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A Comparative Study of Dual Enrollment Student Achievement in Various Learning Environments and Non-Dual Enrollment Student Achievement

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by

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ABSTRACT

A Comparative Study of Dual Enrollment Student Achievement in Various Learning Environments and Non-Dual Enrollment Student Achievement

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The purpose of this study was to examine whether variations in student achievement in college courses exist between high school students who took the courses as dual enrollment (DE) courses and academically comparable high school students (AIMS scholars) who took the courses upon matriculation to college. Additionally, the researcher explored whether differences exist in DE course grade for students by course environment (online, face-to-face at a high school, or face-to-face at a college.) The researcher used final course grades as determinants of student achievement. The study focused on DE student and AIMS scholar grades in English 111, Biology 101, Math 163, and History 101 courses that were taken between the 2009-2010 and 2013-2014 school years at a community college in Southwest Virginia. The population consisted of 429 AIMS scholars and 2,015 DE students. For this study 3,639 DE student grades and 706 AIMS student grades were used in calculations. The dependent variables in this study were final course grades; the independent variables were DE participation and course delivery environment. Welch's *t* tests were used to examine the variations in final grades for DE and non-DE students; ANOVA procedures were used to examine variations in final course grades for DE courses based on delivery environment.

The quantitative findings revealed that students who took English 111, Biology 101, Math 163, and History 101 as DE courses performed significantly better than academically comparable

peers who had not taken the courses as DE. Additionally, findings indicated that students who took English 111 as a DE course on a college campus performed significantly lower than students who took English 111 as a DE course either online or face-to-face at high school. Similarly, students who took Math 163 as a DE course on a college campus performed significantly lower than students who took the DE course online or face-to-face at a high school. History 101 students who took the course online performed better than students who took the same course face-to-face at a high school. There were no significant differences in student achievement in Biology 101 based on DE course environment.

DEDICATION

First and foremost, this study is dedicated to my wonderful parents who have supported me throughout the duration of my educational career. I am fortunate beyond belief to have a mother and father who encourage me to be the best version of myself. Not only have they always supported each of my educational endeavors, but they have also been close by whenever I needed respite from the glow of the laptop screen. I am so incredibly blessed to have parents who are also my best friends, and when I am with them, they make me laugh harder than anyone can (regardless of how much it seems I have on my plate.) I am eternally grateful for the wonderful educational stepping stones that they have given me in order to achieve all of my goals. Words will never be able to express the love and appreciation that I have for them.

I would also like to dedicate this study to my husband Jared. Never once has he questioned how, either in terms of finances or time, my initiation of this degree program would affect us. No matter how many times he has repeated words, “You’re awesome; you got this!” they have never lost their meaning. His continued ability to make me smile, to relax, and to see what in life is really important has enabled me to make the most of my studies. I never thought that I would find someone who complements me so, and I love him for letting me be myself and pursue each of my goals.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

The No Child Left Behind Act of 2001 furthered dialogue regarding a more rigorous high school curriculum supported through the implementation Common Core State Standards (CCSS) and other state mandated curricula (Conley, 2014). In 2003, under the framework of No Child Left Behind, summit leaders from the Department of Education met to examine programs that would better transition students from high school to college (Hofmann, 2012). This dialogue has continued throughout the past decade, and it has culminated in strong educational rhetoric by President Barack Obama as he called for a 50% increase in students who were taking dual enrollment (DE) or advanced placement courses by 2016 (Obama for America, 2008). President Obama later stated that "by 2020, America will once again have the highest proportion of college graduates in the world" ("Remarks of President," 2009).

While there has been recent state backlash over the Common Core State Standards, most noted criticism has stemmed from the use of varying measures of academic preparation within each state as well as issues of accountability (U.S. Department of Education, 2010). Despite the state-to-state differences, state legislatures that have rejected CCSS have also initiated the implementation of standards that align more fully with a college curriculum (Edmunds, 2012). A key component of creating this alignment is the implementation of more partnerships between high schools and colleges in the form of DE (Jones, 2014).

DE programs require collaboration between high schools and colleges. Through DE students are permitted to take college-level courses while still enrolled as high school students (Karp & Hughes, 2008). In an effort to bridge the gap between high school and college, a majority of states offer, support, and fund dual credit and DE programs (Blackboard Institute,

2010; Klopfenstein & Lively, 2012). During the 2010-11 school year 53% of collegiate institutions hosted students taking DE courses on their campus (Marken, Gray, & Lewis, 2013). This number has since increased, and the overall DE population currently includes over two million students nationwide (Schachter, 2014).

This large number of DE participants has yielded positive academic outcomes. The Community College Research Center (CCRC) reported that "dual enrollment participation is positively related to a range of college outcomes, including college enrollment and persistence, greater credit accumulation and higher college GPA" (Columbia University, 2012, p. 2). Similar findings are reported in multiple studies, noting not only that DE students are more prepared for college (in terms of college rigor and environment), but that they also have increased achievement upon transitioning into college (An, 2013b; Crouse & Allen, 2014; Karp, 2012). These positive effects were consistent in multiple demographics including first generation college students and students who were interested in career and technical programs, all of whom benefitted from DE (An, 2013b; 2013a). Additionally, researchers have concluded that DE courses result in positive collegiate outcomes such as higher course grades and increased likelihood of college graduation for DE students (Karp & Hughes, 2008; Venezia & Jaeger, 2013). Although all of the aforementioned researchers concluded that participation in DE leads to positive academic outcomes, they did not take into account variables that could significantly affect student success in DE course such as course environment and access.

Due to recent legislation more students have an opportunity to take DE courses; however, the extent to which DE is successful in preparing students for college can vary based on locale and access to a participating postsecondary institution (Edwards, Hughes, & Columbia University, 2011). This varying access has resulted in multiple methods of DE delivery that span

various classroom environments. The U.S. Department of Education (2007) confirms this existing variation by illustrating that such varying methods of course delivery are a nationwide norm. Because of this variation, researchers have raised questions about the effectiveness of varying methods of DE course delivery (Howley, Howley, Howley, & Duncan, 2013). These questions are reflected in state legislation regarding DE delivery. For instance, Florida's legislation indicates that the preferred location for DE delivery is within the high school, but it also states that high school students are allowed to take courses on a college campus (Kronholz, 2011). Kronholz found that "only Georgia and Wisconsin require that dual-enrollment courses be held on college campuses, and no state requires that college professors do the teaching" (para. 25). These conflicting state mandates only serve to further illustrate the conflict on the perceived best environment for DE delivery.

Statement of the Problem

DE courses are college-level courses offered to high school students leading to high school and college credit. The incentives for DE are twofold: (1) these courses are often offered for free or at a reduced rate, and (2) students acquire college credits while in high school thereby reducing time to college degree completion (Klopfenstein & Lively, 2012). These incentives for students translate to incentives for universities because DE students were more likely to enroll in postsecondary institutions (Allen & Dadgar, 2012; Lewis & Overman, 2008). Despite research regarding the benefits of DE programs in general, there are few existing studies that disaggregate DE student success according to DE course setting. Such disaggregation is imperative since students taking distance education DE courses did not feel as if they were as adequately prepared for college as their peers who had taken the course face-to-face (Judd, Woolstenhulme, Woolstenhulme, & Lafferty, 2009). Because the DE student population is comprised of students

who take DE courses online, face-to-face (F2F) at a high school, or F2F at a college, it is important to understand if there are variations in DE course success (as measured by final course grade) based on DE environment.

DE course environment can vary based on student access to the participating collegiate DE institution. This variation is especially true in rural areas or in schools with large populations of underrepresented students (Pretlow & Wathington, 2013). As reported in 2010, 74% of DE students took DE classes on a high school campus; the remainder of students either traveled to a participating postsecondary institution or took DE courses online (Blackboard Institute, p. 3).With multiple DE environments being presented as options (Marken et al., 2013), researchers should examine the effectiveness of each course delivery type in order to determine if different student outcomes exist within each course.

The purpose of this comparative study is to examine if variations in student achievement exist between dual enrollment (DE) English, biology, history, and mathematics course environments and between dual enrollment students' grades and the grades of academically comparable peers. For the purpose of this study academic achievement is defined as final grade in class. English, biology, mathematics, and history courses were chosen for this study because they are often offered as DE options and because they are included in many general education curricula. Because DE students tend to be higher academic performers who are planning for college enrollment while in high school (Crouse & Allen, 2014), it is important to control for selection bias by matching DE students to other high-achieving students such as AIMS scholars. A comparison group of Appalachian Inter-Mountain Scholars (AIMS) students was included as the AIMS program requires that students meet a distinct set of academic requirements including a minimum of a C average in core-area advanced courses ("AIMS Higher Scholarship," 2014).

Data for students who entered as AIMS scholars were included to control for the quality of high achievement in most DE students and to control for selection bias.

Research Questions

1. Is there a significant difference in English 111 final grade for students who took English 111 as a dual enrollment course and AIMS scholars who entered college with no English 111 dual enrollment credit?
2. Is there a significant difference in dual enrollment English 111 final grade for students who took dual enrollment English 111 online, face-to-face at a high school, or face-to-face at a college?
3. Is there a significant difference in Biology 101 final grade for students who took Biology 101 as a dual enrollment course and AIMS scholars who entered college with no Biology 101 dual enrollment credit?
4. Is there a significant difference in dual enrollment Biology 101 final grade for students who took dual enrollment Biology 101 online, face-to-face at a high school, or face-to-face at a college?
5. Is there a significant difference in Math 163 final grade for students who took Math 163 as a dual enrollment course and AIMS scholars who entered college with no Math 163 dual enrollment credit?
6. Is there a significant difference in dual enrollment Math 163 final grade for students who took dual enrollment Math 163 online, face-to-face at a high school, or face-to-face at a college?

7. Is there a significant difference in History 101 final grade for students who took History 101as a dual enrollment course and AIMS scholars who entered college with no History 101dual enrollment credit?
8. Is there a significant difference in dual enrollment History 101 final grade for students who took dual enrollment History 101 online, face-to-face at a high school, or face-to-face at a college?

Based on the research questions, the following null hypotheses were examined:

Ho1. There is no significant difference in English 111 final grade for students who took English 111 as a dual enrollment course and AIMS scholars who entered college with no English 111 dual enrollment credit.

Ho2. There is no significant difference in dual enrollment English 111 final grade for students who took dual enrollment English 111 online, face-to-face at a high school, or face-to-face at a college.

Ho3. There is no significant difference in Biology 101 final grade for students who took Biology 101 as a dual enrollment course and AIMS scholars who entered college with no Biology 101 dual enrollment credit.

Ho4. There is no significant difference in dual enrollment Biology 101 final grade for students who took dual enrollment Biology 101 online, face-to-face at a high school, or face-to-face at a college.

Ho5. There is no significant difference in Math 163 final grade for students who took Math 163 as a dual enrollment course and AIMS scholars who entered college with no Math 163 dual enrollment credit.

Ho6. There is no significant difference in dual enrollment Math 163 final grade for students who took dual enrollment Math 163 online, face-to-face at a high school, or face-to-face at a college.

Ho7. There is no significant difference in History 101 final grade for students who took History 101 as a dual enrollment course and AIMS scholars who entered college with no History 101 dual enrollment credit.

Ho8. There is no significant difference in dual enrollment History 101 final grade for students who took dual enrollment History 101 online, face-to-face at a high school, or face-to-face at a college.

Significance of the Study

Student levels of self-efficacy and abilities upon entry into the university vary greatly; however, DE practitioners and policymakers have a unique opportunity to provide students with experience in a collegiate environment (Ozmun, 2013). Ozmun suggested that "disaggregating students by delivery modality" would provide a richer analysis of DE programs (p. 70). Such disaggregation yielded significant results in D'Amico, Morgan, Robertson, and River (2013) found that the disaggregation yielded significant results in their study of DE students at a technical college; they found that the DE course setting at a technical college was a significant predictor of student success within the course. These statistically significant results in technical DE courses have not been replicated within general DE transfer courses.

