is an ordinal variable with four levels which divided the face-to-face contact time within blended courses (a value between 0.01 and .99) into four percentiles: .01-25%, 26-50%, 51-75%, and 76-99.9%.

### **Dependent Variables**

Descriptions of the two dependent variables included in this study are described as follows:

**Course Grades.** Course grades were scored based on the course grading scale of Middle CC (A = 4.0; B+ = 3.33; B = 3.0; B- = 2.67; C+ = 2.33; C = 2.0; C- = 1.67; D+ = 1.33; D = 1; D- = 0.67; and F = 0.00) and utilized as a scale variable.

**Course Grades Dichotomous.** Courses were either coded as C- or above or D+ or below. This variable will be coded as 1 for a C- or above and 0 for a D+ or below.

**Course Completion.** Courses not completed, i.e. dropped or withdrawn were coded as a 0 while courses completed were coded as 1.

Table 3.2

*Summary of Independent and Dependent Variables*

Variable Type	Variable Name	Level of Measurement
Independent	Delivery Method	
	One Hundred Percent Face-to-Face Course	Nominal
	One Hundred Percent Online Course	Nominal
	Blended Course	Nominal
	Face-to-face Contact Time within Blended	Scale
Dependent	Percentiles of F2F Contact within Blended	Ordinal
	Course Grades	Scale
	Course Grades Dichotomous	Nominal
	Course Completion	Nominal

**Delimitations**

Delimitations include factors within the researcher's control. Several factors fall under this category. First, this study was delimited to only community college students who attended one Midwestern U.S. community college. Therefore, this study was limited to the demographics and generalizability of the participants at said college. Second, the researcher chose to use course grades and course completion rather than a comparing a multitude of grades or GPAs to measure academic success, including failed courses with withdrawn courses as a measurement for of retention. Finally, the data used in this study was secondary data that was collected without the researcher. Therefore, the researcher could not ultimately guarantee 100% accuracy of the data collected.

**Limitations**

One most notable limitation to this study was the sampling for this study which lacks generalizability. This study was limited to only community college students who attended one Midwestern U.S. community college. Therefore, this study cannot be generalizable to a greater

population for the sample used in this study (one community college in the Midwest U.S.) was not demographically representative of a greater population. Additionally, the Midwest U.S. is not very representative to the national population, and this college which was located in a mid-size urban area was in particular not representative of other geographical areas rural or urban. Secondly, the data collected was cross-sectional in nature. Since it is not longitudinal, results represent only one single point in time. Lastly, this study depends on quantitative results where statistical analysis provides generalizable results by creating differences or associations between variables. However, numbers and data do not provide the whole story. ANOVAs test variables using causal comparative research to statistically examine the differences in variation between multiple independent variables' effect on one dependent variable (APA, 2014). However, these causal comparisons are not absolute; other variables not measured may have influence the difference in variation between the independent and dependent variables. Additionally, logistic regression and linear regression tests variables using correlational research to predict relationships between variables. These associations do not provide absolute answers. Urdan (2017) claimed correlational research measures the variation in scores on one or more variables and how it corresponds with the variation in scores on another variable or variables. It does not measure the variation in the scores on one or more variables and how it causes or creates variation in the scores of another variable or variables (Urdan, 2017). Simply, there are no guaranteed cause and effects in regression testing only plausible predictive relationships.

### **Summary**

This chapter provided the proposed methodological approach for this study. Sections included review of research design, purpose and research questions, participants, data collection procedures, and data analysis procedures. Additionally, descriptions are provided for all

independent and dependent variables that are included in the research questions. Finally, delimitations and limitations are discussed.

## CHAPTER 4

### RESULTS

The purpose of this quantitative study was to determine the effects of different ratios of online versus face-to-face contact hours on students' course completion and course grades in blended courses at Middle CC. Additionally, this study determined if the method of instruction (online, face-to-face, or blended) course affected course completion and course grades at Middle CC. The hypothesis for this study was that face-to-face and blended courses would have higher course completion and course grades because of the interactive qualities and community support that could be lacking or absent in online learning. Additionally it was hypothesized that blended courses with a higher percentage of face-to-face contact time would have higher course grades and higher course completion.

This chapter provides the results of the data analysis and addresses the four previously identified research questions. This chapter is divided into eight sections. The first section describes the processes of data screening and the methods used to confirm assumptions of normality could be made. The second section reports the descriptive statistics of each demographic variable. The third section (Research Question One) reports the results of the one-way ANOVA used to answer research question one. The fourth section (Research Question Two) reports the results of the chi-squared and logistic regression used to answer research question two. The fifth section (Research Question Three) reports the results of tests run in order to answer research question three: correlation (used to address potential issues of multicollinearity), linear regression, independent samples t-test, logistic regression, and one-way ANOVA. The sixth section (Research Question Four) reports the results of the independent samples t-test, logic regression, and chi-squared analysis used to answer research question four. Effect Size is

explained in the seventh section; however, it is also discussed at the end of each summary in the final section. The eighth and final section provides a summary and answer to each of the four research questions.

### **Data Screening and Assumptions of Normality**

Prior to conducting the analyses related to descriptive or inferential statistics, the data were screened for missing values. Cases for which there were missing responses for any variable were deleted from the dataset. The results of the data screening of the dataset required that 5,577 out of the 136,726 cases were removed resulting in a final dataset of 131,149 cases. Analyses were conducted on the 131,149 cases to determine whether they met the assumptions of normality (see table 4.1).

Assumptions of normality need to be met in order to conduct inferential statistics such as one-way ANOVAs, regressions, and independent samples *t*-tests (Tabachnick & Fidell, 2012). Vogt and Johnson (2011) stated that data normality can be assumed when “the dependent variable values are assumed to be normally distributed at each level of the independent variable” (p. 257). Additionally, data normality can be assessed either graphically or statistically, and the two primary components to assess normality are skew, or how well the data is distributed symmetrically, and kurtosis, or how well the data is distributed in a bell shape in terms of flatness and height (Urdan, 2017). A perfect normal distribution of data has a skewness and kurtosis of zero (Cronk, 2016).

Skew and kurtosis were both analyzed for all independent and dependent variables that were dichotomous, ordinal, or scale. The skew and kurtosis for the analyzed ordinal and scale variables were less than  $|3|$ , and Cronk (2016) states that skew and kurtosis values of less than  $|3|$  are acceptable to meet assumptions of normality; therefore, the assumptions of normality

were met for all ordinal and scale variables in this study. The results of the analysis for data normality are reported below in Table 4.1

Table 4.1

*Assessment of Normality for Variables in the Model (n = 131,149)*

Variables	Skew	SE of Skew	Kurtosis	SE of Kurtosis
<b>Demographic</b>				
Year <sup>b</sup>	.088	.007	-1.504	.014
Age <sup>c</sup>	1.922	.007	3.678	.014
Gender <sup>a</sup>	.333	.007	-1.889	.014
<b>Independent Variables</b>				
100% Face-to-face Course <sup>a</sup>	.183	.007	-1.966	.014
100% Online Course <sup>a</sup>	.192	.007	-1.963	.014
Blended Course <sup>a</sup>	2.793	.007	5.799	.014
Face-to-face w/in Blended <sup>c</sup>	-.054	.007	-1.915	.014
Percentiles of F2F w/in Blended <sup>b</sup>	-.044	.007	-1.926	.014
<b>Dependent Variables</b>				
Course Grades <sup>c</sup>	-.570	.007	-1.157	.014
Course Grade Dichotomous <sup>a</sup>	-1.036	.007	-.927	.014
Course Completion <sup>a</sup>	-1.418	.007	.010	.014

Variable<sup>a</sup>: = Dichotomous

Variable<sup>b</sup>: = Ordinal

Variable<sup>c</sup>: = Scale

### Frequencies and Descriptive Statistics

After assessing normality, descriptive statistics were ran for each variable. Statistics include the minimum, maximum, mean, and standard deviation of each variable. Results for demographic variables in the study indicate that 36.0% of the courses were taken in 2015, 32.7% were taken in 2016, and 31.3% of the courses were taken in 2017. The average age of the students was 24.51

with 55.8% identifying as female and 44.2% identifying as male. The race/ ethnicity of the students were as follows: 77.9% Caucasian/ White and, 7.1% Hispanic, 8.9% African American/ Black, 4.8% Asian, and 1.3% Native American. Table 4.2 reports results for the descriptive analysis.

Table 4.2

*Descriptive Statistics for Demographic, Independent, and Dependent Variables (n = 131,149)*

Variables	Min	Max	Mean	SD
<b>Demographic</b>				
Year <sup>a</sup>	1	3	1.952	.819
Age	12	77	24.529	8.679
Gender (1 = male)	0	1	.418	.493
Race <sup>b</sup>	1	5	N/A	N/A
<b>Independent Variables</b>				
Delivery Method <sup>c</sup>	1	3	1.639	.646
100% Face-to-face Course (1 = yes)	0	1	.454	.498
100% Online Course (1 = yes)	0	1	.452	.498
Blended Course (1 = yes)	0	1	.094	.291
Face-to-face w/in Blended	.001	.999	.510	.479
Percentiles of F2F w/in Blended <sup>d</sup>	1	4	2.524	1.442
<b>Dependent Variables</b>				
Course Grades	0	4	2.423	1.503
Course Grade Dichotomous <sup>e</sup>	0	1	.730	.444
Course Completion (1 = Completed)	0	1	.890	.313

Scale<sup>a</sup>: 1 = 2015, 2 = 2016, 3 = 2017

Scale<sup>b</sup>: 1 = White, 2 = Native American, 3 = Hispanic, 4 = Black, 5 = Asian

Scale<sup>c</sup>: 1 = Face-to-face, 2 = Online, 3 = Blended

Scale<sup>d</sup>: 1 = .001 – 25%, 2 = 26-50%, 3 = 51-75%, 4 = 76-99.999%

Scale<sup>e</sup>: 1 = C- and Above, 2 = D+ and Below

## Research Question One

### ANOVA

A one-way ANOVA was conducted for research question one and research question three. One-way ANOVAs compare the means of two or more groups (delivery methods: online, blended, and face-to-face) on one dependent variable (course grades) to find if the group means are significantly different from one another (Urdu, 2016). There are three assumptions that a data set must meet in order to conduct a one-way ANOVA (Cronk, 2016). These assumptions include:

- 1) Independent groups in which participants only belong to one group.
- 2) The dependent variable must be measured on interval or ratio scales, and it must be normally distributed.
- 3) The variances of the dependent variable for each level of the independent variable are equal.

The first two assumptions were met for both research questions by the data screening and initial data analysis as described earlier in this chapter. However, assumption three was not met for both research questions one and three using Levene's test for equality of variances, which assumes equal variance when the test is not significant (Urdu, 2017); therefore, Games-Howell's test was used to make post hoc comparisons.

A one-way ANOVA was conducted to determine what extent is there a difference among the delivery methods and course grades. The independent variables (delivery method) included face-to-face, online, and blended courses. The dependent variable was course grades. The ANOVA was statistically significant,  $F(2, 131, 146) 6.852, p < .001$ .

Follow up tests were conducted to evaluate pairwise differences among the between groups. Levene's test for equal variances was statistically significant so equal variances cannot be assumed and post hoc comparisons were conducted using Games-Howell's test. There was a statistically significant difference in the means between face-to-face ( $M = 2.438$ ,  $SD = 1.481$ ) and online ( $M = 2.406$ ,  $SD = 1.527$ ) course grades, indicating grades were higher in face-to-face courses compared to online courses, effect size  $d = .014$  ( $p = .001$ ). There was no statistical significant difference between face-to-face and blended course grades, and no statistical significant difference between online and blended course grades.

