

An Examination of the Relationship Between Course Schedule Type and AP Exam Score  
Performance

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Dissertation submitted to the faculty of Virginia Polytechnic Institute and State University in  
partial fulfillment of the requirements for the degree of

Doctor of Philosophy

In

Curriculum and Instruction

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October 14, 2013

Blacksburg, Virginia

Keywords: AP Exam, block schedule, traditional yearlong schedule

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**Abstract**

Since the release of *A Nation at Risk* in 1983 student performance on a variety of high stakes tests have become increasingly important in educational settings. The results of this type of assessment are quantifiable, and are intended to indicate certain levels of academic performance and achievement. Advanced Placement (AP) Exams are one example of high stakes tests. With the rapid growth of Advanced Placement (AP) courses and the corresponding popularity of the AP Exams there is a need in the research to identify specific variables that may be influential to AP Exam score performance. Course schedule type, either in the 4×4 block or traditional yearlong format, has been examined as a variable that influences student AP Exam score performance. In some studies the implementation of a 4×4 block in place of a traditional yearlong course schedule type resulted in increased AP Exam score performance, while in other studies replacement of a traditional yearlong course schedule by a 4×4 block course schedule type resulted in decreased AP Exam score performance. The limitations in the existing research present a need for more controlled studies using multiple years of data to further examine the relationship between clearly identified course schedule types and AP Exam score performance. In response to the need, this research performed a controlled study and examined the relationship between three specific course schedule types and AP Exam performance over time. This study analyzed sample data using participants (N=428) from a single institution in a southeastern state in the United States enrolled in the same AP course subject, taught by the same instructor, and who completed the same subject AP Exam over multiple years (2008-2012).

## **Dedication**

This dissertation is dedicated to my lovely daughters, Lilamae and Adaline, my partner in life, Annemarie, my mother, Melanie Mott, and my late grandparents, Thomas and Ann Fritz. I could not be where I am or who I am today without these very important people. I love each of them with all I have.

## **Acknowledgments**

There are a number of people responsible for helping me reach this point. It has been a long but rewarding voyage, and I owe them all far more gratitude than is expressed below.

My committee chair and advisor, Dr. Ken Potter, has spent more time with me during this process than anyone else. I am sure he wishes to have many of those moments back, but I would not trade away any as they cultivated much of my progress. I would like to thank him profoundly, and I truly appreciate his extra effort and assistance.

Committee member Dr. John Burton instilled knowledge, patience, and professionalism I am fortunate to have experienced. Dr. Barbara Lockee emanates professionalism with a personal style, the likes of which I have attempted to replicate in my own practice. I would like to thank Dr. Aaron Bond for stepping up at the last-minute and on short notice. Each of these committee members made an important impact, and I am truly grateful for all they have done to help me. I appreciate the relationship I have forged with each of these individuals, and look forward to any continued camaraderie.

I have had the pleasure of working with a couple of very influential people. I would like to thank Dr. Gary Jones and Mrs. Cheri Kelleher for their professional support and all the valuable personal contributions they have made.

I have also been blessed with incredible friends at VPI throughout this process: Mike Murphy, Brian Moseley, Yavuz Samur, Samantha Blevins, Larry Cox, and Lee Rakes. We have shared quite a bit, and I hope each of you will remain a trusted friend and colleague.

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## **Chapter One: Introduction and Need for the Study**

High stakes tests are described as assessments in which the outcomes are a central determining factor in a significant decision (Amrein & Berliner, 2002). Often high stakes tests have meaningful consequences attached to performance. In educational settings the outcomes of high stakes tests are frequently given significant weight in student acceptance, promotion, placement, and completion in various levels of their academic pursuits (Nichols & Berliner, 2007). The results of these high stakes tests have become a principal component of American high school and college affirmation or recognition. Over the past thirty years the practice of high stakes testing has increased in educational settings, and outcomes of these assessments have become increasingly important to students, parents, educators, and legislators.

In 2001 the No Child Left Behind Act legislation established and promoted the use of high stakes testing in K-12 institutions in the United States. This landmark legislation specifically required states to use high stakes test results as one basis used to determine adequate yearly progress, or AYP (Cochran-Smith, 2005). Consequently, high stakes tests are now regularly used to allocate educational resources; therefore the results of these types of tests are of increased importance. Supporters of high stakes tests advocate that more motivated students and educators need high-stakes tests to know what is important to learn and to teach (Pedulla, Abrams, Madaus, Russell, Ramos, & Miao, 2003). Supporters of these types of tests also assert instructors can be held accountable through high stakes testing thereby motivating them to deliver better instruction (Pedulla et al., 2003). Additionally, supporters of this type of assessment claim the results are a good evaluator of the curriculum that is taught to students in schools, and provide an equal opportunity for all students to demonstrate their knowledge (Amrein & Berliner, 2002). Since the results of this type of assessment have become

increasingly important improved score performance is often a chief interest for test takers and other stakeholders.