The results of this study will provide valuable information regarding variations in student success in DE programs that were delivered in online and F2F environments on both high school and college campuses. Findings indicate DE students in a math course performed better on a high school campus F2F DE course than they did online (Vilardi & Rice, 2014); however, this study

did not include information on student achievement in a DE course that was delivered on a college campus. Additional research is needed to better understand DE student achievement in multiple environments. Furthermore, including additional content areas will aid in understanding whether some content areas yield higher rates of student success in specific environments. If variations exist in student achievement across course environments, results will indicate the environments in which students are more and less successful.

The results of this study could lead to refinement and revision of current DE programs at the community college level as well as policy revision at the K-12 level regarding DE course offerings. The data presented in this study may reveal the DE delivery methods that are most effective in terms of student achievement by highlighting existing patterns of DE student achievement by both course environment and content area. Lewis and Overman (2008) demonstrated that students enrolled in schools that use various DE course environments are continuing college education beyond DE experience, making the longitudinal effects of these DE course environments rich as a subject for research.

Limitations and Delimitations of the Study

A key limitation of this study is that the researcher did not control for individual instructor quality or teaching techniques. Additionally, a limitation of the study was instructor type. Because of the way that courses are coded within the college at which the study is being completed, it was difficult to accurately determine whether the instructor was an adjunct, full-time high school employee, or full-time college employee. This study of DE environment, however, was needed as it may initiate critical dialogue on different DE location in conjunction with course outcomes.

Another limitation of the study may be that grades were used as an indicator of student success within the course. Grading can vary based on student characteristics such as gender and rapport with the instructor (Rauschenberg, 2014); however, because grades and GPA are consistently linked with college or graduate school entry and are used to reward academic accolades, they were used as a predictor of student success within this study. Selection bias is also a limitation of the study as students who are enrolled in DE courses are typically those who are college-bound and are more likely to succeed academically (Crouse & Allen, 2014). To control for selection bias, the researcher has included a group of AIMS scholars who have academic abilities that are commensurate with most entering DE students.

The primary delimitation of this study was the scope. The researcher compared students' DE achievement at a single 2-year community college. Therefore, the findings are not applicable to other types of postsecondary institutions. Additionally, the findings of this study may not be generalizable to students who took DE courses in other content areas than those studied or in different environments (such as a hybrid course environment.) The study was delimited to achievement measures in English, biology, mathematics, and history DE courses. These courses were selected because they are general education requirements at most colleges and universities and because they are offered as DE courses by the participating institution in this study. The population of this study was limited to students who entered the college as full-time students between the 2009-2010 and 2013-2014 school years.

This study is delimited to course environment (F2F at a high school, F2F at a college, and online) and will not take into account instructor type (college or high school employee). However, it was still important to conduct this study because it demonstrates where variations

may lie in DE course delivery and also shows if DE students' grades are commensurate with their academic peers, the AIMS scholars.

Definitions of Terms

Biology 101—This course is titled "General Biology I." According to Virginia's Community College System (2015), this course "develops a basic understanding of plant and animal form, function, and relationships. Prepares students who have a deficiency in high school biology." This is an introductory, transfer-level course that is required of all students wishing to obtain a 2-year transferable diploma.

Concurrent Enrollment--College-level courses, for which high school students receive college credit are taught by a credentialed high school instructor within the high school environment ("About NACEP," n.d.).

Course Achievement—Course achievement is operationally defined as the quality point value of the student's letter grade at the end of a given semester in a particular course.

Dual Enrollment—High school students are permitted to take college courses while still enrolled in high school (Karp & Hughes, 2008). Unlike concurrent enrollment, dual enrollment is not specific of who is teaching the course or where it is taught.

English 111—This course is titled "College Composition I." According to Virginia's Community College System (2015), this course "introduces students to critical thinking and the fundamentals of academic writing." This is an introductory course that is required as a prerequisite for a number of courses on campus as well as all transfer programs.

Face-to-face Course—Students are taught by an instructor who is physically present in their classroom.

History 101—This course is titled "History of Western Civilization I." According to Virginia's Community College System (2015), this course "Examines the development of western civilization from ancient times to the present." This is an introductory, transfer-level course.

Math 163—This course is titled "Precalculus I." According to Virginia's Community College System (2015), this course, "Presents college algebra, matrices, and algebraic, exponential, and logarithmic functions." This course is an introductory, transfer-level course that is offered as a mathematics option to all students earning a transfer diploma.

Overview of the Study

This study was designed to determine if DE students perform better (via final course grade) than their comparable non-DE peers and to determine if a relationship exists between DE course environment and student achievement in the DE course. Chapter 1 overviews the rationale of the study. Chapter 2 includes a review of current literature in the field of dual enrollment as well as an overview of various course environments. Chapter 3 includes an explanation of research methodology that was used to address the research questions and analyze gathered data. Chapter 4 provides research results and analysis of data collected. Chapter 5 includes the summary of the study as well as implications and suggestions for future research.

CHAPTER 2

LITERATURE REVIEW

Introduction

State mandated curriculum is intended to ensure commensurate education throughout each state. Despite equivalent standards for students, there are differences in levels of rigor within schools (Kornhaber, Griffith, & Tyler, 2014; Porter, Polikoff, & Smithson, 2009). With To address these variations many states have implemented college readiness initiatives (Darling-Hammond, Wilhoit, & Pittenger, 2014). One innovative practice in K-12 education that aids college preparation is dual enrollment (DE). To increase availability of DE programs schools have expanded DE programs into the online environment as well as into high school classrooms and within close-knit academy communities (Lukes, 2014; Neumann, 2012). A review of the literature related to DE programs and various course environments yields varying perceptions of student experiences and achievement.

Dual Enrollment Program Overview

A series of meetings among educators in the 1880s led to the formulation of a plan to better unify high schools and colleges throughout the United States. Unfortunately, the planned meetings did little but critique the secondary curriculum, which was geared mainly toward the college-bound student (Fincher-Ford, 1997). Despite this increased focus on college readiness in the secondary curriculum, efforts made in the late 19th and early 20th century did not result in distinct partnerships between secondary and postsecondary institutions; instead, a key area of focus was extending public education in general to a wider demographic in terms of both gender and social class (Golden & Katz, 2000).

The launch of Sputnik I, however, changed the educational landscape as the government experienced increased pressure to strengthen the secondary school curriculum (Wissehr, Concannon, & Barrow, 2011). A result of this pressure was renewed discussion of partnerships between high schools and colleges that spanned beyond increased secondary school standards. It was not until 1972 at Syracuse University, however, that such a partnership was implemented. This partnership, "Project Advance," enabled trained high school teachers to teach courses for which students could receive concurrent high school and college credit ("Our History," n.d.).In the same year, City-As-School, a public school program, was offered to New York City high school students as a means to earn college credit while still in high school. Unlike Project Advance, however, City-As-School exclusively employed college professors to teach college-level material (Greenberg, 2008). Although the methods of DE delivery varied, DE partnerships continued to gain popularity throughout the 1970s (Fincher-Ford, 1997). In the 1980s, DE partnerships gained popularity, especially as *A Nation at Risk* included them as a cornerstone of reforming American education (Fincher-Ford, 1997). Although the number of DE programs across the nation grew through the latter decades of the 20th century (Andrews, 2001; Fincher-Ford, 1997), it was not until 1999 that the National Association of Concurrent Enrollment Partnerships (NACEP) was founded in order to increase partnerships between high schools and colleges through a consistent set of national goals and standards (Lowe, 2010). NACEP continues to monitor such partnerships, and one of its key promises is that DE students' experiences are academically commensurate regardless of DE delivery method or environment (Lowe, 2010).

Because of the popularity of DE programs in recent decades, states have begun to provide policies that govern such high school and college interactions. As of 2012, 46 states had policies

that governed DE, and 12 of those states had mandatory participation from postsecondary institutions (Hofmann, 2012). Although states have mandated participation, DE program delivery environment differs with instructor availability and region. Although NACEP and state departments of education require a certain level of consistency in DE instruction, factors such as course delivery environment are left to the participating high school and college partnerships. Some schools have faculty members who are credentialed to teach dual-enrollment courses within a high school setting, whereas other students take the course online or travel to a college campus to take a DE course (Blackboard Institute, 2010; Lowe, 2010; Puyear, Thor, & Mills, 2001).

Program Benefits for Students

There are many academic advantages of DE that increase the likelihood of matriculation after high school. Fincher-Ford (1997) demonstrated that early objectives of these programs included transitioning seamlessly from high school to college, earning college credits before entering higher education, and "shorten[ing] the time required for high school students to complete an undergraduate degree" (p. xiii). A review of the literature regarding DE program benefits for students has demonstrated that Fincher-Ford's previously defined benefits still act as the cornerstones for many successful DE programs.

College Readiness

Accelerated learning programs such as DE were intended to provide the opportunity for students to be introduced to academic rigor so that they have an increased chance of continuing college beyond the first semester. Karp (2012) demonstrated that almost "25 percent of students who enroll in a first-level college-credit English or math course do not pass" (21). This startling statistic is not without proposed solutions; one of these proposed solutions has been DE. Ganzert

(2014) reported that a lack of college readiness accounts for many college students' initial academic failings. He found that DE courses promote college readiness in multiple content areas including both technical education and transfer-level courses. Martin (2013) also linked DE participation with increased college readiness. Martin's definitions of "college readiness" were defined as both career-planning skills and as college GPA. His findings demonstrated that students who had taken DE courses were more likely to have advanced career-planning skills and that they were more likely to earn grades higher than a C than their non-DE counterparts. As Martin illustrated, college readiness through DE courses is not only defined by the academic rigor of the course itself,but also on the amount of support that students have in order to more successfully bridge the gap between high school and college.

Many researchers have demonstrated that DE courses are transitional and aid in college readiness. Karp (2012), Jones (2014), Ganzert (2014), and Farrell and Siefert (2007) found that because students remain enrolled as high school students, they remained "in the protective cloak of high school" (p. 74).This sense of comfort allowed students to work within the college curriculum as they were being guided to success through the increased presence of an instructor, continued parent-teacher interaction, and lack of other usual college temptations. Karp (2012) also found that DE courses enable students to work at a college level while still having necessary emotional scaffolding and academic preparation. She demonstrated that through DE, students engaged in "anticipatory socialization," allowing them to learn about the structure of college coursework before entering college after high school completion. In a qualitative study Karp focused not on the longitudinal academic effects of DE as many other studies do but instead on the aspects of a DE classroom that make them conducive to college success. She demonstrated that it was only when students were in DE courses that closely aligned with college expectations

that they gleaned increased college readiness. Karp also found that DE programs acted as an introduction to collegiate academics, and high school students can began "to feel comfortable in a college environment" (Karp, 2012, p. 23). Arnold, Lu, and Armstrong (2012) similarly defined college readiness not only as academic rigor, but as the "biological, cognitive, emotional and behavioral characteristics [that] shape individuals' interactions with their surrounding environments" (p. 19). They found that while many of the environmental factors that contributed to college readiness stem from home life and parental influence, others (such as the availability of student support services and program scaffolding) come from a student's school. They also reported that a student's knowledge of how to navigate college norms such as enrollment and financial aid are often predictors of collegiate success. For this reason they argue that it is imperative that educational environments "are rich with resources and structures that promote college readiness" (Arnold et al., 2012, p. 29). Karp demonstrated that this supportive environment is evident through DE programs (2012). Swanson (2010) concluded that the sense of comfort that was evident through a supportive environment increased the likelihood that students would complete a collegiate program. Edmunds (2012) similarly demonstrated that not only was this introduction to advanced curriculum important, but DE programs also provided needed interactions with college rules and standards.