## **Research Question Two**

### **Chi-Squared**

Chi-squared, a statistic used to compare the differences between observed scores and expected values in data (APA, 2014), was used to examine significance in the associations between the categorical dependent variable (completed or dropped) and the categorical independent variables (online, face-to-face, and blended) before running a logistical regression (Urdan, 2017). The chi-squared must be a statistically significant in order to run a categorical logistic regression. There are three assumptions that a dataset must meet in order to conduct a chi-squared test (Cronk, 2016). These assumptions include:

- 1) Simple random sampling was employed.
- 2) Both independent and dependent variables are categorical.
- 3) The expected value of the number of sample observations in each level of the variable is at least five.

The data in this study used the entire population for years 2015, 2016, and 2017 for Middle CC; therefore, the random sampling method was unnecessary. Additionally, both variables of

research question two are categorical. Assumption three was met for the expected values of the observations which were above five.

Therefore with the assumptions met, a two-way contingency table analysis was conducted to evaluate the extent to which there was a difference in course completion based on delivery method. The two variables were course completion with two levels (completed and dropped) and delivery method with three levels (face-to-face, online, and blended). Results indicate that there is significant difference in course completion based on delivery method, Pearson  $\chi^2(2, n = 131,149) = 68.209, p < .001$ , Cramer's  $V = .023$ . The percentage of courses dropped based on delivery method were 10.3% for face-to-face, 11.8% for online, and 10.6% for blended.

Since the overall chi-squared was significant, follow up pairwise comparisons were conducted to evaluate the difference among these proportions. There was a statistically significant difference between delivery methods of face-to-face and online and course completion, Pearson  $\chi^2(1, n = 131,148) = 65.452, p < .001$ , Phi = -.023. The probability that the course was not completed was 1.079 times (.505/.468) more likely when the delivery method was face-to-face with online. The probability that the course was completed was 1.075 times (.532/.495) more likely when the delivery method was online compared with face-to-face. There was also a statistically significant difference in the pairwise comparisons between delivery methods of online and blended and whether the course was completed, Pearson  $\chi^2(1, n = 71,565) = 14.514, p < .001$ , Phi = .014. The probability that the course was not completed was 1.019 times (.843/.827) more likely when the delivery method was online with blended. The probability that the course was completed was 1.102 times (.173/.157) more likely when the delivery method was blended compared with online.

## Logistic Regression

A logistic regression analysis was conducted to determine whether course delivery method (face-to-face, online, and blended) predicts course completion. Results of the analysis revealed that the combination of independent variables significantly predicted whether or not a course was completed,  $\chi^2 = 68.043$ ,  $df = 2$ ,  $N = 131,149$ ,  $p < .001$ . Table 4.3 provides the degrees of freedom ( $df$ ), Wald  $\chi^2$ , unstandardized regression coefficients ( $b$ ), and the standard error for the unstandardized regression coefficient ( $SE\ b$ ), and odd ratios, which suggest that the odds of completing a course are increasingly greater if students take face-to-face courses. The model correctly predicted 11.02% (14,455 out of 131,149) of those who had not completed the course and 88.98% (116,694 out of 131,149) of those who had completed the course.

The odds ratio for online is 1.156. Online students were 1.156 times more likely to drop a class compared to students taking face-to-face courses. The odds ratio for face-to-face is 1.139. Students taking face-to-face courses were 1.139 times more likely to complete their classes compared to online students.

Table 4.3

*Logistic Regression Predicting Course Completion Using Delivery Methods (Face-to-Face, Online, and Blended) (n = 131,149)*

	<i>df</i>	Wald $\chi^2$	<i>B</i>	<i>SE</i> $\beta$	Odds ratio
Constant	1	3266.096	1.983	.035	7.266*
Blended	1	.751	.028	.032	.952
Face-to-face	1	52.985	-.130	.018	.878*
Online	1	65.366	.019	.019	1.156*

Note: Nagelkerke  $R^2 = .001$ ; Cox & Snell  $R^2 = .001$

Note: \* $p < .001$

### Research Question Three

#### Correlation

Pearson correlation coefficients were used to determine to what extent there were relationships between variables and to assess for multicollinearity among the variables in the regression analysis. Correlations address the association between two variables by representing the strength of the linear relationship between them (Vogt & Johnson, 2011). The strength of the relationship between two variables is indicated by the correlation coefficient ( $r$ ), which ranges between -1 and 1. An  $r$  value of -1.00 or 1.00 indicates perfect predictability, and less and less predictability exists as  $r$  values get closer to zero (Tabachnick & Fidell, 2012). Multicollinear variables are two variables that are too highly correlated, .9 or higher, and are considered redundant (Tabachnick & Fidell, 2012). Correlation coefficients with an absolute value of .3 or less indicate a weak relationship, .3 to .7 moderate, and .7 or above strong (Cronk, 2016). There are two assumptions that a dataset must meet in order to conduct a correlation and a regression (Green & Salkind, 2010). These assumption are:

- 1) The variables are bi-variately normally distributed.
- 2) The cases represent a random sample from the population, and the scores on the variables for one case are independent of scores on these variables for other cases (p. 176).

Both assumptions were met for correlations and regressions by the data screening an initial data analysis described earlier in this chapter.

A Pearson correlation coefficient was computed between the variables Face-to-face Contact within Blended Courses and Grades resulting in one correlation coefficient. There was a negative correlation with what would be considered a low effect size according to Cronk (2016),

$r = -.018$   $p = .046$ . This weak correlation shows no multicollinearity while also indicating that as face-to-face contact time increases within blended courses, grades decreased.

### Linear Regression

A linear regression analysis was conducted to determine the extent to which face-to-face contact time within blended courses was a statistically significant predictor for course grades.

Table 4.4 provides information in which the variables were entered into the regression analysis, the unstandardized regression coefficients ( $b$ ), the standard error for the unstandardized regression coefficient ( $SE\ b$ ), standardized regression coefficients ( $\beta$ ), and the variance ( $R^2$ ).

Results for the linear regression analysis indicated that face-to-face contact time within blended courses was a significant predictor for course grades  $F(1, 12895) = 4.00$ ,  $p = .046$ , accounting for 0% ( $R^2 < .001$ ) of the variance in the course grades.

Table 4.4

*Regression Coefficients for Course Grades Predicted by Face-to-face Contact Time*  
( $n = 131,149$ )

	$\beta$	$SE\ \beta$	$\beta$
Constant	2.526	.060	
Face-to-face Contact within Blended	-.197	.099	-.018*

Note:  $R^2 < .001$ , \* $p = .046$

### Independent Samples *T*-test

Independent-sample  $t$ -tests were conducted in research questions three and four to check the statistical significance between a continuous independent variable and a dichotomous dependent variable before running logistic regression. The independent samples  $t$ -test must be

statistically significantly different in order to run a binomial logistic regression with one or more continuous independent variables (Urdan, 2017). However, in order to conduct an independent samples *t*-test there are four assumptions that a dataset must meet (Cronk, 2016). These assumptions include:

- 1) The two groups being compared must be independent of each other.
- 2) The scores should be normally distributed, but *t* tests are robust enough to handle violations of this assumption.
- 3) The two samples should have the same variance.
- 4) The dependent variable must be measured on a ratio or interval scale, and the independent variable should only have two discrete levels.

Assumptions one, two, and four were met by the data screening and initial data analysis as described earlier in this chapter. Assumption three was met using Levene's test for equality of variances, which assumes equal variance when the test is not significant (Urdan, 2017). Levene's test for equality of variances was significant in both of the independent samples *t*-tests so equal variances could not be assumed. Effect sizes were calculated using the unequal *N*'s formula for effect size calculation.

This independent-sample *t*-test was conducted to determine whether there was a statistically significant difference in face-to-face contact time in blended courses between course grades - dichotomous (C- and above or D+ and below) before running a logistic regression to determine the prediction of course grades - dichotomous by face-to-face contact time within blended courses. The independent-sample *t*-test was statistically significant,  $t(12,895) = -4.004$ .,  $p < .001$ ,  $d = .082$  indicating that the mean for face-to-face contact time in blended courses that were C- or above ( $M = .593$ ,  $SD = .132$ ) is statistically significantly greater than the mean for the

face-to-face contact time in blended course that were D+ and below ( $M = .582$ ,  $SD = .143$ ). The 99% confidence interval ranged from  $-.018$  to  $-.004$  with the value of zero not included in this range indicating that the difference was statistically significant.

### **Logistic Regression**

A logistic regression analysis was conducted to determine whether face-to-face contact time within a blended course predicts course grades - dichotomous (C- and above or D+ and below). Results of the analysis revealed that the independent variable significantly predicted Course Grades - Dichotomous (C- and above or D+ and below),  $\chi^2 = 13.248$ ,  $df = 1$ ,  $N = 12,897$ ,  $p < .001$ . Table 4.5 provides the degrees of freedom ( $df$ ), Wald  $\chi^2$ , unstandardized regression coefficients ( $b$ ), and the standard error for the unstandardized regression coefficient ( $SE b$ ), and odd ratios, which suggest that the odds of completing a course are increasingly greater if students take face-to-face courses. The model correctly predicted 27.2% (3513 out of 12,897) of those who had not completed the course and 72.8% (9384 out of 12,897) of those who had completed the course. Additionally, the probabilities of students completing a course by the percentage of face-to-face contact time are as follows: at 88% face-to-face contact a student has a 69.581% chance of receiving a C- or above, at 67% face-to-face contact a student has a 71.921% chance of receiving a C- or above, at 50% face-to-face contact a student has a 73.733% chance of receiving a C- or above, at 36% face-to-face contact a student has a 75.168% chance of receiving a C- or above, and at 16% face-to-face contact a student has a 77.124% chance of receiving a C- or above. The odds ratios are as follows: 88% contact time = 2.287 times more likely to receive a C- or above compared to a D+ or below, 67% contact time = 2.561 t times more likely to receive a C- or above compared to a D+ or below, 50% contact time = 2.807 times more likely to receive a C- or above compared to a D+ or below, 36% contact time = 3.027 times more likely to receive

a C- or above compared to a D+ or below, 16% contact time = 3.371 times more likely to receive a C- or above compared to a D+ or below.

Table 4.5

*Logistic Regression Predicting Course Grades - Dichotomous Using Face-to-face Contact Time in Blended Courses (n = 12,897)*

	<i>df</i>	Wald $X^2$	<i>B</i>	SE $\beta$	Odds ratio
Constant	1	206.316	1.302	.091	3.675*
Face-to-face Contact within Blended	1	13.114	-.539	.149	.583*

Note: Nagelkerke  $R^2 = .001$ ; Cox & Snell  $R^2 = .001$

Note: \* $p < .001$

## ANOVA

A one-way ANOVA (assumptions detailed in research question one) was conducted to determine whether there was a difference among four percentiles within the face-to-face contact time in blended courses and course grades. The independent variable (percentiles within the face-to-face contact time) included Percentile 1: 0.99-25%, Percentile 2: 26-50%, Percentile 3: 51-75%, and Percentile 4: 76-99.99%. The dependent variable was course grades. The ANOVA was statistically significant,  $F(3, 12,893) = 9.218, p < .001$ .