Students' perceptions of their own success in DE programs has also been widely studied and reported. Ozmun (2013) confirmed that a student's "self-efficacy" (accountability and confidence in one's actions) increased over the course of a semester in a face-to-face dual credit course. The same students questioned in Ozmun's quantitative study stated that they had little self-efficacy before the course, demonstrating a changed mindset from throughout the term of DE studies. This increase in self-efficacy could have a long-term impact on DE students as Karp

(2012) found that “less than 50% of new college students earn an associate’s degree within three years or a bachelor’s degree within six” (p. 21). As Ozmun demonstrated, increased student confidence in their own ability to complete tasks may result in improved student outcomes upon matriculation. Ozmun also noted, though, that further research should be completed to determine whether course delivery has an impact on students’ perceived levels of accountability before and after dual credit courses; this accountability could have a distinct impact on matriculation and whether or not they successfully complete postsecondary endeavors. Karp and Hughes (2008) further demonstrated the longitudinal effects of DE courses, concluding that students who had taken these courses had significant positive outcomes including increased likelihood of graduation and ability to cope with the rigor of college. Henriksen, Stichter, Stone, and Wagoner (2008) also confirmed that preparation for college via DE provides a stable framework for all students by easing them into a new academic environment.

Shortened Time to Degree Completion

Financial and academic advantages are not only present within the DE classes, but such advantages are also evident upon matriculation into a college or university. Students who have taken DE courses can significantly reduce the amount of time that it takes to earn a 4-year degree (Allen & Dadgar, 2013). This reduced time to degree completion is especially important given that Complete College America (2013) recently called for a redefinition of the full-time course load; a reduction in the full-time course load could mean a longer time to degree completion. This assertion was based on their findings that70% of full-time college students were not able to complete a bachelor’s degree within 4 years (Mangan, 2013). Because many DE programs are funded in large part by either the school division or the participating college through grants or

government funding, the fact that DE courses can expedite a student's time to degree completion could have major financial benefits for that student (Adams, 2014).

Increased Likelihood of Attending College

Another advantage of DE programs is that students who have taken these courses are more likely to continue their education beyond high school. According to the Community College Research Center (CCRC) students who were enrolled in DE courses were more likely to enroll in college, pursue a bachelor's degree, and persist into the second year of college (Columbia University, 2012). Whissemore (2012) reported that "students who took dual enrollment classes were 12 percent more likely to attend college and 7 percent more likely to earn a bachelor's degree" (p. 9). Several others (An, 2013a; Karp & Hughes, 2008; Lichtenberger, Witt, Blankenberger, & Franklin, 2014) also found that first generation college students were more likely to enroll in college if they had taken DE courses than if they had not.

Researchers have found that upon matriculation to a college or university, students who have taken DE courses perform better academically than students who had no previous DE experience. For example, Jones (2014) found that participation in DE had a positive effect on student GPA upon matriculating to a college or university. Studies that demonstrate specific quantifiable differences in DE versus non-DE student GPAs upon matriculation to a college or university only demonstrate small GPA variations. Allen and Dadger (2013) reported that DE was an evident predecessor for academic success in college; however, they also demonstrated that factors such as self-efficacy and existing levels of motivation were also predictors of collegiate success.

Not only are students who have taken DE courses more likely to have higher GPAs, but they are also more likely to persist within their collegiate studies. Ozmun (2013) found that

because DE students are more familiar with college norms, students who take DE courses "might persist beyond their first semester or first year of college" (p. 62) while their peers may leave college after a short period of time. Jones (2014) also found that students who matriculated to a university were more likely to persist beyond the first year of college.

Financial Benefits

Andrews (2001) reported over a decade ago that a key advantage of DE was that high school students could take more challenging college-level courses at a reduced price; he noted that most families would not be able to absorb the full tuition cost of a college class. Andrew's discussion of the families' ability to pay full college tuition is one that is still pertinent. Currently, most postsecondary institutions absorb most of the cost of a DE course (Adams, 2014). These financial benefits have also been reported in the media, with Porter (2012) demonstrating that an advantage of DE studies was that the courses were often offered at no cost (or a small cost) to the student.

Dual Enrollment Demographic

As DE programs are changing to include a broader range of students, policymakers have begun to see that these programs can motivate students both academically and emotionally by teaching students that they are capable of college level coursework (Edwards et al., 2011). In an interview with *Education Week*, Secretary of Education Arne Duncan stated that DE programs are not only for high achieving students anymore; instead, these programs can be used to engage students who may otherwise be tempted to drop out of high school (Adams, 2014). This assertion is in accordance with Karp and Hughes's (2008) declaration that DE programs are well suited for students "who have not performed well in traditional academic environments" (p. 14). As an effect of DE programs' wider availability students, Howley et al. (2013) reported that the

increased overall availability of DE programs to a wider student population has resulted in increased matriculation into a college or university from DE students, a fact that has made DE programs a rich area for research.

On the state level policymakers are also beginning to see that DE opportunities should be extended to a broader range of students. The California Linked Learning District Initiative and mandates in Texas that require each student to have the opportunity to earn 12 hours of college credit are both evidence of the wider array of students who are entering college with DE credit (Edwards et al., 2011). Although DE programs were primarily offered to high school seniors, many underclassmen partake in course offerings as well (Marken et al., 2013). Early and Middle College partnerships particularly cater to underclassmen, as many of the students are able to complete an associate's degree while simultaneously enrolled as high school students (Edmunds, 2012).

The last decade has also introduced new procedures in terms of dual enrollment student eligibility based on GPA and academic performance. Andrews (2001) had previously demonstrated that in some states offering these programs, there are barriers in regards to student eligibility. Student GPA and successful completion of an entrance examination were two oft-used methods of monitoring admission to certain college level courses; just as students would be screened for college admission, they were examined for enrollment. Andrews's assertion is still true as postsecondary institutions still have a minimum GPA requirement for entry into DE programs (Pretlow & Wathington, 2014). However, some colleges have opted to eliminate eligibility requirements that were once imposed upon DE participation (Columbia University, 2012). Doing so has extended DE opportunities beyond those at the top of their class. Leonard (2013) referenced the "forgotten middle" (p. 186); these students were defined in the study as

those who are rarely in trouble at school, do not have excessive absences, maintain average grades, may persist to college as a first-generation college student, and who are more likely to drop out once they begin collegiate studies. In eliminating or reducing eligibility requirements for DE, colleges and high schools extend their partnerships into the career and technical fields and to those students who fall into the forgotten middle. DE is also being used as an early intervention system for students who need remediation in order to begin college-level coursework (Edwards et al., 2011). Because DE programs are being redefined and restructured to include a broader demographic, it will become more difficult to conclusively assume that students who are enrolled in DE students are high-achieving students who are likely to succeed and matriculate regardless of course delivery type or even course effectiveness.

Dual Enrollment Access

Although DE programs are now being offered to more students, the availability of such programs varies between rural and urban areas (Pretlow & Wathington, 2013). As demonstrated by the array of research regarding the academic benefits of DE, DE courses are an attractive option, especially to those students who plan to transfer credits to another college or 4-year university. Not all locales, though, are equal in terms of access to such classes. In fact, Pretlow and Wathington (2013) concluded that "dual enrollment offerings are disproportionally associated with certain high school characteristics" (p. 196). They also found that students of a lower socioeconomic status mainly attended schools with students of the same demographic; these schools were less likely to have technological resources or teachers who were qualified to deliver higher level courses. For this reason, even though DE courses were made available at most high schools, the delivery methods varied from school to school. They argue that, in light

of disproportionate DE offerings, “the postsecondary outcomes associated with participation” should be examined (p. 203).

Although a number of schools do not have credentialed faculty on staff to teach DE classes, some of these school districts are making changes to increase DE availability to their students. For instance, Courrégé (2012) reported that in Halifax, Virginia, 91% of students completed their high school degrees while simultaneously earning credits toward their college transcript. The superintendent of this rural county achieved this feat by not only offering incentives for high school teachers to become credentialed to teach college courses but also by creating satellite campuses and increasing DE offerings to the career and technical areas (Courrégé, 2012).

Edmunds (2012) reported that with increased state and national emphasis on accelerated learning opportunities, DE programs are offered to students “for whom the entrance into college has historically been more challenging,” including low income and first-generation students (p. 81). Because DE offerings are now being extended beyond those students for whom college seemed imminent (Howley et al., 2013), it is important to understand the student achievement in these various course designs so that all students’ future success can be ensured (Hughes & Edwards, 2012).

Dual Enrollment Environments

The multitude of DE program options that are available to students has resulted in variation in perceived levels of rigor and communication. While some colleges offer DE programs that allow students to choose individual courses they would like to take from a menu of options, other DE programs (such as Early and Middle Colleges) are more immersive. The latter involves increased progress toward a college degree and introduction to the physical college

environment (Edwards et al., 2011). Conversely, the former is less structured toward matriculation to college. The online environment and the F2F environments within both high schools and colleges are all commonly accepted environments for DE delivery.

The Online Environment

Online delivery of DE courses occurs much less frequently than delivery on a high school or college campus (Blackboard Institute, 2010). Despite some state policies that require high school students to have completed online course experience before high school graduation (Carnevale, 2006), there has been little substantive research to demonstrate an increase in online dual enrollment delivery. For this reason a more general discussion of the online environment and student perceptions of it is warranted.

Online Course Overview.

Fully online courses are those in which the student and teacher are connected through an online platform such as Moodle, Blackboard, or Desire to Learn. These programs include discussion boards, announcement pages, recordings of lectures, and even virtual chat forums to both substitute for face-to-face interactions and enhance online content (O'Brien, Hartshorne, Beattie, & Jordan, 2011). Murphy, Rodriguez-Manzanarez, and Barbour (2011) found that such courses can significantly alter the relationship between student and teacher, shifting the classroom from teacher-centered to student-centered.

Though online classes were established to provide distance education to those students who were unable to meet at a regular time each week, Mellander (2012) found that at Central Florida, close to "75% of online students were already on campus or lived nearby" in part because there were not enough faculty members to meet the needs of the student population (p. 66). This lack of credentialed faculty is also the case in high schools that do not have teachers who are credentialed to teach DE courses. Without teachers who held content area master's

degrees, schools were using online platforms to deliver DE courses. Such an issue is not atypical, as many schools are "using technology . . . to overcome limited budget constraints" and teach those students who are not able to attend classes on campus (El Mansour & Mupinga, p. 242).

Online Dual Enrollment. Exposure to online courses in students' high school careers via DE can prepare them for the online courses t they may take when they move on to college by teaching them "self-directed, collaborative, and active learning" (Gresham et al., 2012, p. 43). Though Mellander (2012) contended that "students who attend superior high schools do not expect to take classes on the web" (p. 68,), he also demonstrated that postsecondary academic institutions (including the Maryland and Minnesota university systems) required their students to take a certain percentage of courses that were delivered via an "alternative learning" method (p. 67). Studies also show that "at least 30 percent of all college and university students [had] enrolled in at least one online course" (Bergstrand & Savage, 2013, p. 302). In addition, Bergstrand and Savage found that use of online course tools prepared students for "an increasingly global economy" in which they would most likely interact with coworkers and peers online (p. 296). In summation, because of the high level of autonomy and asynchronicity that accompany online courses, many students were prone to procrastination and falling behind. However, if they were exposed to college rigor at an earlier age, they were much better prepared for the level of independent learning required in college.

Perceptions of Online Course Delivery. Early exposure to online courses provides students with knowledge of an online academic environment while still experiencing the relative structure of a high school classroom. O'Brien et al. (2011) found that traditional students (who were not used to courses delivered via distance learning) struggled with the online course much more than students who had experience in such classes. Bergstrand and Savage (2013)

determined that students reported that they learned less and gleaned less respect from their online instructors. Students' evaluations of online and face-to-face courses revealed much lower ratings for the former; in studies that demonstrated online course effectiveness, researchers found that while the course had positive learning outcomes for students who were continuously enrolled, there were high dropout rates (Murphy et al., 2011). According to El Mansour and Mupinga (2007) online courses also limited the "depth of interactions regarding course material and procedures" (p. 244). This confusion is especially true for students who have never used an online platform before who are unfamiliar with online course norms (El Mansour & Mupinga).

With many DE courses now being held online, potential pitfalls of online courses must be examined. For instance, in states such as Kentucky, West Virginia, and Tennessee, Massive Online Open Courses (MOOCs) are being examined as a mode of online course delivery (Davis & Cavanagh, 2013). However, the apparent lack of research on the effects of DE online courses along with the introduction of a new online environment could redefine both the landscape of DE instruction and DE student readiness upon matriculation.

While Judd et al. (2009) qualitatively demonstrated that students taking DE courses via distance education were not satisfied with their DE experience because they did not feel as if they were fully prepared for college, they did not examine student achievement (either longitudinally or within the DE course), nor did they take into account different F2F DE environments. Aside from Judd et al.'s research, little research has been completed on the effectiveness of online DE programs possibly because online delivery has been cited as a less frequent DE instructional mode (Blackboard Institute, 2010). Although online DE delivery is not frequently referenced in research, it is evident that the inclusion of online coursework in high schools is becoming more prevalent. For instance, graduation requirements via state law in some

states-- such as Michigan have required students to have taken a minimum number of courses online before they graduated high school (Carnevale, 2006). For this reason, many universities in the state have online students who are dually enrolled (Brenner, 2007; Neumann, 2012). Additionally, universities such as Liberty University and Grand Canyon University, boast online DE programs that increase accessibility to college-level courses ("Dual Enrollment," 2014; "Get the Edge," 2014). Although collegiate websites often boast the presence of online DE programs, as noted above, research has not been completed regarding the effectiveness of online DE delivery.

The High School Environment

While DE programs have been present in high schools and colleges since the latter half of the 20th century (Fincher-Ford, 1997), most studies regarding the effectiveness on these programs have been centered on the success of the programs in general rather than on the setting of the individual program. Despite the fact that NACEP works to ensure consistent DE course effectiveness ("About NACEP," n.d.), the same collegiate content delivered within a high school setting can vary from the college setting because of student perceptions of the physical high school environment (Taczak & Thelin, 2014). Such differences in perception can be based on the stress and rigor that accompany state standards as well as perceived "coddling" from instructors and administrators (Hebert et al., 2013). For this reason, a discussion of state standards (that affect high school instructional methods as well as the general high school atmosphere) and the general high school atmosphere will act as an introduction to DE courses delivered within the high school.

The Impact of State Standards. The landscape of secondary education has changed vastly since the 2001 introduction of increased state standards (through NCLB) and an emphasis on

standardized testing. While standardized tests are often critiqued within popular media, many argue that they act as successful transitions into college because of their emphasis on rigor (Jones & King, 2012). The K-12 environment is a changing landscape, and it is imperative to consider whether state-mandated changes align or conflict with DE initiatives. Additionally, because the K-12 landscape has changed dramatically in recent years, the effect of state mandated curricula on the high school environment could affect DE delivery within high schools. As Anson (2010) reported DE courses are constructed with the assumption "that high school students are intellectually, experientially, and emotionally ready to do college-level work, and it is this assumption that drives controversy" regarding such programs (p. 246).

Although Common Core standards emphasize rigor, they have also resulted in a dramatic shift in the way that teachers approach instruction. According to one instructor, the new linear model of teaching and learning involves "link[ed] Common Core standards with a Common Core curriculum taught by teachers who will assess student learning through a slate of Common Core exams and be evaluated with a common rubric that uses scores on these exams as a measure of teacher quality" (Brooks & Dietz, 2012, p. 65). Furthermore, Brooks and Dietz found that many teachers feel as if policymakers are out of touch with real-world educational practices and that current state policies do not align with the reality of student needs. Though this bleak outlook on the high school environment is not necessarily indicative of all that can be completed academically within a secondary school, it is representative of a changing mindset within high schools across the nation (Weber, 2014).

Characteristics of the High School Environment. Ryzin (2011) found that high school students were more apt to succeed when they feel comfortable and safe within their learning environment. His definitions of "success" were followed by his conclusion that students were

more engaged and academically self-sufficient when immersed in what was regarded as a protected environment. Other studies have demonstrated that there is a distinct increase on content focus in the high school DE classroom. Denecker (2013) reported that within the high school environment, DE writing students were able to engage in college-level writing; however, this engagement was only the case when the instructors were aware of both secondary and postsecondary writing expectations.

Weber (2014) described the high school environment much differently and stated that the environmental change that high-stakes testing has had on the high school landscape has produced "over-stressed, uninterested, uncreative homogenized students who hate school and who have lost their senses of self and wonder" (p. 46). Additionally, the high school environment is often filled with adolescent drama and students "yearn to be cared for as children, while simultaneously demanding to be treated as adults" (Hebert et al., 2013, p. 95). These results are in direct contrast to Ryzin's as they show that students' transitions into college coursework may be hampered by seemingly arbitrary academic structures and an inability to be self-sufficient. While these results largely vary because of research setting, they also demonstrate that the high school environment is one that is better suited for an academic transition when the DE curriculum is seen as a separate entity from the regular high school curriculum.

Dual Enrollment in the High School Environment. Although original concurrent enrollment partnerships were designed to take place on the high school campus ("About NACEP," n.d.), college administrators and faculty express concern "about their ability to ensure the quality of the courses taught in high schools by high school faculty" (Kinnick, 2012, p. 40). Additionally, many college instructors felt that the dialogue with high school instructors was dominated by focus on paperwork and deadlines rather than course content (Howley et al.,

2013). In contrast, high school instructors believed that their lack of knowledge about college policy and procedures acted as a distinct impediment to performance (Howley et al., 2013).

Zimmerman (2012) critiqued, exclusively, the impact of the physical high school setting to DE progress. Because, he argued, the high school setting has its own etiquette and decorum that is distinctly different from the college setting, DE students within the high school setting are not fully benefitting from courses that are meant to be transitional. He also argued that the myriad of extracurricular activities that high schools are involved in could act as a barrier to success and appropriate college rigor; however, he did not provide significant data to maintain that assertion. Karp (2012) supported these findings by illustrating that only DE students who are able to engage in "role rehearsal and anticipatory socialization" would experience increased self-efficacy (p. 26). However, Karp's speculative findings resulted from only completing observations in a DE course on a high school setting and were not compared to DE courses on a college setting or in an online course environment. The differences in DE instruction at the high school and college level have been addressed within individual institutions. Charlier and Duggan (2010) studied DE adjunct faculty orientation and demonstrated that one college's initiative to align DE objectives in both high school and college was successful. Their data-driven orientation program ensured that the teachers who were certified to teach on the high school campus were providing an education that was in alignment with the college's course objectives.

The College Environment

While the high school environment has been critiqued as one that creates students who are dependent on instructor prompting, the college environment is critiqued as one that could potentially create a disconnect between student and environment. O'Keeffe (2013) found students are less attached to a college or university because they have other full-time

commitments outside of the institution and because they are often intimidated by the larger size of the institution. This disconnect between student and environment, O'Keeffe found, was not without academic repercussions. Students within the college setting also stated that they were less likely to report impediments or affective issues to instructors for fear that such an admission would reflect negatively on them academically (O'Keeffe, 2013). While O'Keeffe demonstrated the feeling of detachment that students often feel when entering college, Petty (2014) reported that first-generation students often drop out of college because they have little knowledge of college norms and that they also might be less psychologically prepared for collegiate studies than their counterparts. Both of these studies demonstrated that a level of awareness about the collegiate environment and college expectations is needed in order to succeed as a college student.

Dual Enrollment in the College Environment. The issues reported by O'Keeffe (2013) and Petty (2014), however, are not present within studies of DE within the college environment. Instead of being confused and daunted by a college atmosphere, studies have found that DE students thrive when DE courses are taken at a college or university. For instance, the Community College Research Center (CCRC) found that students in Florida, New York City, and California who took DE courses on a college campus were 9% more likely to enroll in college, 6% more likely to pursue a bachelor's degree, and 5% more likely to attain a bachelor's degree than students who took DE courses on a high school campus (Columbia University, 2012, p. 5). CCRC also reported that there were no distinguishable benefits for students who had taken DE courses on a high school campus versus those students who had not taken DE at all. The researchers noted, however, that individual DE courses could have had a significant impact on

future placement testing even though the effects of that individual course were not evident within the larger data analysis.

In addition to success in terms of college enrollment and degree completion, DE students also experienced more success within their courses when they were taken on a college campus. Farrell and Siefert (2007) reported that it is only when students take DE courses on a college campus that they are familiarized with the academic and student support services that make college success feasible. Speroni (2011) found that Florida students who took DE courses on a college campus, rather than on a high school campus, experienced increased academic outcomes. However, the sample of students in Speroni's study who took DE courses mainly on a high school campus was quite low (approximately 5%). Therefore, additional research in the area may be needed in order to conclusively determine a relationship between location and student outcomes.

Although researchers have found that DE that is delivered on a college campus can have significant academic outcomes, there are critics who argue that placing high school students on a college campus can force them to mature too quickly, for better or worse. Taczak and Thelin (2014) argue high school students are forced to mimic adult behavior too early when they take courses on a college campus. However, McCord and Roberts (2014) found that because most students do matriculate to college after a DE program, an early introduction into the college environment prepared students for collegiate behaviors rather than forcing too much stress upon them or causing them to skip class.

Critiques of Dual Enrollment

Despite the many reported benefits of dual enrollment, there are areas in which researchers and critics of dual enrollment have found fault. Mainly, these criticisms focus on

dual enrollment funding and academic rigor. Although researchers have demonstrated the effectiveness of dual enrollment programs in preparing students for college, other researchers have found that there are minimal differences in dual enrollment students' college GPAs and their counterparts who did not take dual enrollment courses. A report of recent criticisms of both dual enrollment funding and academic rigor is included below.

Dual Enrollment Funding. One critique of dual enrollment is the source of funding. While grants and federal funds are available for dual enrollment courses, they often do not cover the complete tuition cost. This can create a burden for high schools, colleges, and students. In an effort to gain funding, states (such as Alabama) have begun to offer generous tax credits to offset the necessary funding for such programs (Adams, 2014, p. 4).

In many cases for students and parents, state funds or grants are not available or do not cover an adequate portion of the dual enrollment tuition cost; this is particularly the case with the Early College Model (Leonard, 2013a, p. 4). Kinnick's (2012) qualitative examination of dual enrollment's effects on the collegiate institution revealed that many college administrators and faculty members see dual enrollment as an impediment to funding because enrolled students do not pay full tuition. Additionally, Leonard (2013a), in his qualitative study, found that dual enrollment programs often come at a cost to both the high school and participating college.

Some dual enrollment programs required the school district pay the tuition for the student while the college earned credit for increased enrollment (Howley et al., 2013). However, Lukes (2014) reported that colleges benefitted from dual enrollment that is delivered on a high school campus because college resources (teachers and other budgetary items) were not being spent, while the college is still gaining FTE. This loss deterred high schools from encouraging a large number of students to participate and limited the participating student body to only those at the

top of their class. Kronholz (2011) found that a result of this financial strain is the idea of shared responsibility, in which parents and schools share the tuition cost. Leonard (2013a) argued that shared responsibility increases community ownership of the program and also further introduces students (and parents) to the college environment as they become familiar with tuition payments and collegiate responsibility. Although Leodard's assertions align with Arnold et al. (2012), who reported that student knowledge of financial aid was a facet of college success, Adams (2014) reported that only nine states require families to pay all or a portion of dual enrollment tuition.