Follow up tests were conducted to evaluate pairwise differences among the means between groups. Levene's test for equal variances was statistically significant so equal variances cannot be assumed and post hoc comparisons were conducted using Games-Howell's test. There was a statistically significant difference in the means between Percentile 1: 0.99-25% ( $M = 2.742, SD = 1.220$ ) and Percentile 2: 26-50% ( $M = 2.372, SD = 1.534$ ) indicating grades were higher in Percentile 1 compared to Percentile 2, effect size  $d = .246 (p < .001)$ . There was also

statistically significant difference in the means between Percentile 1: 0.99-25% ( $M = 2.742$ ,  $SD = 1.220$ ) and Percentile 3: 51-75% ( $M = 2.398$ ,  $SD = 1.516$ ) indicating grades were higher in Percentile 1 compared to Percentile 3, effect size  $d = .229$  ( $p < .001$ ). There was also a statistically significant difference in the means between Percentile 2: 26-50% ( $M = 2.372$ ,  $SD = 1.534$ ) and, Percentile 4: 76-99.99% ( $M = 2.555$ ,  $SD = 1.456$ ) indicating grades were higher in Percentile 4 compared to Percentile 2, effect size  $d = .120$  ( $p = .015$ ). There was also a statistically significant difference in the means between Percentile 3: 51-75% ( $M = 2.398$ ,  $SD = 1.516$ ) and Percentile 4: 76-99.99% ( $M = 2.555$ ,  $SD = 1.456$ ) indicating grades were higher in Percentile 4 compared to Percentile 3, effect size  $d = .069$  ( $p = .035$ ). There was no statistically significant difference between Percentiles 1 and 4 and no statistical significant difference between Percentiles 2 and 3.

#### **Research Question Four**

##### **Independent Samples *T*-test**

To test the statistical significance between variables, an independent-sample *t*-test was run before running a binomial logistic regression with one or more continuous independent variables. As mentioned in research question three, all four assumptions were met by either data screening and initial data analysis described earlier in this chapter or by using Levene's test for equality of variances. However, Levene's test for equality of variances was significant in this independent samples *t*-test so equal variances could not assumed. Effect sizes were calculated using the unequal *N*'s formula for effect size calculation.

This independent-sample *t*-test was conducted to determine whether there was a statistically significant difference in face-to-face contact time in blended courses between courses completed and courses dropped before running a logistic regression to determine the prediction

of courses completed by face-to-face contact time within blended courses. The independent-sample  $t$ -test was statistically significant,  $t(12,895) = -7.724$ ,  $p < .001$ ,  $d = .218$  indicating that the mean for face-to-face contact time in blended courses that were completed ( $M = .5931$ ,  $SD = .132$ ) is statistically significantly greater than the mean for the face-to-face contact time in blended course that were dropped ( $M = .5638$ ,  $SD = .155$ ). The 99% confidence interval ranged from  $-.039$  to  $-.019$  with the value of zero not included in this range indicating that the difference was statistically significant.

### **Logistic Regression**

Since there was a statistically significant difference in face-to-face contact time in blended courses between course completed and course dropped, a logistic regression analysis was conducted to determine whether face-to-face contact time within a blended course predicts course completion. Results of the analysis revealed that the independent variable significantly predicted whether or not a course was completed,  $\chi^2 = 9.316$ ,  $df = 1$ ,  $N = 12,897$ ,  $p = .002$ . Table 4.6 provides the degrees of freedom ( $df$ ), Wald  $\chi^2$ , unstandardized regression coefficients ( $b$ ), and the standard error for the unstandardized regression coefficient ( $SE b$ ), and odd ratios, which suggest that the odds of completing a course are increasingly greater if students take face-to-face courses. The model correctly predicted 11.0% (1419 out of 12,897) of those who had not completed the course and 89.0% (11,478 out of 12,897) of those who had completed the course. Additionally, the probabilities of students completing a course by the percentage of face-to-face contact time are as follows: at 88% face-to-face contact a student has a 92.7% chance of completing the course, at 67% face-to-face contact a student has a 90.3% chance of completing the course, at 50% face-to-face contact a student has a 87.8% chance of completing the course, at

36% face-to-face contact a student has a 85.3% chance of completing the course, and at 16% face-to-face contact a student has a 81.1% chance of completing the course.

Table 4.6

*Logistic Regression Predicting Course Completion Using Face-to-face Contact Time in Blended Courses (n = 12,897)*

	<i>df</i>	Wald $X^2$	<i>B</i>	SE $\beta$	Odds ratio
Constant	1	340.914	2.535	.137	12.620**
Face-to-face Contact within Blended	1	9.142	-.676	.224	.509*

Note: Nagelkerke  $R^2 = .002$ ; Cox & Snell  $R^2 = .001$

Note: \* $p = .002$ ; \*\* $p < .001$

### Chi-Squared

To compare differences in data rather than merely the predictive testing of regressions, chi-squared was run to show the strength of the relationship between the percentiles of face-to-face contact time within blended and course completion. The three assumptions for chi-squared goodness-of-fit detailed in research question two were met. Therefore, a two-way contingency table analysis was conducted to evaluate the extent to which there was a difference in course completion based on percentiles of face-to-face contact time within blended courses. The two variables were course completion with two levels (completed and dropped) and percentiles of face-to-face contact time within blended courses with four levels (.01-25%, 26-50%, 51-75%, and 76-99.99%). Results indicate that there is significant difference in course completion based on delivery method, Pearson  $\chi^2(3, n = 12,897) = 91.688, p < .001$ , Cramer's  $V = .084$ . The percentage of courses dropped based on percentiles of the ratios of face-to-face time within

blended courses were 5.2% for Percentile 1 .01-25%, 35.4% for Percentile 2: 26-50%, 53.6% for Percentile 3: 51-76%, and 5.7% for Percentile 4: 76-99.9%.

Follow up pairwise comparisons were conducted to evaluate the difference among these proportions. There was a statistically significant difference between percentiles of face-to-face contact time within blended courses Percentile 1 (.01-25%) and Percentile 2 (51-75%) and whether students completed courses, Pearson  $\chi^2 (1, n = 3928) = 6.994, p = .008, \text{Phi} = .042$ . The probability that the course was not completed was 1.376 times (.128/.093) more likely when the percentile of face-to-face contact time within blended courses was .01-25% with 51-75%. The probability that the course was completed was 1.040 times (.907/.872) more likely when the percentile of face-to-face contact time within blended courses was 51-75% compared to .01-25%.

There was a statistically significant difference between percentiles of face-to-face contact time within blended courses Percentile 1 (.01-25%) and Percentile 3 (51-75%), Pearson  $\chi^2 (1, n = 8666) = 42.415, p < .001, \text{Phi} = .070$ . The probability that the course was not completed was 2.225 times (.089/.040) more likely when the percentile of face-to-face contact time within blended courses was .01-25% with 51-75%. The probability that the course was completed was 1.054 times (.960/.911) more likely when the percentile of face-to-face contact time within blended courses was 51-75% compared to .01-25%.

There was also a statistically significant difference between percentiles of face-to-face contact time within blended courses Percentile 1 (.01-25%) and Percentile 4 (76-99.9%), Pearson  $\chi^2 (1, n = 1073) = 11.079, p = .001, \text{Phi} = .102$ . The probability that the course was not completed was 1.407 times (.477/.339) more likely when the percentile of face-to-face contact time within blended courses was .01-25% with 76-99.9%. The probability that the course was

completed was 1.264 times (.661/.523) more likely when the percentile of face-to-face contact time within blended courses was 76-99.9% compared to .01-25%.

There was also statistically significant difference between percentiles of face-to-face contact time within blended courses Percentile 2 (26-50%) and Percentile 3 (51-75%), Pearson  $\chi^2$  (1,  $n = 11,824$ ) = 65.165,  $p < .001$ , Phi = .074. The probability that the course was not completed was 1.382 times (.398/.288) more likely when the percentile of face-to-face contact time within blended courses was 26-50% with 51-75%. The probability that the course was completed was 1.183 times (.712/.602) more likely when the percentile of face-to-face contact time within blended courses was 51-75% compared to 26-50%.

There was also a statistically significant difference between percentiles of face-to-face contact time within blended courses Percentile 3 (51-75%) and Percentile 4 (76-99.9%), Pearson  $\chi^2$  (1,  $n = 8969$ ) = 4.984,  $p = .026$ , Phi = -.024. The probability that the course was completed was 1.023 times (.925/.904) more likely when the percentile of face-to-face contact time within blended courses was 51-75 % with 76-99.9%. The probability that the course was not completed was 1.280 times (.096/.075) more likely when the percentile of face-to-face contact time within blended courses was 76-99.9% compared to 51-75 %.

### **Effect Size**

According to the American Psychological Association (2014), effect size measures the magnitude of a relationship between two variables. It is also the measure of how large an observed effect is without regard to the sample size (Urdan, 2017). In a one-way ANOVA and a  $t$ -test the effect size is provided by the interpretation of Cohen's  $D$  which is the number of standard deviation units between two means (APA, 2014). According to Cronk (2016) Cohen's  $D$  is low if it is .2, moderate at .5, and large at .8. (In regression analysis, the effect size is

calculated by squaring the correlation coefficient ( $R^2$ ) also known as the coefficient of multiple determination in regression.) Additionally, effect sizes are often interpreted as an indication of practical significance which indicates whether the results of a test have meaningful applications in real-world settings (APA, 2014). Statistical significance shows that the results are not attributed to chance or random factors, yet practical significance must be interpreted by the researcher to determine whether the difference (or relationship for regressions) among variables is substantial. The effect size for each test are discussed in the summaries following.

### **Summary and Answers to Research Questions**

Each of the four research questions are answered in this section, using results from the statistical analyses previously presented.

#### **Research Question One**

*Is there a statistically significant difference among final course grades and course delivery method (online, blended, or face-to-face)?*

**One-way ANOVA.** To compare the course grades of the three delivery methods (face-to-face, online, and blended) to one another, a one-way ANOVA was ran. This is accomplished by comparing the means of the delivery methods (online, blended, and face-to-face) to course grades in order to find if the delivery methods' means are statistically significantly different from one another. The results of the one-way ANOVA was statistically significant in comparing grades in online and face-to-face courses (blended courses were not significantly significant). This indicates that grades were higher in face-to-face classes compared to online courses.

**Answer.** To answer research question one, there was a significant difference between final course grades for online and face-to-face courses, but not for blended courses. The effect size (Cohen's  $D$ ), however, was very low ( $d = .014$ ) according to Cronk (2016). This shows that

even though grades were higher in face-to-face courses, the practical significance between the two means ( $d = .014$ ) was likely minimal.

### **Research Question Two**

*Does course delivery method predict course completion in a) 100% face-to-face courses b) 100% online courses and c) blended courses?*

**Chi-squared.** Chi-squared was used to examine statistical significance in the associations between the three delivery methods (online, face-to-face, and blended) and course completion before running a categorical binomial logistical regression. According to Urdan (2017) chi-squared test of independence computes and compares the categorical variables (online, face-to-face, blended, and course completion) known as observed frequencies with the frequencies that were expected by chance alone, known as expected frequencies. This comparison determines whether the observed frequencies are significantly different from the expected frequencies. Additionally, the chi-squared must be a statistical significant in order to run a categorical logistic regression (Urdan, 2017). The results for this test were statistically significant indicating that fewer students (10.3%) dropped courses in a face-to-face format compared to online (11.8%). Although the percentage of dropped courses for face-to-face (10.3%) was lower than blended (10.6%); the percentages were comparable. Additionally there were statistically significant differences in courses completed among delivery methods (listed below in Table 4.7) indicating these delivery methods (face-to-face and online) and (online and blended) were far from similar.