Dual Enrollment Academics. There are multiple studies, as demonstrated previously, that show the academic benefits of DE programs. However, these academic benefits have been questioned as other studies have found that student success (by GPA) varies little between DE participants and nonparticipants. For instance, Allen and Dadger found that DE only had a minimal a positive effect (.16 points) on first semester college GPA. An (2013b) similarly found that college students with previous DE experience had an average first semester college GPA that was just .11 points higher than those of their non-DE counterparts. However, An did not detail the non-DE students' and DE students' high school GPAs; therefore, it is possible the students who had taken DE courses prior to college entry were those who would were more likely to have succeeded regardless of enrollment in DE classes. Likewise, Speroni (2012) found that the enrollment into successful DE courses could have particularly successful outcomes; however, the researcher also demonstrated that enrollment in DE courses on its own is not necessarily a predictor of success. Instead, she concluded, individual DE courses should be evaluated for effectiveness and alignment with college objectives. The alignment with college course objectives can also vary based on the institution to which the student matriculates. Crouse and Allen (2014) found that while DE students typically outperform their peers when they

matriculate to a community college, there was little difference in students who took DE and those who did not upon matriculation to a 4-year university.

Conclusion

Research has demonstrated that participation in an effective DE program increases the likelihood that students will be emotionally and academically prepared for the rigor of either a 2-year college or 4-year university. While there is conflicting evidence regarding the extent of the academic benefits of DE, the generally stated conclusion among schools and policymakers is that DE is an effective method of bridging the gap between high school and college. The role of dual enrollment is still one that continually redefined. Hofmann and Voloch's (2012) definition of dual enrollment as a "'liminal space' conveys the concomitant unease of dissolved boundaries and creates a productive tension that requires secondary and postsecondary institutions to articulate together their expectations for 'college-ready students' and 'college-level' work" (p. 101). This "productive tension" is further muddled by the fact that there are now multiple environments in which DE courses are typically taught (Blackboard Institute, 2010). Despite the extensive research that has been completed on DE courses and their impacts on student achievement, it is evident that DE is an area in which there is still much to be studied.

CHAPTER 3

METHODOLOGY

The purpose of this comparative study was to examine whether variations in student achievement in college courses exist between high school students with dual enrollment (DE) credit and academically comparable high school students with no DE credit. Additionally, the researcher explored whether differences exist in course grade for DE students by course environment (online, face-to-face at a high school, or face-to-face at a college.)

Population

The population for this study included students at a community college in Southwest Virginia who either took DE English 111, DE Biology 101, DE History 101, or DE Math 163 or who entered as an AIMS scholar with no DE credit in one or more of the aforementioned courses. The population consisted of 429 AIMS scholars and 2,015 DE students. The researcher limited the population to those who entered the college between the 2009-2010 and 2013-2014 school years. The population was divided into two groups: those who entered the college with DE credit and those who entered with no DE credit. The latter group acted as a comparison group. Both groups were divided by course content area. The DE group was further divided based on the DE environment (online, face-to-face [F2F] at a high school, or F2F at a college) for each DE course content area (English, biology, history, or math.)

Design

McMillan and Schumacher (2010) stated that comparative studies allow the researcher to "investigate the relationship of one variable to another by examining whether the value of the dependent variable in one group is different from the value of the dependent variable in the other group" (p. 222). Within this study the grades of non-DE students were compared with the grades

of DE students respective to each content area. Additionally, the grades of DE students were compared based on DE course environment (online, F2F at a high school, and F2F at a college).

Comparative studies have proven useful in looking at different methods of course delivery as well as different course environments. For example, López-Soblechero, González-Gaya, and Hernández-Ramirez (2014) employed a comparative design when examining distance versus F2F vocational education. Similarly, Cameron (2013) used a comparative study to demonstrate the variations between online and F2F nursing graduate students. Comparative research designs have been successfully used in order to demonstrate variations in course delivery methods and environments. The design is particularly useful within the study of DE course environments as allows the researcher "to make a preliminary identification of possible causes of important educational outcomes" (McMillan & Schumacher, 2010, p. 222). These outcomes were evident through the presence or absence of significant variation in course grade for different types of DE delivery.

The design of this study was focused on the impact of DE delivery method on DE course achievement as well as the DE student grades in comparison with their non-DE peers. In order to evaluate the impact of DE delivery method, the research questions focus on method of DE delivery and content area-specific DE course achievement. Because high school students who enroll in DE have higher levels of academic preparedness than the average high school student (Allen & Dadgar, 2012), selection bias was addressed by comparing DE students to a comparison group of AIMS scholars. In order to be an AIMS scholar at the college where the study is being completed, "students must achieve a grade of at least 'C' or better in each of the 17 approved high school courses" ("AIMS Higher Scholarship," 2014, para. 3). This grade cutoff in courses such as biology, history, English, and mathematics will ensure that DE students are

being compared with students who are academically similar. In Virginia, all high school students are eligible for DE, and the Virginia Department of Education only cautions that individual schools ensure that students who take DE courses are prepared for college-level rigor; this is ensured through a principal's endorsement of the student and the student's admission into the participating college. Additionally, there is no GPA cutoff or requirement for DE participation (*Virginia's plan for*, 2008). For this reason AIMS scholars and DE students are academically comparable.

The following research questions were used to guide this study:

1. Is there a significant difference in English 111 final grade for students who took English 111 as a dual enrollment course and AIMS scholars who entered college with no English 111 dual enrollment credit?
2. Is there a significant difference in dual enrollment English 111 final grade for students who took dual enrollment English 111 online, face-to-face at a high school, or face-to-face at a college?
3. Is there a significant difference in Biology 101 final grade for students who took Biology 101 as a dual enrollment course and AIMS scholars who entered college with no Biology 101 dual enrollment credit?
4. Is there a significant difference in dual enrollment Biology 101 final grade for students who took dual enrollment Biology 101 online, face-to-face at a high school, or face-to-face at a college?
5. Is there a significant difference in Math 163final grade for students who took Math 163as a dual enrollment course and AIMS scholars who entered college with no Math 163dual enrollment credit?

6. Is there a significant difference in dual enrollment Math 163final grade for students who took dual enrollment Math 163 online, face-to-face at a high school, or face-to-face at a college?
7. Is there a significant difference in History 101 final grade for students who took History 101 as a dual enrollment course and AIMS scholars who entered college with no History 101 dual enrollment credit?
8. Is there a significant difference in dual enrollment History 101 final grade for students who took dual enrollment History 101 online, face-to-face at a high school, or face-to-face at a college?

Data Collection

The data collected for this research study were obtained through the coordinator for institutional effectiveness within the Institutional Review Board at the 2-year college in Southwest Virginia. The college uses software, PeopleSoft (also known as Student Information System [SIS]), to retain student records. For this study the researcher gathered student grades in all DE English 111, Biology 101, Math 163, and History 101 courses offered from the 2009-2010 and 2013-2014 school years. Each DE course is coded by the college to indicate course environment (online, F2F at a high school, or F2F at a college). Additionally, a list of grades in English 111, Biology 101, Math 163, and History 101 for AIMS scholars who entered college in the same time frame with no DE credit in those specific courses was collected. The researcher was able to identify AIMS scholars by their coding in PeopleSoft.

Methodology

Ethics procedures dictate that all studies must be approved by the Institutional Review Board in order to assure the effects of a study on participants. All university procedures,

including IRB approval, were followed in participant selection and the assurance of participant privacy. Because student identifiers were not collected, this study was not categorized as human subjects research. ETSU's IRB policy states that studies are eligible for exempt status if there is "minimal risk to participants," participant privacy is maintained, and "the selection of participants is equitable" (East Tennessee State University, 2014). Additionally, the participating community college's IRB director has stated that this study did not need to be submitted for approval through the college. This study was approved for exempt status at ETSU.

Stated in the null form, below are the research hypotheses examined in this study:

Ho1. There is no significant difference in English 111 final grade for students who took English 111 as a dual enrollment course and AIMS scholars who entered college with no English 111 dual enrollment credit.

Ho2. There is no significant difference in dual enrollment English 111 final grade for students who took dual enrollment English 111 online, face-to-face at a high school, or face-to-face at a college.

Ho3. There is no significant difference in Biology 101 final grade for students who took Biology 101 as a dual enrollment course and AIMS scholars who entered college with no Biology 101 dual enrollment credit

Ho4. There is no significant difference in dual enrollment Biology 101 final grade for students who took dual enrollment Biology 101 online, face-to-face at a high school, or face-to-face at a college.

Ho5. There is no significant difference in Math 163 final grade for students who took Math 163 as a dual enrollment course and AIMS scholars who entered college with no Math 163 dual enrollment credit.

Ho6. There is no significant difference in dual enrollment Math 163final grade for students who took dual enrollment Math 163 online, face-to-face at a high school, or face-to-face at a college.

Ho7. There is no significant difference in History 101 final grade for students who took History 101 as a dual enrollment course and AIMS scholars who entered college with no History 101dual enrollment credit.

Ho8. There is no significant difference in dual enrollment History 101 final grade for students who took dual enrollment History 101 online, face-to-face at a high school, or face-to-face at a college.

Data Analysis

Data analysis began with descriptive statistics that provide an overview of the population by demonstrating the percentage of the population that had not taken DE courses as well as those that had taken biology, history, English, and mathematics as DE courses. DE data were further separated by course environment (online, F2F at a high school, and F2F at a college) for DE Biology 101, History 101, English 111, and Math 163. Separate data on course delivery environment were provided for each respective course. It was not expected that students would have taken all DE courses being examined or that they will have taken all DE courses in the same type of environment. Therefore, if students have taken more than one of the courses being analyzed, student success in each course was analyzed separately.

After descriptive analysis the researcher examined research questions in terms of collected data. Student letter grades were treated as interval data. Although letter grades are often treated as ordinal data because the distinct intervals between A and B can be difficult to define, the use of letter grades as interval data is typical in educational research in order to run statistical

procedures and gather means. Kaplan (2011) demonstrated that researchers "can't average letters, so they are converted to numbers (i.e., A=4, B=3, and so on) and the numbers are averaged" (p. 92). This scale, with A=4, B=3, C=2, D=1, and F=0 was used. Data indicating a grade of "Incomplete" or "Withdrawal" were not included in calculations.

Research questions 1, 3, 5, 7, and 8 were analyzed using an independent samples *t* test. This statistical procedure allowed the researcher to "compare a treatment group with a control group" in order to "permit unambiguous conclusions about cause-effect relationships" (Witte & Witte, 2010, p. 285). The *t* test is also a statistical procedure that has a well-established history in research (Pelham, 2012). Data for each content area were coded as follows: no DE experience (0); online DE course (1); DE course taught F2F at a high school (2); and DE course taught F2F at a college (3). Completing the *t* test allowed the researcher to determine more conclusively if there were significant differences in DE and non-DE student grades, a common issue of contention among researchers. When the results of these procedures yielded significant results, the researcher continued analyses by "estimating the size of the underlying effect" (Witte & Witte, p. 285). Although the nature of research question 8 was appropriate for Analysis of Variance (ANOVA), the sample size for the group of History 101 DE students who had taken the course on campus was quite small (n=5). In research, "larger sample sizes may be required to provide relatively valid *p* values if the population distributions are substantially nonnormal" (2011, p. 176). Because the population distribution was nonnormal, omission of this group yielded more trustworthy results.

Research questions 2, 4, and 6 were analyzed using Analysis of Variance (ANOVA). ANOVA "tests whether differences exist among population means categorized by only one factor or independent variable" (Witte & Witte, p. 338). Using ANOVA allowed the researcher

to determine if there were significant differences in final course grade for each DE course environment. Because all grades (the dependent variable) were tested based on delivery type (the independent variable), the one-way ANOVA is appropriate for this comparative research. For instances in which the ANOVA revealed significant differences among the means, *post hoc* analyses were completed by testing against the mean using the Games-Howell procedure. Games-Howell was used because it works well with unequal sample sizes (Games & Howell, 1976). Where needed, effect size was calculated in order to gauge the "difference between population means" (Witte & Witte, p. 287). All statistical analyses were completing using an alpha level of 0.05. This preset cutoff point is one that is widely accepted in the field of educational research (Leahey, 2005).

Results of these statistical procedures are reported in Chapter 4.

CHAPTER 4

RESULTS

Introduction

The purpose of this comparative study was to examine whether variations in student achievement in college courses exist between high school students with dual enrollment (DE) credit and academically comparable high school students (AIMS scholars) with no DE credit. The results of this study also demonstrated whether differences exist in course grade for students by course environment (online, face-to-face [F2F] at a high school, or F2F at a college.) The study was focused on DE student and AIMS scholar grades in English 111, Biology 101, Math 163, and History 101 courses that were taken between the 2009-2010 and 2013-2014 school years at a community college in Southwest Virginia. The population consisted of 429 AIMS scholars and 2,015 DE students. For this study 3,639 DE student grades and 706 AIMS student grades were used in calculations. The research questions outlined in Chapter 3 were used to guide this study. The distribution of subjects between AIMS and DE by course is presented in Table 1. (The sample sizes of the population are unequal; this was taken into account during calculations, and all analyses were performed with statistical procedures that take into account both unequal variances and unequal sample sizes.)

Table 1
Presentation of Student Grades by Course and Student Type

Student Type	Course							
	English 111		Biology 101		Math 163		History 101	
	n	%	n	%	n	%	n	%
Dual Enrollment	1,456	85	719	78	1,116	92	348	72
Non-Dual Enrollment	262	15	204	22	102	8	138	28
Total	1,718	100	923	100	1,218	100	486	100

The dual enrollment population was also divided based on course delivery environment. Four of the eight research questions required such disaggregation. The breakdown of DE course delivery environment is provided in Table 2. The History 101 final course grades for courses delivered at the college were omitted from statistical analysis as the sample size (n=5) was too small. However, a *t* test was still used to compare means for online and high school environments for History 101.

Table 2
Dual Enrollment Sample Characteristics by Course Environment

Course Environment	Course							
	English 111		Biology 101		Math 163		History 101	
	n	%	n	%	n	%	n	%
DE Online	239	16	65	9	102	9	72	21
DE at High School	1,062	73	618	86	984	88	271	78
DE at College	155	11	36	5	30	3	5	1
Total	1,456	100	719	100	1,116	100	348	100

Research Question 1

Is there a significant difference in English 111 final grade for students who took English 111 as a dual enrollment course and AIMS scholars who entered college with no English 111 dual enrollment credit?

Ho1. There is no significant difference in English 111 final grade for students who took English 111 as a dual enrollment course and AIMS scholars who entered college with no English 111 dual enrollment credit.

A Welch's *t* test was conducted to determine whether students who took English 111 as a dual enrollment (DE) course earned higher grades in the course than AIMS scholars who entered college with no English 111 credit. The independent variable, student type, included two types: AIMS scholars and dual enrollment students. The dependent variable was earned grade in English 111. Because the initial two samples were unequal (with n=262 for the AIMS group and

n=1,456 for the DE group), a Welch's *t* test was used in favor of an independent samples *t* test, to account for unequal sample size. The Welch's *t* test was statistically significant, *t* (305.81) = -9.98, *p*<.001; therefore, the null hypothesis was rejected. AIMS students (*M*=2.45, *SD*=1.39), performed significantly lower with overall grades that were almost one full letter grade below DE students (*M*=3.34, *SD*=0.94). The 95% confidence interval for the difference in means was -1.06 to -0.71. The eta square index indicated that 5% of the dependent variable was attributed to student type (AIMS or DE). The distributions for the two groups is presented in Figure 1.

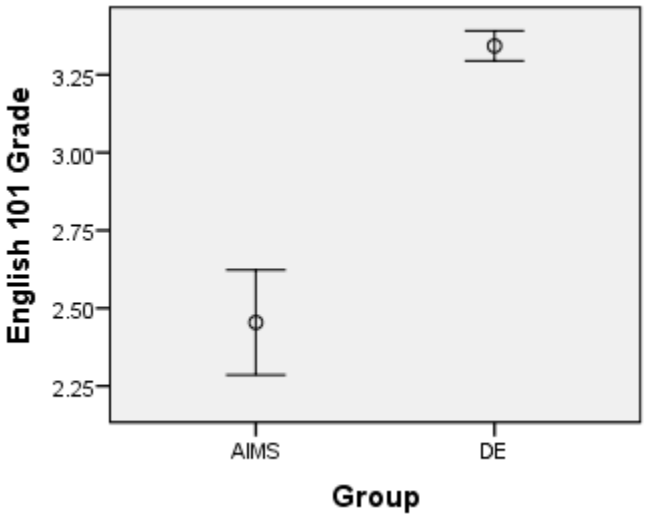

Figure 1: Results of *t* test Using Error Bars to Represent English 111 Grades by Student Type. Final course grade is measured in quality points.

Research Question 2

Is there a significant difference in dual enrollment English 111 final grade for students who took dual enrollment English 111 online, face-to-face at a high school, or face-to-face at a college?

Ho2. There is no significant difference in dual enrollment English 111 final grade for students who took dual enrollment English 111 online, face-to-face at a high school, or face-to-face at a college.

A one-way analysis of variance was conducted to evaluate the relationship between the DE course environment for English 111 and final course grade. The independent variable, course environment, included three types: online, F2F at a high school, and F2F at a college. The dependent variable was the final course grade. Tests for skewness and kurtosis revealed that the data was not normally distributed. A Shapiro-Wilk's test ($p>.05$) showed that student final course grade was not normally distributed for online, high school, and college course environments, with skewness of -1.58 (SE = .157) and kurtosis of 2.45 (SE = .314) for online DE English 111 courses; skewness of -1.66 (SE = .075) and kurtosis of 2.79 (SE = .150) for DE English 111 courses taught at a high school; and, skewness of -1.26 (SE = .195) and kurtosis of .617 (SE = .387) for DE English 111 courses taught at a college.

Because the data were not normally distributed, a no-parametric Levene's test was used to test for homogeneity of variances; for this test the assumption of equal variances was violated, with F (2, 1453)=7.79, $p<.001$; the variances were unequal. For this reason the Welch test was used to test for significance. The resulting ANOVA was significant, F (2, 306.14)=9.78, p=.002; therefore, the null hypothesis was rejected.

Follow-up tests were conducted to evaluate pairwise differences among the means. The variances among the three groups ranged from 0.80 to 1.47, and the assumption of equal variances was violated using a nonparametric Levene's test; post hoc comparisons were conducted using the Games-Howell procedure. There was a significant difference in the means between the online DE English group and the college DE English group; the online group performed significantly higher than the college group. There was also a significant difference between the high school DE English group and the college DE English group, with the high school DE English group performing significantly higher. However, there was no significant

difference in DE English 111 final course grade between high school and online DE English 111 groups. The 95% confidence intervals for the pairwise differences, means, and standard deviations for the three course environments are reported in Table 3.

Table 3
Mean Grades and Confidence Intervals for English 111 by Course Environment

Course Environment	*M*	*SD*	Online	High School
DE Online	3.34	0.92	---	---
DE at High School	3.39	0.89	[-.20, .11]	---
DE at College	3.03	1.21	[-.58, -.04*]	[-.60, -.12*]

Note: An asterisk indicates the difference in means is significant at the .05 significance using the Games-Howell procedure.

Research Question 3

Is there a significant difference in Biology 101 final grade for students who took Biology 101 as a dual enrollment course and AIMS scholars who entered college with no Biology 101 dual enrollment credit?

Ho3. There is no significant difference in Biology 101 final grade for students who took Biology 101 as a dual enrollment course and AIMS scholars who entered college with no Biology 101 dual enrollment credit.

A Welch's *t* test was conducted to determine whether students who took Biology 101 as a dual enrollment (DE) course earned higher grades in the course than AIMS scholars who entered college with no Biology 101 credit. The independent variable, student type, included two types: AIMS scholars and dual enrollment students. The dependent variable was Biology 101 final course grade. Because the initial two samples were unequal (n=204 for the AIMS group and n=719 for the DE group), a Welch's *t* test was used. The Welch's *t* test was statistically significant, t (260.43) = -8.77, p<.001; therefore, the null hypothesis was rejected. AIMS students (M=2.24, SD=1.27), performed significantly lower than DE students (M=3.07,

SD=0.88). The 95% confidence interval for the difference in means was -1.02 to -0.65. The eta square index indicated that 8% of the dependent variable was attributed to student type (AIMS or DE). The distributions for the two groups are provided in Figure 2.

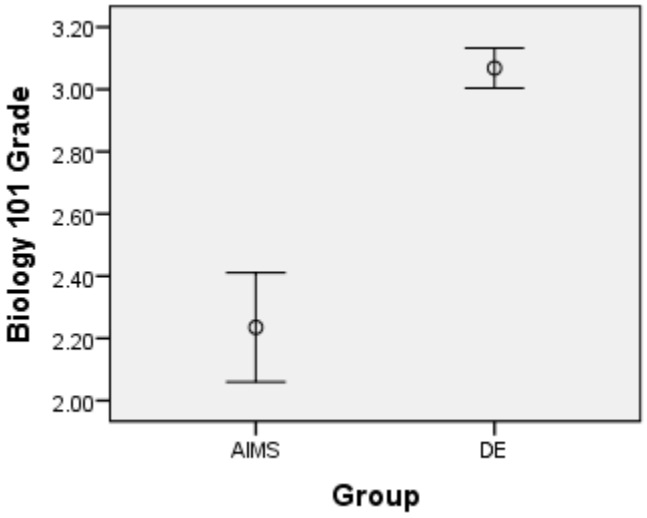

Figure 2: Results of *t* test Using Error Bars to Represent Biology 101 Grades by Student Type. Final grade is measured in quality points.

Research Question 4

Is there a significant difference in dual enrollment Biology 101 final grade for students who took dual enrollment Biology 101 online, face-to-face at a high school, or face-to-face at a college?

Ho4. There is no significant difference in dual enrollment Biology 101 final grade for students who took dual enrollment Biology 101 online, face-to-face at a high school, or face-to-face at a college.

A one-way analysis of variance was conducted to evaluate the relationship between Biology 101 course environment and final course grade. The independent variable, course environment, included three types: online, F2F at a high school, and F2F at a college. The dependent variable was the final course grade. Tests for skewness and kurtosis revealed that the

data were not normally distributed. Additionally, a Shapiro-Wilk's test (p>.05) showed that student final course grade was not normally distributed for high school and college course environments, but it was normally distributed for online environments. Tests reported a skewness of -.475 (SE = .297) and kurtosis of .459 (SE = .586) for online DE Biology 101 courses; skewness of -.746 (SE = .098) and kurtosis of .239 (SE = .196) for DE Biology 101 courses taught at a high school; and, skewness of -.963 (SE = .393) and kurtosis of .580 (SE = .768) for DE Biology 101 courses taught at a college.

Because the data were not normally distributed, a nonparametric Levene's test was used to test for homogeneity of variances; for this test, the assumption of equal variances was violated, with F (4, 714) = 8881.06, p<.001; the variances were unequal. For this reasonthe Welch's t test was used to test for significance. The resulting ANOVA was not significant, F (2, 67.56)=2.17, p=.115; therefore, the null hypothesis was retained. The strength of the relationship between the course delivery environment and final course grade as assessed by $\cdot^2$ was weak with the delivery environment accounting for 0.6% of the variance of the dependent variable.

Research Question 5

Is there a significant difference in Math 163 final grade for students who took Math 163 as a dual enrollment course and AIMS scholars who entered college with no Math 163 dual enrollment credit?

Ho5. There is no significant difference in Math 163final grade for students who took Math 163 as a dual enrollment course and AIMS scholars who entered college with no Math 163 dual enrollment credit.

A Welch's t test was conducted to determine whether students who took Math 163 as a dual enrollment (DE) course earned higher grades than AIMS scholars who entered college with

no Math 163 credit. The independent variable, student type, included two types: AIMS scholars and DE students. The dependent variable was earned grade in Math 163. Because the initial two samples were unequal (n=102 for the AIMS group and n=1,116 for the DE group), a Welch's *t* test was used. The Welch's *t* test was statistically significant, $t(112.30) = -9.05$, $p<.001$; therefore, the null hypothesis was rejected. AIMS students ($M=1.82$, $SD=1.36$), performed significantly lower than DE students ($M=3.07$, $SD=1.05$). The 95% confidence interval for the difference in means was -1.52 to -0.98. The eta square index indicated that 6% of the dependent variable was attributed to student type (AIMS or DE). Distributions for the two groups is presented in Figure 3.