Table 4.7

*Chi-squared Pairwise Differences among Delivery Methods (n = 131,149)*

	Within	Compared To	Phi
	Odds	Odds	
Face-to-face & Online	1.079*	1.075*	-.023
Online & Blended	1.019*	1.102*	.014

Note: \*p < .001

**Logistic Regression.** After receiving statistically significant results from the chi-squared, a categorical binomial logistic regression was ran. Logistic regression was the best test for predicting course completion since this dependent variable is dichotomous; it also provided odds ratios. The results of the logistic regression analysis revealed that the combination of delivery methods (face-to-face, online, and blended) significantly predicted whether or not a course was completed. However, blended courses did not statistically predict whether a course was completed. The odds ratios showed online to be 1.156. Online students are 1.156 times (or 15.6%) more likely to drop a class compared to students taking face-to-face courses. The odds ratio for face-to-face is 1.139. Students taking face-to-face courses are 1.139 times (or 13.9%) more likely to complete their classes compared to online students.

**Answer.** To answer research question two, while blended courses did not statistically significant predict course completion, face-to-face and online courses did predict course completion. Additionally, students were more likely to drop an online class than a face-to-face course. In contrast, the coefficient of multiple determination for the logistic regression was very low (Nagelkerke  $R^2 = .001$  and Cox & Snell  $R^2 = .001$ ) indicating practical significance of the difference between online and face-to-face course completions could likely be negligible.

### Research Question Three

*Do various ratios of face-to-face contact time in blended courses predict course grades?*

Research question three investigates a unique aspect, the ratio of face-to-face delivery assigned to blended courses effects' on students' course grades, which is a study that appears to have never been conducted. Therefore the researcher choose to conduct multiple tests (correlation, linear regression, independent samples *t*-test, logistic regression, and a one-way ANOVA) in order to attain more data and compare the results among the different tests to gain further perspective and increase reliability.

**Correlation.** Pearson correlation coefficients were used to determine to what extent there were relationships between Face-to-face Contact within Blended Courses and Course Grades and to assess for multicollinearity among these variables in the regression analysis. The results showed there was no multicollinearity with a negative correlation with a low effect ( $p = .046$ ,  $r = -.018$ ). The negative correlation indicates that as face-to-face contact time increases within blended courses, course grades decreased.

**Linear regression.** According to APA (2014) linear regressions assume the independent variables are related to the dependent variable to such degree that an increase in the independent variables result in a consistent increase in the dependent variable. The direction and rate of change of the dependent variable is constant with the change of the independent variable (APA, 2014). Since face-to-face contact time within blended courses was hypothesized to predict grades, a linear regression was used to test whether face-to-face contact time within blended courses was a statistically significant predictor for course grades. The results indicated that face-to-face contact time within blended courses was a significant predictor for course grades ( $p = .046$ ). There was a low negative relationship ( $\beta$  was  $-.018$ ) indicating as face-to-face contact time

in blended courses increased course grades would decrease. Additionally, 0% of the variance in the course grades was accounted for in the linear regression ( $R^2 < .001$ ) providing potentially very low practical significance.

**Independent samples *t*-test.** An independent samples *t*-test was used to examine statistical significance in the associations between the face-to-face contact time within blended courses and course grades – dichotomous (C- and/or above or D+ and/or below) before running a logistical regression. The independent samples *t*-test must be statistically significant in order to run a continuous binomial logistic regression (Urdan, 2017). Independent samples *t*-tests compare means of two independent variables (course grades – dichotomous) on a given continuous dependent variable (grades).

The independent-sample *t*-test was statistically significant ( $p < .001$ ). The mean for face-to-face contact time within blended courses that were C- and/or above ( $M = .593$ ) was statistically significantly greater than the mean for the face-to-face contact time in blended course that were D+ and below ( $M = .582$ ). The 99% confidence interval also did not have the value of zero included in its range, indicating that the difference was statistically significant. The effect size, Cohen's *D*, was also low (.082).

**Logistic Regression.** After receiving statistically significant results from the independent samples *t*-test, a continuous binomial logistic regression was ran. Logistic regression was the best test for predicting course grades dichotomous since this dependent variable is categorical; it also provided predicted probabilities and odds ratios. The results of the logistic regression analysis revealed that face-to-face contact time within blended courses significantly predicted ( $p < .001$ ) whether or not a student received a C- and/or above or a D+ and/or below. The exponential beta value ( $\beta = -.539$ ) along with the odds ratio showed that as face-to-face contact

time within a blended courses increased the likelihood of students receiving a C- and/or above decreased. A student with 88% face-to-face contact has a 69.581% chance of receiving a C- or above (2.287 times more likely to receive a C- and/or above compared to a D- and/or below), and at 16% face-to-face contact a student has a 77.124% chance of receiving a C- and/or above (3.371 times more likely to receive a C- and/or above compared to a D- and/or below). Again, the coefficient of multiple determination for the logistic regression was very low (Nagelkerke  $R^2 = .001$ ; Cox & Snell  $R^2 = .001$ ) indicating practical significance could likely be negligible.

**One-way ANOVA.** In order isolate the many ratios of face-to-face contact time within blended courses ranging from .001 to .999, the researcher created four percentile groups (Percentile 1: 0.99-25%, Percentile 2: 26-50%, Percentile 3: 51-75%, and Percentile 4: 76-99.99%). This allows the researcher to run a one-way ANOVA comparing each percentile group with one another rather than relying on the results of regression analysis which only shows the direction, strength, and predictive nature of the relationship between the ratios and course grades. A one-way ANOVA was conducted to determine the difference among the four percentiles within the face-to-face contact time in blended courses and course grades. The ANOVA was statistically significant ( $p < .001$ ) indicating there is a significant difference between the four groups. Therefore, follow up tests were conducted to evaluate pairwise differences among the means between groups. Table 4.8 lists the statistically significant differences in the means between percentiles and Figure 4.1 provides a line chart of the percentiles and grades. There was no statistically significant difference between Percentiles 1 and 4 and no statistically significant difference between Percentiles 2 and 3. Each Cohen's  $D$  for the statistically significant pairwise comparisons were very low according to Cronk (2016) for Percentiles 2 and 4, and for

Percentiles 3 and 4 but only somewhat low for Percentiles 1 and 2, and Percentiles 1 and 3. This indicates that Percentile 1 had the greatest difference between groups.

Table 4.8

*One-way ANOVA Pairwise Differences among the Means between Percentile Groups Comparing Grades (n = 12,897)*

	Higher Grades			Lower Grades		Cohen's <i>D</i>
	Mean	<i>SD</i>		Mean	<i>SD</i>	
Percentile 1	2.742**	-.36	Percentile 2	2.372**	.19	.246
Percentile 1	2.742**	.09	Percentile 3	2.398**	.16	.229
Percentile 4	2.555*	.38	Percentile 2	2.372*	.12	.120
Percentile 4	2.555*	.07	Percentile 3	2.398*	-.04	.069

Note: \* $p < .05$ ; \*\* $p < .001$

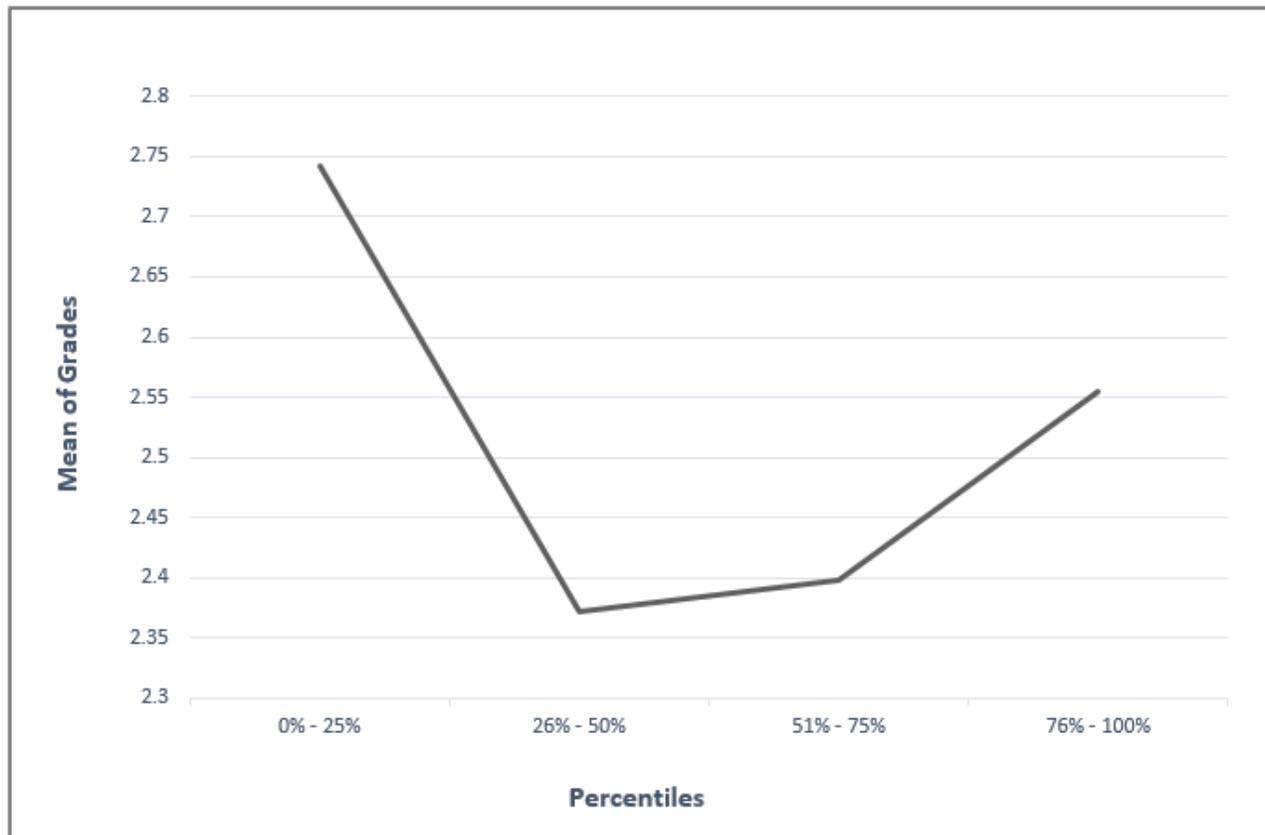


Figure 4.1 Line Chart of Percentiles and Course Grades.

**Answer.** To answer research question three, ratios of face-to-face contact time in blended courses does predict courses grades. There was a statistically significant inverse relationship between ratios of face-to-face contact time in blended courses and courses grades for both the linear regression and logistical regression. As the ratio of face-to-face time went up, course grades went down. The coefficients of multiple determination were quite low, however, indicating a low influence. The odds ratio from the logistic regression shows the difference in grades showing a nearly 8% difference in predicted probabilities of receiving a C- or above between 16% contact time and 88% contact time. This divide is made even clearer with the one-way ANOVA which shows that the grand majority of students receiving poor grades in Percentiles 2 and 3. Also, the one-way ANOVA's Cohen's *D* was only moderately low (.246) with Percentile 1 differing from Percentiles 2 and 3 also with moderately low effect sizes. This indicates students receive much higher grades when they have less than 25% face-to-face contact time within their blended courses.

#### **Research Question Four**

*Do various ratios of face-to-face contact time in blended courses predict final course completion rates?*

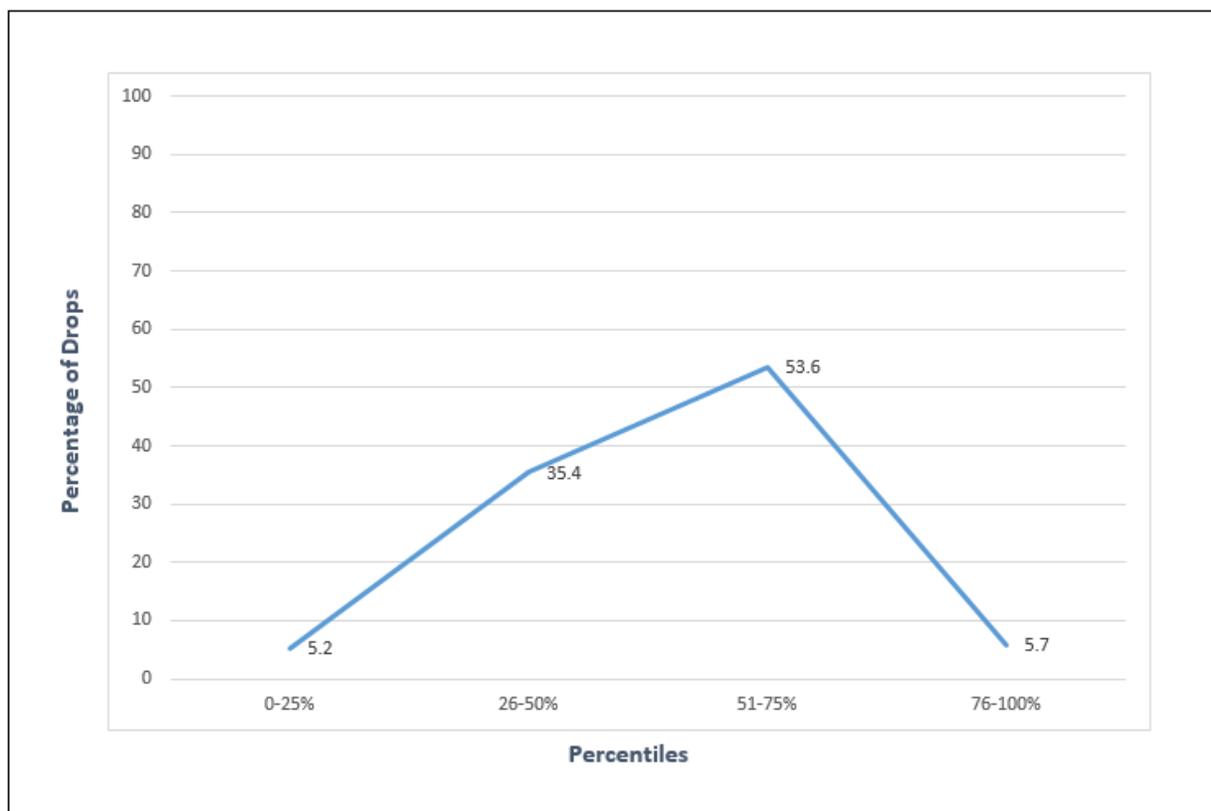
**Independent samples *t*-test.** An independent samples *t*-test was used to examine statistical significance in the associations between the face-to-face contact time within blended courses and course completion before running a logistical regression. The independent samples *t*-test must be a statistically significant in order to run a continuous binomial logistic regression (Urdu, 2017). As described earlier in this chapter, an independent samples *t*-tests compares the means of two independent variables (course grades – dichotomous) to a continuous dependent variable (face-to-face contact time within blended courses).

The independent-sample *t*-test was statistically significant ( $p < .001$ ). The mean for face-to-face contact time within blended courses that were completed ( $M = .588$ ) was statistically significantly greater than the mean for the face-to-face contact time in blended courses that were dropped ( $M = .603$ ). The 99% confidence interval also did not have the value of zero included in its range, indicating that the difference was statistically significant. The effect size, Cohen's *D* (.218) was moderately low.

**Logistic Regression.** After receiving statistically significant results from the independent samples *t*-test, a continuous binomial logistic regression was run. Logistic regression was the best test for predicting course completion since this dependent variable is dichotomous; it also provided predicted probabilities and odds ratios. The results of the logistic regression analysis revealed that face-to-face contact time within blended courses significantly predicted ( $p < .001$ ) whether or not a student completed or dropped a course. The regression's the  $\beta$  (-.822) along with the odds ratio showed that as face-to-face contact time within a blended courses increased the likelihood of students dropping a course decreased. A student with 88% face-to-face contact had a 86.5% chance of completing the course, and at 16% face-to-face contact a student had a 92.0% chance of completing the course. Again, the coefficient of multiple determination was very low (Nagelkerke  $R^2 = .002$ ; Cox & Snell  $R^2 = .001$ ) likely indicating low practical significance.

**Chi-squared.** To compare differences in data rather than merely the predictive testing of regressions, chi-squared was used to examine statistical significance in the associations between course completion and percentiles of face-to-face contact time within blended courses (.01-25%, 26-50%, 51-75%, and 76-99.99%). The observed data of these categorical variables were statistically significantly different from the expected data ( $p < .001$ ). The percentage of courses

dropped based on the four percentiles were 5.2% for Percentile 1, 35.4% for Percentile 2, 53.6% for Percentile 3, and 5.7% for Percentile 4 indicating that far fewer students dropped in both Percentiles 1 and 4. The majority of students dropped in the middle range between Percentiles 2 and 3 (26% - 75%) of face-to-face contact time within blended courses. Percentile 3 had over half of the drops (53.6%) indicating that students were most likely to drop a class when the face-to-face contact time was between 51-75% (see Figure 4.2 below). Additionally there were statistically significant differences in courses completed among the percentiles (listed below in Table 4.9) indicating these percentiles were far from similar.



*Figure 4.2* Line Chart of Percentiles and Course Drops.

Table 4.9

*Chi-squared Pairwise Differences among Proportions of Percentiles of Face-to-face Contact Time within Blended Courses (n = 12,897)*

	Within	Compared To	Phi
	Odds	Odds	
Percentile 1 & Percentile 2	1.376*	1.040*	.042
Percentile 1 & Percentile 3	2.225**	1.054**	.070
Percentile 1 & Percentile 4	1.407**	1.264**	.102
Percentile 2 & Percentile 3	1.382**	1.183**	.074
Percentile 3 & Percentile 4	1.023*	1.280*	-.024

Note: \*p < .05; \*\*p < .001

**Answer.** To answer research question four, ratios of face-to-face contact time in blended courses does predict course completion. There was a statistically significant relationship between ratios of face-to-face contact time in blended courses and courses course for both the logistical regression. As the ratio of face-to-face time went up, course completion also went down. However, the coefficient of multiple determination was quite low, indicating a low influence. The odds ratio from the logistic regression shows the difference in grades showing a 5.5% difference in predicted probabilities of courses completed between 16% contact time and 88% contact time. This divide is made even clearer with the chi-squared test which shows that the grand majority of students dropping courses in Percentiles 2 and 3 (89%). Percentiles 1 and 4 only held 5.2% and 5.7% of the course withdraws.

## **CHAPTER 5**

### **DISCUSSION, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS**

Chapter Five provides a discussion of the results presented in Chapter Four, guided by the current literature that supports or does not support the hypothesis of this study: the more time taken away from face-to-face instruction the less integrated Middle CC students would be at their campuses, which ultimately would negatively impact course completion and course grades. This chapter begins with a summary of the study, followed by a discussion of the results as they pertain to the study's hypothesis. Recommendations for policy, practice, and future research are then examined, followed by a conclusion.

#### **Summary of the Study**

Chapter One detailed an overview of the growth of online courses particularly in community colleges, the benefits of online learning, and the negative aspects of online learning, and the exacerbated negative outcomes community college students experience from online learning. Chapter One touched on the lack of campus community online and the benefits of blended learning. Information was provided on the statement of the problem, purpose of the study, the four research questions, and the significance of the study. Before concluding with a summary, definitions of key terms and acronyms used throughout the study were provided.

Chapter Two provided a review of the literature pertinent to this study in order to help determine whether there was a recommended learning platform when looking at course completion and course grades among the three delivery methods (online, blended, and face-to-face). Chapter Two included a review of the literature on the growth of online learning and community colleges' lead in online offerings; barriers community college students faced with regards to online learning; the benefits and drawbacks of online learning with special attention

given to literature that pertained to community and communication; reasons as to why students do not perform well in online courses; blended learning and its many benefits, and the comparison of the three delivery methods along with their effects on community college students.

Chapter Three explained the methodological approach for this study. Discussion of the research design and methodological approach were included, as well as the purpose and research questions. Information about the participants, data collection procedures, and data analysis procedures were also provided. Each of the independent and dependent variables was explained. Details were provided on how the data were analyzed to address each of the four research questions. Limitations and delimitations were detailed to conclude the chapter.

Chapter Four included the results of the analyses, while also providing a review of the methods for screening the data before statistical analysis and the establishment of the assumption of normality of the dataset. Frequencies and descriptive statistics were also provided, as well as results of the one-way ANOVAS, independent samples *t*-tests, chi-squared tests, logistic regressions, a correlation, and a linear regression. The chapter concluded with summaries of the four research questions posed in this study.

The following sections of Chapter Five discuss the results presented in Chapter Four as they relate to the dependent and independent variables. Recommendations for policy, practice, and future research are then examined followed by a conclusion.

### **Introduction of the Results**

Students' success and retention are important (Caruth, 2018; Shaffer, Eshbach, & Santiago-Blay, 2015; Slanger, Fisk, & Hanson, 2015; Trucker, 2014). As online education becomes a predominate fixture in higher learning, educational institutions need to take distance

learning seriously (Danie, 2010; Karaoglan-Yilmaz, 2017; Maddix, 2013). Institutions must not only provide more online offerings, but to also monitor their effective qualities of online learning (Karaoglan-Yilmaz, 2017). “Monitoring academic success and retention in online learning is crucial for students need to know the best method instruction” (Maddix, 2013, p. 175).

Community colleges particularly need to be concerned since community colleges are the leaders in online offerings (Allen & Seaman, 2015; CCRC, 2013) and many community college students are known to have added difficulties in online learning environments (Futch, 2016; Snart, 2017; Wladis et al., 2015; Xu, & Jaggars, 2013a; Xu & Jaggars, 2011b). One of the ways to determine whether online learning is benefiting or negativity impacting students is through examining course completion rates and course grades (Almeda et al., 2018; Hachey, Wladis & Conway, 2014; Liu, Gomez, & Yen, 2009).

### **Discussion of the Results**

The goal of this study was to explore whether online learning impacts course completion and course grades by first comparing the different delivery methods (online, face-to-face, and blended) to one another and second by comparing the course grades and course completion rates among the ratios of face-to-face time in blended courses. The hypothesis supported the notion that face-to-face and blended courses would have higher course grades and course completion because of the interactive qualities and community support that is lacking or absent in online learning. In that same vein, it was also hypothesized that courses with a higher percentage of face-to-face time in blended courses would have higher course completion and higher course grades. The following sections contain a discussion of the results of this study organized by independent variables that were statistically significant as well as how the results compare to previous research.