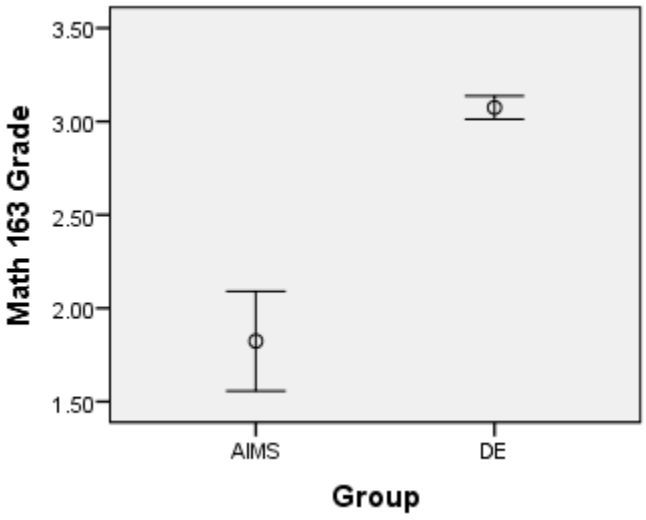

Figure 3: Results of *t* test Using Error Bars to Represent Math 163 Grades by Student Type. Final grade is measured in quality points.

Research Question 6

Is there a significant difference in dual enrollment Math 163 final grade for students who took dual enrollment Math 163 online, face-to-face at a high school, or face-to-face at a college?

Ho6. There is no significant difference in dual enrollment Math 163 final grade for students who took dual enrollment Math 163 online, face-to-face at a high school, or face-to-face at a college.

A one-way analysis of variance was conducted to evaluate the relationship between the Math 163 course environment and final course grade. The independent variable, course environment, included three types: online, F2F at a high school, and F2F at a college. The dependent variable was the final course grade. Tests for skewness and kurtosis revealed that the data were not normally distributed. A Shapiro-Wilk's test ($p>.05$) showed that student final course grade was not normally distributed for online, high school, and college course environments, with skewness of -.923 (SE = .239) and kurtosis of .188 (SE = .474) for online DE Math 163 courses; skewness of -1.095 (SE = .078) and kurtosis of .687 (SE = .156) for DE Math 163 courses taught at a high school; and, skewness of -.300 (SE = .427) and kurtosis of -1.399 (SE = .833) for DE Math 163 courses taught at a college.

Because the data were not normally distributed, a nonparametric Levene's test was used to test for homogeneity of variances; for this test, the assumption of equal variances was violated, with F (4, 1111) = 6001.06, $p<.001$; the variances were unequal. For this reason the Welch's t test was used to test for significance. The resulting ANOVA was significant, F (2, 63.86)=10.90, p=.007; therefore, the null hypothesis was rejected. The strength of the relationship between the course delivery environment and final course grade as assessed by $\cdot^{2}$ was weak with the delivery environment accounting for 2% of the variance of the dependent variable.

Follow-up tests were conducted to evaluate pairwise differences among the means. Because the variances among the three groups ranged from 1.05 to 2.23 and because the

assumption of equal variances was violated using a nonparametric Levene's test, post hoc comparisons were conducted using the Games-Howell procedure, which does not assume equal variances among groups. There was a significant difference in the means between the online DE Math 163 group and the college Math 163 group with the online DE group performing higher than the college group. There was also a significant difference between the high school DE Math 163 group and the college DE Math 163 group with the high school math group performing higher than the college math group. However, there was no significant difference in DE Math 163 final course grade between high school and online DE Math 163 groups. The 95% confidence intervals for the pairwise differences, as well as the means and standard deviations for the three course environments, are reported in Table 4.

Table 4
Mean Grades and Confidence Intervals for Math 163 by Course Environment

Course Environment	*M*	*SD*	Online	High School
Online	3.07	1.03	---	---
High School	3.10	1.03	[-.29, .22]	---
College	2.20	1.49	[-1.58, -.16*]	[-1.58, -.22*]

Note: An asterisk indicates the difference in means is significant at the .05 significance using the Games-Howell procedure.

Research Question 7

Is there a significant difference in History 101 final grade for students who took History 101 as a dual enrollment course and AIMS scholars who entered college with no History 101 dual enrollment credit?

Ho7. There is no significant difference in History 101 final grade for students who took History 101as a dual enrollment course and AIMS scholars who entered college with no History 101 dual enrollment credit.

A Welch's *t* test was conducted to determine whether students who took History 101 as a dual enrollment (DE) course earned higher grades in the course than AIMS scholars who entered college with no History 101 credit. The independent variable, student type, included two types: AIMS scholars and dual enrollment students. The dependent variable was earned grade in History 101. Because the initial two samples were unequal (n=138 for the AIMS group and n=348 for the DE group), a Welch's *t* test was used. The Welch's *t* test was statistically significant, $t(194.2) = -7.56$, $p<.001$; therefore, the null hypothesis was rejected. AIMS students (M=2.80, SD=1.29) performed significantly lower than DE students in History 101(M=3.66, SD=0.78). The 95% confidence interval for the difference in means was -1.08 to -0.64. The eta square index indicated that 11% of the dependent variable was attributed to student type (AIMS or DE.) The distributions for the two groups are presented in Figure 4.

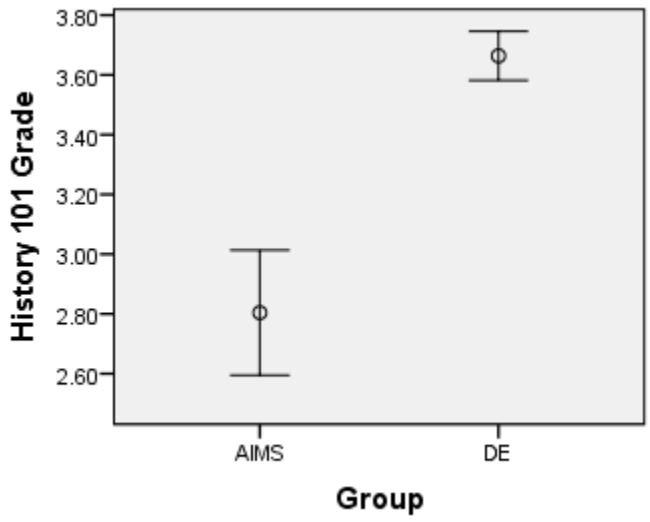

Figure 4: Results of *t* test Using Error Bars to Represent History 101 Grades by Student Type. Final grade is measured in quality points.

Research Question 8

Is there a significant difference in dual enrollment History 101 final grade for students who took dual enrollment History 101 online, face-to-face at a high school, or face-to-face at a college?

Ho8. There is no significant difference in dual enrollment History 101 final grade for students who took dual enrollment History 101 online, face-to-face at a high school, or face-to-face at a college.

For this dataset, there were only five course grades in the sample that were representative of students who had taken History 101 as a F2F course at a college. To ensure statistical validity, this small group was omitted from this statistical analysis. Additionally, a Welch's *t* test was conducted to determine whether students who took History 101 as an online DE course earned higher grades in the course than students who took History 101 on F2F at a high school. The independent variable, course environment, included two environments: high school and online. The dependent variable was earned grade in History 101. Because the initial two samples were unequal (with n=72 for the online group and n=271 for the DE group), a Welch's *t* test was used in favor of an independent samples *t* test, which would not account for unequal sample size. The Welch's *t* test was statistically significant, t (166.92) = 3.53, p = .001; therefore, the null hypothesis was rejected.

Further examination of the results demonstrated that DE students who took History 101 at a high school (M=3.60, SD=0.82) performed significantly lower than students who took History 101 online (M=3.89, SD=0.55). The 95% confidence interval for the difference in means was 0.13 to 0.45. The eta square index indicated that 4% of the dependent variable attributed to

course environment (online or high school.) Distributions for the two groups are provided in Figure 5.

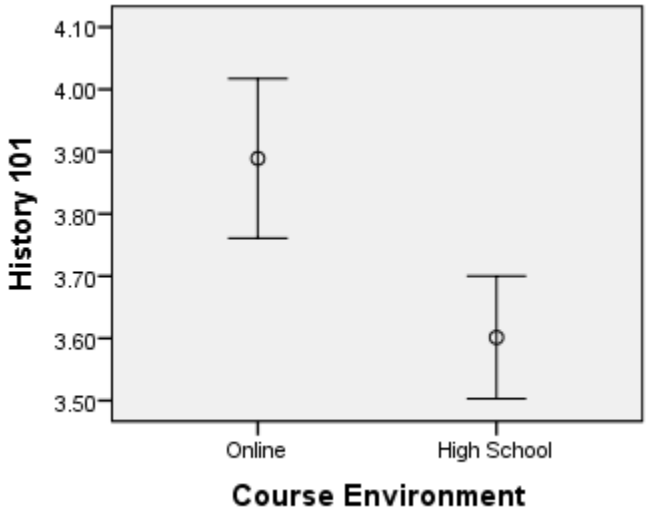

Figure 5: Results of *t* test Using Error Bars to Represent History 101 Grades by Course Environment. Final grade is measured in quality points.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to examine whether variations in student achievement in college courses exist between high school students with dual enrollment (DE) credit and academically comparable high school students with no DE credit. Additionally, the study explored whether differences exist in course grade for students by course environment (online, face-to-face [F2F] at a high school, or F2F at a college.) The analysis focused on variations in student achievement. Summary, conclusions, and recommendations are overviewed in the following sections.

Summary

Many studies have demonstrated that DE results in increased academic outcomes for students who participate (Allen & Dadgar, 2013; Henriksen et al., 2008; Jones, 2014; Karp, 2012; Karp & Hughes, 2008; Martin, 2013). These academic outcomes are higher likelihood of matriculation to college and a higher college GPA. Although researchers have focused on dual enrollment achievement and college readiness, there have been no evident studies that disaggregate DE student achievement by course delivery. DE course availability (and thus delivery) can vary based on student access to a participating DE institution (Edwards et al., 2011). Therefore, a study of the variations DE delivery environments was imperative to continue data-driven dialogue on DE program effectiveness and implementation.

The findings of this study support findings prior studies on DE program effectiveness. The results of this study demonstrated that DE students receive higher final course grades compared to a sample of academically-matched AIMS scholars. Additionally, findings indicated that the DE course environment for English 111, Math 163, and History 101 leads to statistically

significant differences in final grades. Students who took DE English 111 on a college campus had a mean final grade that was significantly lower than either students who had taken the course F2F at a high school or online. There was also a significant difference in the grades of Math 163 students who took the course on a college campus; their grades were lower than students who took the course on either a high school campus or online. Additionally, students who took DE History 101 on a high school campus earned final course grades that were significantly lower than students who had taken the course online; because the sample size (n=5) for student grades in DE History 101 for students who had taken the course F2F at a high school, it was not included in these calculations. For students enrolled in Biology 101 there was no significant difference in final grades between course type (online, F2F at a high school, F2F at a college.)

The researcher was aware that data analyses could be skewed because of unequal sample sizes and took precautions (via Welch's test and the Games-Howell procedure) to account for unequal variances.

Conclusions

For this study student final grades in English 111, Biology 101, Math 163, and History 101 were gathered for DE students and AIMS scholars. The population consisted of 429 AIMS scholars and 2,015 DE students; the study was comprised of 4,345 total grades; these grades were disaggregated first by DE participation (3,639 DE grades and 706 AIMS student grades) and then further by DE subject area and course environment. (Descriptive statistics on the DE population are included in Chapter 4 of this study.)