## **Delivery Method**

This study compared 131,149 courses by their delivery. The three delivery methods are face-to-face courses (courses which utilized no e-learning tools or any other online components), online courses (courses which was completely online with no face-to-face components), and blended courses (courses which used e-learning tools or other online components while also having face-to-face contact time). A one-way ANOVA compared the means of the three delivery methods in response to course grades, and a logistic regression was used to predict the completion rate for the three delivery methods.

**Influences on course grades.** The one-way ANOVA results indicated that final course grades were statistically significantly ( $p < .001$ ) higher for face-to-face courses compared to online courses; however, there was no statistical significance for blended courses. Although, there was an impressive level of statistical significance, the practical significance was, as measured by the effect size, questionable. The effect size for face-to-face courses and online courses was very low ( $d = .014$ ) indicating that though grades were higher in face-to-face courses the practical difference was marginal. Online course grades were not much different than that of face-to-face course grades. These effect sizes do not support this study's hypothesis (which is that face-to-face courses, which provide greater community and connections between students and their classmates and instructors, would foster higher course grades). The effect sizes also do not support the results of previous research that stated students in face-to-face courses achieved better grades and higher test scores than students in online courses (Carpenter et al., 2004; Davis, 2016; Driscoll et. al, 2012; Gasparic & Pecar, 2016; Gregory & Lampley, 2016; Jaggars & Xu, 2010; Xu & Jaggars, 2011a, 2011b; Zavarella & Ignash, 2009). The amount of research supporting higher academic success in face-to-to-face courses not only out-numbers the research

that supports academic success rates in online courses, many studies have also investigated the reasons behind the lower academic successes in online courses. Examples include lack of self-discipline (Johnson & Berge, 2012; Kenner & Weinerman, 2011; Kerr et al., 2006; Wojciechowski & Palmer, 2005), poor instruction (Brooks & Young, 2016; Burke, 2002; Stumpf et al., 2005), isolation online (Gillet- Swan, 2017; Jaggars, 2014; McInnerney & Roberts, 2004; Overbaugh & Nickel, 2010; Pigliapoco & Bogliolo, 2008), and other barriers (Aragon & Johnson, 2008; Bambara et. al, 2009; Capra, 2011; Futch, 2016; Gillet- Swan, 2017; Snart, 2017; Wladis et al., 2015; Wojciechowski & Palmer, 2005). Studies have also indicated that community college students in particular have not been as academically successful in online courses compared to face-to-face or blended courses (Futch, 2016; Snart, 2017; Wladis et al., 2015; Xu, & Jaggars, 2013a; Xu & Jaggars, 2011b).

More recent studies, however, support the current study's low effect size finding showing that there is little difference between face-to-face and online learning (Bacescu, 2014; Davis, 2016; Kendall, 2001, Lim et al., 2008; Mollenkopf et al., 2017). Specifically, Lim et al. (2008) found that students in online and blended courses had statistically significant higher levels of academic achievement than students in face-to-face classes. In 2014, Bacescu reported that online learning promotes more growth of creative thinking, problem solving skills, an increase in reaction time, self-assessment opportunities, immediate feedback, and working at a student's own learning pace compared to face-to-face courses. These behaviors used and skills development in online courses likely attribute to the reasons behind the results supporting no difference in the two delivery methods in other recent studies (Bacescu, 2014; Davis, 2016; Kendall, 2001, Lim et al., 2008).

Today's community college students have had more exposure to technology than in the past (Burgess, 2015). They have adapted to the style of learning that online courses provide, and they benefit from their e-learning tools (Bacescu, 2014; Burgess, 2015; Gonzalez-Gomez et al., 2016; Hibbard et al., 2016). Although, this study's impressive levels of statistical significance support higher course grades in face-to-face courses, the practical significance indicates that there is little difference in course grades between online and face-to-face courses. This may be attributed to the growth of technology, greater availability and access to the internet, the adaptation of teaching and learning virtually (Burgess, 2015), or the simple fact that younger generations have grown up with immense exposure of technological learning tools. Learning through online courses is likely second nature for students that have learned through using technology and the internet their entire life.

**Influences on course completion.** Logistic regression results indicated that final course completion data were statistically significantly higher for face-to-face courses compared to online courses; however, there was no statistically significant prediction for blended courses. The odds ratios showed online students to be 1.156 times more likely to drop a class compared to students taking face-to-face courses. Students taking face-to-face courses were 1.139 times more likely to complete their classes compared to online students. The chi-squared test that was run before the logistic regression was also statistically significant. It showed that 10.3% of students dropped courses in a face-to-face format compared to 11.8% taking online courses. Students taking blended courses dropped their courses at a very close percentage to face-to-face courses (10.6%). The pairwise differences also indicated that the delivery methods (face-to-face and online) and (online and blended) were far from similar.

The low  $p$ -value for the predicting of course completions between online and face-to-face course may be deceptively impressive. The effect size for face-to-face and online courses was very also very low (Nagelkerke  $R^2 = .001$  and Cox & Snell  $R^2 = .001$ ). The combination of these two numbers indicate that there is definitely a statistical difference between face-to-face and online courses regarding course completions, but the difference is quite small. These low effect sizes do not support this study's hypothesis (that face-to-face courses, which provide greater community and connections between students and their classmates and instructors, foster higher course completions). The low effect sizes also do not support the results of the literature, which concludes that students in face-to-face courses are more likely to complete their courses compared to students taking online courses (Allen & Seaman, 2015; Gregory & Lampley, 2016; Hachey et al., 2013; Harrell & Bower, 2011; Jaggars & Bailey, 2010; Mays, 2016; Xu & Jaggars, 2011a, 2013).

For example, Xu and Jaggars (2013) investigated students' academic outcomes in online and face-to-face formats using data over a five-year period from multiple community colleges in the state of Washington. They found that courses taught online as opposed to face-to-face had a significant negative impact on both course completion (Xu & Jaggars, 2013b). Huston and Minton (2016) investigated 176 sections of an Intermediate Algebra course in three separate semesters and compared online to face-to-face courses. They found that students taking face-to-face courses were statistically significantly more likely to complete their courses (Huston & Minton, 2016). In 2010, in their empirical meta-analysis, Jaggars and Bailey reported that although the learning outcomes were similar in blended, online, and face-to-face, the withdrawal rate was much higher in online courses (Jaggars & Bailey, 2010). Similarly, Ashby, et al. (2011) studied the pass rates of students taking online and face-to-face classes. They determined that

face-to-face classes had a much better pass rate until they adjusted their sample for attrition. They discovered that low course completions were the reason that pass rates were low and when removed, online courses had better pass rates. They concluded their study stating that students were more likely to fail in face-to-face courses but more likely to drop in online courses (24% vs 7%). Gregory and Lampley (2016) also found something similar in their study. They examined students' academic achievements by comparing the grades of students in multidiscipline face-to-face courses to the same courses online and found that although the grades were fairly similar, online students were more likely to withdraw from their courses (Gregory & Lampley, 2016).

Conversely however, Shea and Bidjerano's (2014, 2016) found that students taking a combination of online and face-to-face classes were more likely to graduate than students taking only face-to-face courses. In 2014, Shea and Bidjerano examined whether community college students enrolled in for-credit online courses were more likely to complete their degrees. They found that online students were more likely to complete a four-year degree than students taking traditional courses (Shea & Bidjerano, 2014). In 2016, Shea and Bidgerano conducted an additional study to examine three outcomes for online community college students: attainment of first associate degree, transfer, and dropout. They concluded that community college students who took online courses had a significantly higher six-year degree completion rate and no significant differences in dropout rates compared to community college students who did not participate in any online courses. The researchers attributed high completion rates in online classes to "higher levels of interaction, embedded support for meta-cognitive strategies, and asynchronous formats" (Shea & Bidjerano, 2016, p. 23). These results, which conflict with the majority of other studies, show an emerging complexity in findings regarding online education.

Although most research studies match the statistical significance results for face-to-face course completion compared to online course completion, this study's low effect size supports Shea and Bidjerano's (2014, 2016) findings. As online learning becomes a more predominate fixture in academia, student retention in online courses will be monitored at a higher rate and may increase over time (Hachey, et al., 2014). "If online learning which lacks a little of the traditional campus feel can provide a similar learning profile as face-to-face courses, then our future in the virtual world can be possibly more effective than ever before" (Karaoglan-Yilmaz, 2017, p. 864).

### **Face-to-Face Contact within Blended**

Blended coursework has been described as the best of both worlds (Carnevale, 2002; Crawford, Baker, & Seyam, 2014; Graham & Robison, 2007; Oblender, 2002; Snart, 2017; Ward, 2004; Young, 2002); however, it has not be examined specifically regarding the amount of online versus face-to-face time within the course itself. This study utilized data that recorded the exact percentage of face-to-face time within a blended course (.01% - 99.99%). The continuous variable of face-to-face contact within blended courses comprised of a value between 0.01 and .99, signifying course possessing both online and face-to-face components (0.00 being completely online and 1 being completely face-to-face). The face-to-face time within blended courses was compared to both course completion rates and course grades. This study examined students' completion rates and grades within 12,897 blended courses. A linear regression was used to predict course grades for the face-to-face contact time within the blended courses, and a logistic regression was used to predict the completion rate for the face-to-face contact time within the blended courses.

**Influences on course grades.** The linear regression results indicated that face-to-face contact time within blended courses was a significant predictor for students' course grades. There was a negative relationship; therefore as face-to-face contact within the blended courses increased, grades decreased. The effect size,  $R^2$ , accounted for 0% of the variance in the course grades, however. This indicates that face-to-face contact within blended courses' prediction of courses grades had high-variability and low precision. Face-to-face contact within blended courses still provides a prediction of courses grades; however, the data points fall further from the regression line. "Even when  $R$ -squared is low, low  $P$  values still indicate a real relationship between the significant predictors and the response variable" (Dahiru, 2008, p. 23).

The logistic regression (which measured whether face-to-face contact time within a blended course predicted course grades - dichotomous (C- and above or D+ and below) also showed a statistically significant prediction of face-to-face contact time within blended courses on course grades. Additionally, the probabilities of students completing a course by the percentage of face-to-face contact time are as follows: at 88% face-to-face contact a student has a 69.581% chance of receiving a C- or above and a 16% face-to-face contact a student has a 77.124% chance of receiving a C- or above. The odds ratios are 88% contact time = 2.287 times more likely to receive a C- or above compared to a D+ or below and 16% contact time = 3.371 times more likely to receive a C- or above compared to a D+ or below. This mirrors the linear regression's negative relationship showing that as face-to-face contact time within blended courses increased, course grades decreased. Like the effect size for the linear regression, the practical significance was also low for the logistic regression (*Nagelkerke*  $R^2 = .001$  and *Cox & Snell*  $R^2 = .001$ ). The low effect sizes for both regressions indicate that face-to-face contact within blended courses does predict course grades; however, the prediction is not strong. The

negative relationship also does not support this study's hypothesis: The more face-to-face contact time within blended courses the greater the likely hood of built community and connections between students and their classmates and instructors which ultimately fosters higher grades.

**Influences on course completion.** The logistic regression (which measured whether face-to-face contact time within a blended courses predicted course completion – dropped or completed) showed a statistically significant prediction of face-to-face contact time within a blended courses on whether or not a student completed or dropped a course. The regression's  $\beta$  (-.822) along with the odds ratio showed that as face-to-face contact time within blended courses increased the likelihood of students dropping a course decreased. A student with 88% face-to-face contact had 86.5% chance of completing the course, and at 16% face-to-face contact a student had 92.0% chance of completing the course. Again, the coefficient of multiple determination was very low (Nagelkerke  $R^2 = .002$ ; Cox & Snell  $R^2 = .001$ ) indicating that face-to-face contact within blended courses does predict course completion; however, the prediction is not strong. The negative relationship (as face-to-face time increases, the completion rate decreases) also rejects this study's hypothesis: The more face-to-face contact time within blended courses the greater the likely hood of built community and connections between students and their classmates and instructors which ultimately fosters lower course drops.