The grouping variables used for research questions 1, 3, 5, and 7 were (1) AIMS participation and (2) DE participation. The grouping variables used for research questions 2, 4, 6, and 8 were (1) online DE environment, (2) high school DE environment, and (3) college DE

environment. The eight research questions were addressed using *t* tests and ANOVA procedures; unequal sample sizes were accounted for in each procedure using Welch's test and the Games-Howell procedure. The following sections provide an overview of the results of each of the research questions.

Research Questions 1, 3, 5, and 7

Research questions 1, 3, 5, and 7 focused on the difference in final course grades for DE and AIMS students in four content areas, English, biology, mathematics, and history. All *t* tests yielded significant results, demonstrating that DE students performed higher (based on final course grade) than non-DE students. The results of these research questions aligned with the results with many other studies that have demonstrated the success of DE programs (Ganzert, 2014; Jones, 2014; Karp, 2012; Martin, 2013)**.** In each content area, English, biology, mathematics, and history, the DE students performed significantly higher than their AIMS (non-DE) counterparts. This difference was most evident in the mathematics courses, with a mean difference of 1.25 in final letter grades for DE and AIMS students. (One point is representative of one letter grade). This Math 163 difference reveals over a one letter grade variation in student final grades for those who took Math 163 as a DE course versus comparable students who took the course upon matriculation to college. Although this content area had the highest mean difference in final course grade, there were also mean differences in English, biology, and history that were 0.89, 0.83, and 0.86 respectively.

It is possibly because the students who took these courses as DE courses had additional support systems in place that they were more successful than their non-DE peers. Farrell and Siefert (2007) as well as Karp (2012) reported the importance of emotional scaffolding and the feelings of academic safety that accompany DE programs. Instead of being expected to work

within college norms and being shocked by the transition into a collegiate environment, DE students are often given both the rigor of college coursework and increased amounts of structured study time (as is built in to the secondary school day) than other college students. Because a comparison group of AIMS scholars was used in this study, it is not accurate to say that these DE students were simply better students than the AIMS group in this study. Instead, factors such as student support services and academic rigor may be better indicators of this variation in student success.

Research Question 2

Research question 2 focused on the mean difference between final course grade in DE English 111 based on course delivery environment: online, F2F at a high school, or F2F at a college. An ANOVA yielded significant results, and *post hoc* procedures demonstrated that final course grades in DE English 111 that was delivered on a college campus were significantly lower than DE English 111 that was delivered on either a high school campus or in an online environment. There was no significant difference in final course grades between the high school and online environments.

There are multiple factors that could contribute to both the lower grade in the college environment as well as higher grades in online and high school environments. Firstly, it is possible that the DE English 111 course that was delivered on a college campus was more rigorous. CCRC (2012) demonstrated that there were no benefits for students who had taken DE courses on a high school campus versus those who had not taken DE courses at all. Perhaps the students who took the courses in online and high school environments were so protected by secondary school norms that they were not exposed to the full rigor of college courses. Also, researchers have demonstrated that students who have taken DE courses on a college campus

experience increased academic outcomes (Speroni, 2011); however, it was not possible given the nature of this study to fully measure long-term academic outcomes. To expand upon this study and to explain some of this variation in final course grade, it would be necessary to follow these DE students beyond matriculation to see if they did, in fact, experience longitudinal benefits that could not be seen within this study. Finally, it is possible that students who took English 111 on a college campus were simply not prepared for the rigor of a college course or for the freedom (regarding structured study time, decreased principal involvement, and decreased instructor involvement) of college courses that took place outside of the protective walls of their own high school.

Research Question 4

Research question 4 was focused on the mean difference between final course grade in DE Biology 101 based on course delivery environment: online, F2F at a high school, or F2F at a college. An ANOVA did not yield significant results, and *post hoc* procedures more fully demonstrated small variations among the means. Within this DE Biology 101 group, the means for each delivery environment ranged from 2.86 (online environment) to 3.09 (high school environment). The college environment fell in the middle in terms of student course achievement with a mean final course grade of 3.0 (a B in the class). The findings of this study are commensurate with course achievement at the college level, as many students who take this course online at the college at which the study was completed perform slightly lower than students who take the course face-to-face.

Research Question 6

Research question 6 was focused on the mean difference between final course grade in DE Math 163 based on course delivery environment: online, at a high school, or at a college. An

ANOVA did yield significant results, and *post hoc* procedures (via the Games-Howell procedure) outlined significant differences between the online group and the college group and between the high school group and the college group. There was no significant difference in DE Math 163 final course grade between high school and online DE Math 163 groups.

These results are fairly similar, in terms of areas of variation, to the English 111 groups. It is evident in both analyses that students who took the courses on a college campus performed significantly lower than the students who took the course online or at a high school. The students who took DE Math 163 online had a mean final course grade of 3.07, those who took the course at a high school had a mean final course grade of 3.10, and those who took the course at a college had a mean final course grade of 2.20.

Research Question 8

Because the sample size for students who had taken DE History 101 on the college campus was so small (n=5) a Welch's *t* test was used to examine the variations between final course grade for students who had taken the course online and at a high school. The results of this test were statistically significant; students who took the course online had higher final course grades than students who had taken the course on a high school campus. DE students who took the course high school had a mean final course grade of 3.60, whereas students who took the course online had a mean final course grade of 3.89.This is the only one of the content areas studied that demonstrated that students who had taken a course on a high school campus performed significantly lower than their peers who had taken a course in a different course environment.

These specific findings conflict with many perceptions of the online course environment reported by educational researchers such as El Mansour and Mupinga (2007) and Bergstrand and

Savage (2013). Students are often unfamiliar with online course platforms, due dates, and decreased instructor interaction, and they often feel disconnected from the course and their grades suffer. Two main issues could account for these differences. Students now are more familiar with technology because they have interacted with it both personally and within educational settings. For this reason a more self-paced, low-interaction course could serve both acceleration and enrichment for advanced students. Additionally, there could be an issue in terms of rigor in one of the educational settings. Because, for this content area, there was little difference in student success in online and F2F courses, it is evident that these online courses could present a cost-effective alternative to F2F courses at a high school if they are as rigorous and provide the same amount of college preparation (in the long term) as F2F courses.

Recommendations for Practice

Because DE programs are associated with increased student success, it is imperative that colleges continue to grow, fund, and support them. Not only do such programs result in increased Full Time Equivalency (FTE) for colleges, but they also provide necessary scaffolding and preparation for collegiate studies. This scaffolding is necessary to best encourage and enable students to continue their educational careers through college; this preparation also supports President Obama's recent political promise of heavily increasing America's proportion of college graduates by 2020 ("Remarks of President," 2009). For this reason, the following recommendations are been made in light of this study's findings.

Because there were significant differences in student final grades for English 111, Math 163, and History 101 DE courses that were delivered in different environments, this issue is one that should stay at the forefront of colleges' examinations of their DE programs. To do this colleges should analyze DE student success based on course environment at least every other

year so that an open and effective line of communication can be kept between colleges and secondary schools. Maintaining and distributing such reports would allow institutions of higher education to see if differences emerge by DE course environment; therefore, the institution could make adjustments accordingly if teaching environment continues to lead to statistically significant differences. Additionally, because online courses are becoming more prevalent in colleges, online DE program offerings will also most likely increase. Therefore, this shift in technology and instruction should be carefully monitored and reported for student success and overall course effectiveness.

In each of the content areas in which there were significant differences in DE student achievement based on environment, the students who had taken the courses F2F at a high school performed better than students who had taken the courses online. While the reason for this could be that students have more time in class to prepare, there could also be issues in terms of consistent rigor within the high school classroom. For this reason DE courses delivered on a high school campus and online should also be evaluated according to college standards, including course observations and online course faculty review. This will also help to ensure consistency across delivery environments. Although DE course syllabi are evaluated according to college standards, further review of environment would strengthen programs across the board.

Because students who take DE courses perform better based on final course grades than comparable students who did not take DE courses, colleges should further encourage and recruit students into these programs. This type of recruitment can both bridge the gap between high school and college for students who are unaware of college norms and procedures and also increase FTE for colleges. However, because the landscape of DE is changing and a wider

demographic is now participating in DE, colleges should also ensure that rigor in such programs is maintained.

Upon student matriculation colleges should begin tracking students who have taken DE courses to discern significant long-term benefits both for DE students and to DE students based on the environment in which they took specific courses.

Lastly, the online courses examined within this study did not yield significantly lower final course grades for DE students in English, biology, history, or mathematics. For this reason, colleges and high schools should work to provide more of these online courses and also to monitor them in a way that colleges can continue to ensure their effectiveness. Because more students can often be put in an online class than in a F2F one (because of seating restrictions), these online courses can be a convenient, cost-effective solution to staffing issues that may be present because of a lack of a DE credentialed teacher within a high school.

Recommendations for Further Research

Although results of this study demonstrated both that DE is effective and that student success for English, mathematics, and history (but not biology) based on DE delivery environment does differ, there are still many areas of DE research that could yield significant benefits to the field. Data-driven research, in all fields, is necessary to promote program growth and development. Studies such as those suggested below would significantly address many of the areas of inquiry that this study's results show are necessary for advancement in the field of DE.

1. In this study English 111 and Math 163 course grades for DE courses delivered on a college campus were significantly lower than the same courses when delivered online or at a high school. A study that expands the study to multiple colleges and college types (community college and 4-year college or university) could demonstrate whether this is a

trend across a college system. Additionally, if this is a trend, one could examine why it exists.

2. Although this study focused on final course grade, it did not address whether higher course grade was necessarily an indicator of college preparedness. This study could be expanded into a paired-samples study that addresses the question of whether higher final course grades equate to increased college success. This could be done by creating clear matched pair groups that compare a DE course grade to course grade earned in the same content area upon matriculation to a college or university.
3. Although this study compared DE delivery environments, a researcher could compare course delivery for AIMS students (or other students who have GPAs comparable to DE students) to delivery for DE students. This further disaggregation could demonstrate whether the delivery environments and student success for DE courses are commensurate with any mean differences between course delivery and student success across the board.
4. It is evident that the support systems embedded within DE courses are beneficial to students. A potential area of research for colleges (outside of dual enrollment) is an exploration of how these support systems can be incorporated for other students, either through increased student development courses or embedded supplemental instruction for gateway courses (such as those chosen in this study.)

In conclusion, the results of this study demonstrated that DE is effective insofar as it results in higher course grades as compared to comparable non-DE students. Although there were significant differences in final course grades for English 111, Math 163, and History 101 based on DE course delivery environment, this type of analysis should be further carried out by

colleges that offer DE courses within various environments at least on a bi-yearly (every 2 years) basis.

Ensuring that DE programs do shift with the nature of instruction and technology is not only a way to make sure that DE programs remain effective but that they are also efficient in carrying out the goal of promoting student success. Dual enrollment is an area that remains rich as an area for research; it is only through a study of the nuances of these programs that colleges can best serve their students and communities.

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APPENDIX

Exemption Letter from Institutional Review Board

Mountain Empire Community College

3441 Mountain Empire Road
Big Stone Gap, Virginia 24219

March 26, 2015

Ms. Bethany Arnold
English Instructor
MECC, Godwin Hall, Rm 111
barnold@mecc.edu

Re: MECC IRB Review # 2015-002 – A Comparative Study of Dual Enrollment Student Achievement in Various Learning Environments and Non-Dual Enrollment Student Achievement

Dear Ms. Arnold,

This letter serves as your official notice that the MECC Institutional Review Board Chair has determined that the above-referenced research proposal does NOT qualify as human subject research as defined by MECC IRB guidelines and will not require further IRB review.

Please note that any changes in the purpose or design of this project may have an impact on the criteria upon which this determination was made, and may require additional review by the IRB. If changes in the purpose or design of this project become necessary, please contact me to discuss possible impacts on the project's IRB compliance status.

Please let us know if we can be of further assistance.

Sincerely,

Nikki Morrison

Nikki Morrison
MECC IRB Manager

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VITA

BETHANY KAYE HALL ARNOLD

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