### **Percentiles of Face-to-Face Contact Time within Blended**

In order to compare the face-to-face contact times within blended courses to one another, a percentile variable was constructed. Each of the 12,897 blended courses were placed in one of these four percentiles (Percentile 1: 01-25% face-to-face time, Percentile 2:26-50% face-to-face time, Percentile 3: 51-75% face-to-face time, and Percentile 4: 76-99.9% face-to-face time). These percentiles were used in a one-way ANOVA in order to compare the means of each

percentile in response to course grades. The percentiles were also used in a chi-squared in response to course completion rates.

**Influences on course grades.** The one-way ANOVA results were statistically significant, and the follow up test which evaluated pairwise differences among the means between groups also showed statistically significant differences. These pairwise differences between means are provided in Table 4.8 on page 74 but also listed below (the first percentile listed had higher course grades):

Percentile 1 and Percentile 2 with a with a moderately low effect size ( $d = .246$ )

Percentile 1 and Percentile 3 with a with a moderately low effect size ( $d = .229$ )

Percentile 2 and Percentile 4 with a with a low effect size ( $d = .120$ )

Percentile 3 and Percentile 4 with a with a low effect size ( $d = .069$ )

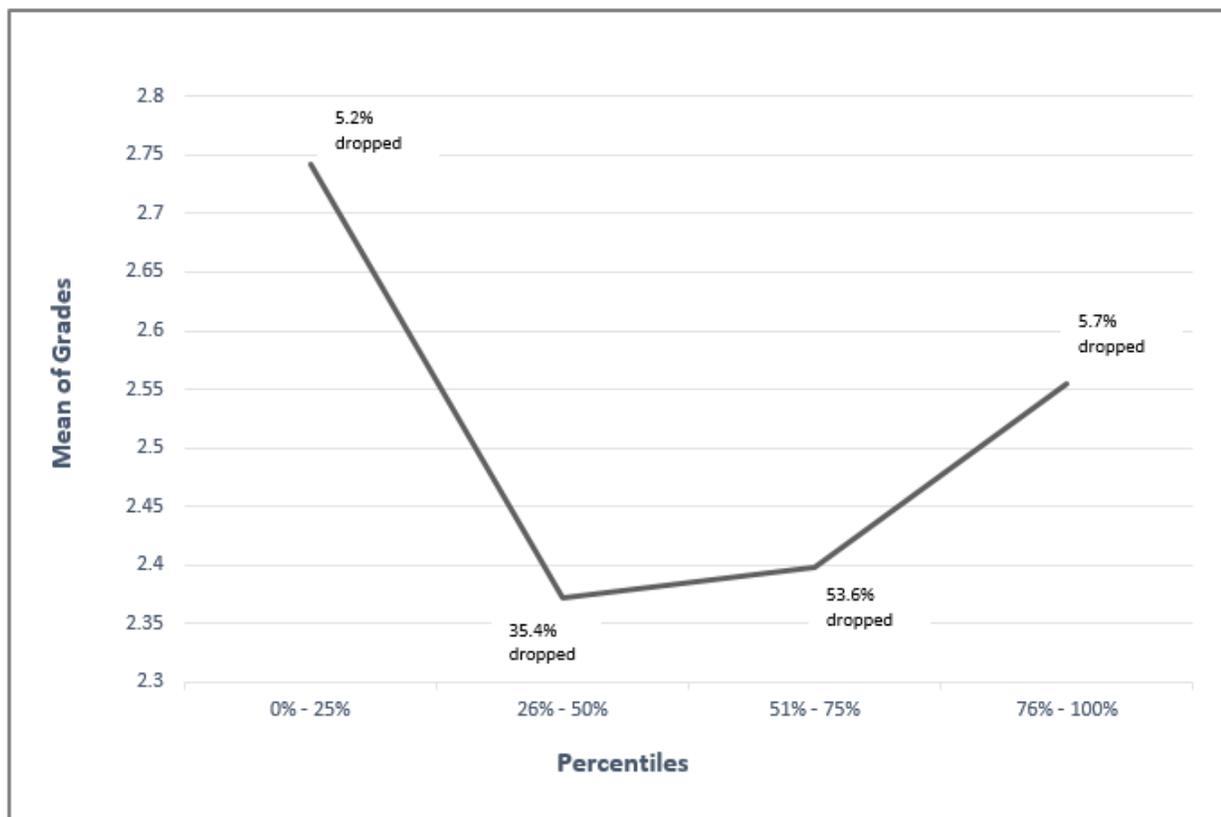
These results show that Percentile 1 and Percentile 4 had the highest course grades with the grand majority of students receiving poor grades in Percentiles 2 and 3 (see Figure 4.1 on page 74). Also, the one-way ANOVA's Cohen's  $D$  was only moderately low between Percentile 1 and 2 and Percentiles 1 and 3. This indicates students receive much higher grades when they had less than 25% face-to-face contact time within their blended courses. These results mirror the logistic regression which measured whether face-to-face contact time within a blended course predicted course grades - dichotomous (C- and above or D+ and below). The odds ratio from the logistic regression showed nearly an 8% difference in course grades in predicted probabilities of receiving a C- and above between 16% contact time and 88% contact time. Percentile 4's mean was also statistically significantly higher than Percentiles 2 and 3 showing that students received higher course grades when their courses were either less than 25% face-to-face contact time within their blended courses or more than 75%, see Figure 4.1 on page 74. As face-to-face time

increased, grades decreased. These results also reject this study's hypothesis: The more face-to-face contact time within blended courses the greater the likely hood of built community and connections between students and their classmates and instructors which ultimately fosters lower course drops.

**Influences on course completion.** The chi-squared test (which examined statistical significance of the associations between course completion and percentiles of face-to-face contact time within blended courses) showed statistically significant observed data for the four percentiles. The percentage of courses dropped based on the four percentiles were 5.2% for Percentile 1, 35.4% for Percentile 2, 53.6% for Percentile 3, and 5.7% for Percentile 4 indicating that far fewer students dropped in both Percentiles 1 and 4. The majority of students dropped in the middle range between Percentiles 2 and 3 (26% - 75%) of face-to-face contact time within blended courses. Percentile 3 had over half of the drops (53.6%) indicating that students were most likely to drop a class when the face-to-face contact time was between 51-75%. These chi-squared results provide more information than that of the logistic regression, which measured face-to-face contact time within a blended courses and course completion. The logistic regression showed that as face-to-face time increased drops increased. This matches the results of the Percentiles; however, interestingly the majority of the drops were in Percentile 3 (53.6%), and collectively Percentile 2 and 3 held 89% of the drops. The fewest percentage of drops (5.2%) was in Percentile 1 which would be expected, but surprisingly Percentile 4 had nearly as few with 5.7% of the drops which unexpectedly held the highest amount face-to-face time (76-100%). This shows that the grand majority of students dropped their blended courses when they had a medium amount of both face-to-face and online. Although the majority of the dropped courses were in the middle amount of online and face-to-face contact time, there were ultimately

more dropped courses when there was greater face-to-face time which like the results of the logistic regression, rejects this study's hypothesis: The more face-to-face contact time within blended courses the greater the likely hood of built community and connections between students and their classmates and instructors which ultimately fosters lower course drops.

**Course grades and course completion in blended courses.** Below is figure 5.1. This figure blends the results for course grades and course completions for the four Percentiles. The course drops are identified by percentages on the line graph of course grades. As noted Percentiles 1 and 4 had both the highest course grades and lowest course drops. Percentiles 2 and 3 had the most course drops and lowest course grades. This further indicates that community college students perform better when they have little face-to-face contact or a lot of face-to-face contact within blended courses. When taking blended courses that are closer to 50/50 (online and face-to-face) they receive lower course grades and higher course drops. These results imply that community college students perform better in mostly online or mostly face-to-face courses and that the true idea of half online and half face-to-face blended courses are the worse delivery option for students. In the comparison of the three delivery methods, blended courses did not have statistically significant different results compared to online and face-to-face courses indicating that blended courses' completions and grades were not significantly different than online and/or face-to-face courses. It would be interesting to determine whether blended courses would have been statistically significantly different if the end Percentiles (1: 0-25% and 2: 76-100%) were isolated from the middle Percentiles (3: 26-50% and 4: 51-75%). This would be an opportunity for future research to determine.



*Figure 5.1* Line Chart of Percentiles, Grades, and Drop Percentages.

### **The Hypothesis of the Study**

They hypothesis of this study was grounded in previous research supporting the notion that campus community and physical connections and interactions made between student and instructor or student and peers are necessary for students to preform to the fullest potential academically (Jaggars, 2014; Mays, 2016; McInnerney & Roberts, 2004; Overbaugh & Nickel, 2010; Pigliapoco & Bogliolo, 2008). Higher student retention can also be attributed to student interactions and connections (Bacescu, 2014; Mays, 2016). The literature also indicates that students prefer face-to-face interactions with faculty and peers, the deeper relationships they developed in and outside of the classroom, and a stronger sense of belonging when they took

classes face-to-face (McInnerney & Roberts, 2004, Moon-Heum, & Moonkyoung, 2017; Overbaugh & Nickel, 2010; Pigliapoco & Bogliolo, 2008).

The results of this study did support this study's hypothesis: face-to-face and blended courses would have higher course grades and course completion because of the interactive qualities and community support that is lacking or absent in online learning. However, the practical significance of this study indicates online course grades and course completion were nearly just as high as face-to-face course. Even if campus community and human connections attributed to higher course grades, the advancements in building virtual connections and e-learning tools in online courses have likely bridged a large gap with today's community college student. Arasaratnam-Smith and Northcote (2017) found that online classes offer a different type of community online. They argued that it is not practical nor logical to replicate face-to-face communication interactions online. Instead online should be assessed differently, identifying the unique communication advantages and viable alternatives to in class interactions (Arasaratnam-Smith & Northcote, 2017). Therefore, it is a possibility that either virtual communities are growing and constructing a rich and meaningful environment for students to learn and grow or students are adapting to a virtual learning environment from the vast exposure to technology (Maddix, 2013).

The researcher also believed that blended courses having a combination of online and face-to-face would have the highest course grades and courses completion rates, for blended classes have the community aspects of face-to-face classes and the e-learning tools of online courses. However, the results for blended courses were not significant. When blended courses were independently studied to determine the best ratio for face-to-face time in regards to course grades and course completion. It was also hypothesized that blended courses with a higher

percentage of face-to-face time would have higher course completion and higher course grades because those blended classes would have more opportunity to build community. Unlike the level of statistical significance that was identified higher grades and higher completion rates in face-to-face courses compared to online, the results of the blended courses indicated that as face-to-face time increased, course grades and course completions decreased. This rejects the alternative hypothesis: courses with a higher percentage of face-to-face time in blended courses would have higher course completion and higher course grades because of the added community that is built with more face-to-face connections. This study did not support the existing research that states community and face-to-face connections foster higher course grades and higher course completion.

In short, the hypothesis for the best ratio of face-to-face contact within blended courses predicted a straight line with a slope rising steadily with both higher grades and more completions of courses when the blended courses had more face-to-face contact time. This increasing line would have indicated that more face-to-face contact in blended courses was more favorable. Instead, results indicated a U-shaped relationship (See Figure 5.1) between face-to-face and online course contact, whereby high levels of either face-to-face or online (not evenly distributed blended courses) yielded higher course grades and higher course completion rates. This is a new and different way of conceiving of the ratio of percentage of face-to-face and online contact in community college courses and offers many opportunities for future investigations.

### **Recommendations for Policy and Practice**

The results of this study suggest a variety of relationships and differences exist among delivery method and ratio of face-to-face time in blended courses. This study is unique in that no

other study has investigated the ratio of face-to-face time in blended courses. These findings have important implications for community colleges and community college students by providing information that could potentially influence community college students' course grades and course completion rates. The following sections describe specific recommendations for community college students and community colleges.

### **Online Courses vs Face-to-Face Courses**

Results of the one-way ANOVA suggest that face-to-face classes seem to be the best courses for community college students to take at present. However, the low effect sizes indicate that online courses are very competitive with course grades and course completion. These effect sizes showed a minimal difference between face-to-face and online courses in regards to both course completion and course grades. Based on literature, community college students should avoid online courses and choose face-to-face or blended option instead (Carpenter, Brown, & Hickman, 2004; Jaggars & Xu, 2010; Xu & Jaggars, 2011a, 2011b; Zavarella & Ignash, 2009). This study's results did not support these previous research studies' recommendations and the hypothesis of this study, community and connections made between students and their classmates and instructors fosters better grades and less withdraws, course completion and course grades for online learning is not vastly different from that of face-to-face courses.

**Recommendations for community college students.** Online learning is a growing learning platform that has become very popular. According to the results of this study, previous research in support of face-to-face learning over online learning is likely outdated. The effect sizes of this study indicate that online courses are viable and beneficial for educating community college students. Community colleges students concerned about their course grades and course

completion rates should know that there is little difference between the two platforms, and they can be just as successful in online courses.

Effect size aside, however, at the most concrete level, the low  $p$  value for the comparison and prediction of online and face-to-face courses indicated that face-to-face courses had higher course grades as well as a higher completion rate. Although the gap between online and face-to-face learning is narrowing, according to Gillett-Swan (2017) not all students learn the same way; therefore, it would be best for community colleges to continue to offer face-to-face as well as online. “Teaching with technology is not a one size fits all approach” (Orlando & Attard, 2015, p. 119); therefore, the more community college students know their learning style and what resources are available to them, the more likely they will pick the best delivery method for themselves.

**Recommendations for Community colleges.** Although online courses may be more expensive and add technology fees (Hachey et al., 2013) and additional work for faculty (Brooks and Young, 2016), the effect sizes for this study show that online courses, which are rapidly gaining popularity, can provide a similar educational benefit compared to face-to-face courses in regards to course grades and course completion rates. Online is becoming a more competitive learning platform, and if it benefits students similarly to face-to-face courses, offering more online options might be wise. That stated, although the effect sizes for the ANOVA and linear regression were very low, the overall statistical significance results for both tests showed differences which indicated that face-to-face courses ultimately provided higher course grades and higher completion rates. Since not all students learn the same way (Gillett-Swan, 2017), it would also be recommended that community colleges still provide alternative learning platforms,

meaning that while it might be smart to add more online courses, it would be best if they also keep providing face-to-face courses.

### **Blended Courses**

Although the literature indicates blended learning is the best alternative for community college students (McGee & Reis, 2012; Moskal et al., 2013; Lloyd-Smith, 2010; Watson, 2008, Rovai et al, 2008) by combining “the effectiveness and socialization opportunities of the classroom with the technologically enhanced active learning possibilities of the online environment” (Moskal, Dziuban, & Hartman, 2013, p.17). This study did not have significant results to support this claim. This study did however help identify the optimal ratio of face-to-face contact time in blended courses which could be helpful to community college students and community colleges. It was determined that community college students performed better when their courses had either more face-to-face time or more online time. Community college students who took blended courses with a more balanced amount of face-to-face and online time had lower course grades and a higher course drop rate compared to the students whose blended courses had either more online contact time or more face-to-face time. This is an exciting new finding in the field of online education.

**Recommendations for community college students.** Community college students who plan on taking blended courses should consider blended courses that have either more face-to-face contact or more online contact, depending on their students’ own personal learning style. According to the results of this study, community college students who took blended courses that had more than 25% face-to-face contact and less than 75% contact were more likely to drop their course or have lower course grades. Community college students who took blended courses that either had less than 25% face-to-face contact time or more than 75% face-to-face time performed

significantly better with course completion and course grades. It is recommended that students avoid blended courses that have closer to a 50/50 ratio of online and face-to-face contact. If the students prefers online, they should take a blended courses that have less than 25% face-to-face contact. If the students prefers face-to-face, they should take a blended courses that have more than 75% face-to-face contact. This study did not investigate which type of community college student would benefit more from more face-to-face or more online, as it was an unexpected finding that blended courses would actually be the “worst of both worlds”. It is for future researcher to determine the driving forces behind these results.

**Recommendations for community colleges.** Community colleges should also consider offering more blended classes that either have less than 25% face-to-face contact time or more than 75% face-to-face time. This will help to ensure that their students are successful both with completing their courses and getting better course grades. It will likely also help with fewer satisfactory academic progress concerns, better graduation rates, and higher quality graduates. It could also help increase student satisfaction. Students who perform better in their courses likely will be happier with the class, their own progress, their faculty, and the campus as a whole. Additionally, it might be wise for community colleges to investigate the reasons that are attributed to greater drops and lower grades when the blended courses are equally split between online and face-to-face.

### **Recommendations for Future Research**

This study added to the current literature focused on the comparison of online, face-to-face and blended learning. This study is unique in that minimal previous research has examined whether there is a better ratio of face-to-face time in blended courses which promotes higher course grades and course completion. Recommendations for future research include:

1. **Conducting a longitudinal study using the same variables in this study.** This study utilized a cross-sectional design which measured data collected at one point in time (2015, 2016, and 2017). Conducting a more longitudinal study would allow for variables to be measured with a greater depth, and would allow for data analyses examining course completion and course grades through a longer period of time, not simply within the last three years. Future research using the same variables at multiple points in time is recommended.

2. **Conducting a similar study using the same variables at the university level.** This study concentrated solely on community college students. Previous research shows community college students to be not as prepared for online learning as students that attend universities. Future studies could widen the research by investigating course grades and course completions between online, face-to-face, blended, and the ratios of face-to-face contact within blended courses at four-year institutions.

3. Conducting a more longitudinal study would allow for variables to be measured with a greater depth, and would allow for data analyses examining course completion and course grades through a longer period of time, not simply within the last three years. Future research using the same variables at multiple points in time is recommended.

4. **Obtaining a diverse population.** The population for this sample consisted mostly of white community college students at Middle CC. Some concerns surrounding online learning state that computer-based learning is still expensive and may exclude students from certain demographic groups (Bacescu, 2014). Therefore, future research using the same variables and tests is recommended with a more diverse population specifically those who suffer from barriers such as are low social economics, non-traditional-age, minorities, inadequate support systems,

and limited technology experience (Bambara et. al, 2009; Capra, 2011; Futch, 2016; Gillet-Swan, 2017; Provasnik & Planty, 2008; Snart, 2017; Wladis et al., 2015).

5. **Investigating more variables.** This study focused on course completion and course grades. Future studies could benefit from utilizing other variables that also influence academic success such as GPAs or graduation rates. Also, future studies could widen the research by evaluating demographic variables such as age, gender, race, personality traits, social economics, and part-time versus full-time students.

6. **Researching blended courses more in depth.** This is the first study that compared blended courses to other blended courses for the sake of understanding what level of face-to-face time improves course completion and course grades. Many recent studies have concluded that blended courses are the way of the future and the best platform for students to learn; however, the results of this study do not support that recommendation at all. More research is need compare blended courses to face-to-face and online courses since the results of this study were vastly different from most of the literature. Additionally, future studies should examine blended classes that offer an equal ratio of online and face-to-face to determine the reasons behind their larger quantity of drops and lower grades.

7. **Researching the U-shaped nature of the relationship of face-to-face and online coursework.** This study hypothesized that face-to-face contact time would yield better results for students than online contact time, and that blended would be incrementally more or less effective depending on the percentage of face-to-face vs. online contact. Instead, this study found that blended is “the worst of both worlds” and that either high levels of face-to-face or high levels of online participation yield the best results. Future research should investigate reason behind this phenomenon.

## Conclusion

The world is changing with technology. Online is growing and having more success with students than ever before. This study shows that the gap between face-to-face and online learning in regards to course grades and course completion is narrowing. Online learning is becoming more competitive. Although face-to-face courses still result better course grades and course completion rates for community college students, the belief that community and connections make a huge impact on students might be incorrect. Either students are finding their college communities virtually in their online classes, or they are adapting to needing less community and face-to-face contact with their peers and instructors. It is not very surprising that as generations are changing with students growing up with a prevalent use of technology that these students are doing better in online learning environments. Millennials have been exposed to online technology since birth. They may have even had interactive technological toys as teaching tools at very young ages. This allows millennials and future generations to become proficient with learning from technology and the internet. It is however, surprising that the campus community piece in regards to having the “true college experience” did not seem to make a bigger impact on the course grades and course completions. This could be attributed to the fact that these were community college students, students who planned to take courses without needing the college campus experience. Regardless of reason, the results of the study lead to the recommendation that community colleges and community college students view online courses with as much integrity as they would with face-to-face. It would be interesting to also assess how four-year institutions would fare with the comparing online and face-to-face course completions and course grades, since previous research indicates that community college students do not perform as well in online courses compared to students at four-year colleges. If this is the case, the gap

between online and face-to-face for university students' grades and completions might be even narrower.

Blended courses and their influence on course grades and course completion rates have up until now not been studied. This study investigated the ratio of face-to-face contact within blended courses and its influence on course grades and course completion. The results showed that the best ratios are at the extreme ends of the spectrum: blended courses with very little face-to-face or very little online tended to provide the highest course grades and the lowest drops. Since the success of students in blended classes fell on either extreme (nearly all online or nearly all face-to-face) and online and face-to-face courses were pretty comparable in their results, it would appear as if students would perform better in either 100% online or 100% face-to-face courses. One possibility for this could be that there are only two types of students: students who do well in online course (and often prefer them) and students who do not. It is possible that Middle CC might not been clear on the type of course (blended or face-to-face) a student could take. If a student who does not perform well in online courses took a blended course and thought he or she was taking a traditional face-to-face course, he or she might receive a lower grade or may have ended up dropping the course. For instance, if a three credit class was two thirds face-to-face and one third online, it is possible that many students could have assumed that the class was simply less time than other sections (meeting two hours a week instead of three). Once these students realized that the courses had a required online portion, it may have been too late to withdraw from the course with a refund and not count as credits attempted. Also, if these students waited too long to participate in the online portions of the blended courses, this could have contributed to a poor grades and potential withdraws. This is simply speculative, however. More research would be need to explore the reasons as to why students do not do well in blended

courses that have face-to-face contact time between 26-75%. Until more research is conducted to explore the reasons behind the disparity between the different ratios or until blended courses are altered in a way that improves course grades and course completions, it is recommended that community college students think twice about taking blended courses that are closer to a 50/50 ratio of face-to-face to online contact time. It is also recommended that community colleges should offer fewer sections of blended courses that have a 50/50 ratio of online to face-to-face.

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