The College Board's AP Exam is an example of a high stakes test, and the results carry potentially meaningful benefits and consequences for test takers. Since its inception nearly sixty years ago the College Board's Advanced Placement Program has grown dramatically in scope and popularity with American high school students, parents, educators, and legislators. The Advanced Placement Program is a comprehensive program that offers students the chance to participate in college-level classes while still enrolled in high school, or similar college prep institution (College Board, 2011). The Advance Placement program is more commonly known in educational settings as the AP program (Byrd, 2007). The AP program was established in 1955, and was originally designed as a mechanism for granting exceptional northeastern prep school students in the United States the opportunity for advanced study that would be equivalent to college-level course work (Stemler, Grigorenko, Jarvin, & Sternberg, 2006). The AP program is named for the initial program objective where advanced achievement tests were to be offered to these high school students and colleges and universities who supported the program could grant these entering students college credit and advanced placement into courses beyond those of typical first year college students (Jones, 2001).

The AP Program developed rapidly and continues to be popular among American high school students. The AP Examination, a core assessment tool of the AP program, is the part of most interest to parents and students (Highsmith, 1989). This examination is more commonly known as the AP Exam. As an institution, the College Board administered more than 3.6 million AP Exams to 2.1 million students in the 2012 academic year (College Board, 2013b). A large and increasing number of high school students regularly take advantage of the AP program and

AP Exams to expand and challenge their intellectual perspective, enhance a competitive college application, and prepare them for college-level course work.

AP Exam score performance is the quantifiable measure by which AP students can earn verified college credit for an AP course completed in high school. However, AP Exams only provide an opportunity for high school students to obtain the college credit if they pass these AP Exams with a sufficiently high score. The AP Exams are graded on a 1-5 scale: a score of 1 carries no recommendation for college credit, and a score of 5 is considered extremely well qualified for college credit (Deerwester, 2007). AP Exam scores in the 3-5 range are typically regarded as passing scores, and often accompany recommendations for advanced placement (Stemler et al., 2006). AP courses and the associated AP Exams are of great importance for high school students interested in going to college and obtaining verified course credit while simultaneously meeting the graduation requirements of their high school.

AP Exam score performance also can play a large part in the American college admissions process. Although the AP program was designed as a college placement incentive, taking AP courses has clearly become a significant factor in a highly selective college admissions process (Jones, 2001). The AP Exam results are viewed as a measure showing student intellectual ability, interest in learning, and genuine desire to achieve academically (Stemler et al., 2006). The AP Exam scores are also used as a standardized measure of performance when evaluating applicants (Stemler et al., 2006). The AP Exams are popular not only with college-bound American students; international high school students seeking admission and advanced placement in American institutions of higher education also utilize the exams. For example, in 2012 over twenty five thousand AP Exams were administered to roughly seventeen thousand Canadian students (College Board, 2013b).

With an annual yearly growth rate of 9.3 percent over the last two decades, Advanced Placement courses and AP Exams have become a juggernaut in American high school education (Sadler, Sonnert, Tai, Klopfenstein, & Harvard 2010). Today there are roughly 35,000 high schools in the U.S. (U.S. Department of Education, 2012). Approximately sixty percent of U.S. high schools routinely participate in the AP program (Byrd, 2007). Public and private high schools may offer as many AP courses as they like, and students may take as few or as many of these courses as they want, though schools may establish prerequisites for enrolling students in these courses (Jones, 2001). The increased access to AP courses and AP Exams has resulted in rapid growth and popularity of the AP program, and therefore increased consciousness of the AP Exam results.

There is motivation for students, parents, and educators to participate in the expansive AP program. The benefit for students and their parents is quantifiable as a savings of time and money: take AP courses, score well on AP Exams, get sophomore standing, graduate ahead of schedule, and save on costs associated with tuition (Pushkin, 1995). The cost savings are significant as placing out of a college course can save a student thousands of dollars in tuition in subsequent years (Stemler et al., 2006). Studies have indicated AP students are more likely to graduate from college in four years, and students who take longer to graduate at public colleges and universities can spend up to \$19,000 for each additional year (College Board, 2008). AP classes also provide students with a more a more rigorous course path than traditional high school courses (Jones, 2001). AP students are twice as likely to go on to graduate school, graduate with a double major, and specialize in majors with tougher grading standards (Curry, MacDonald, & Morgan, 1999). With each AP Exam only taken once, coupled with the

potentially significant financial savings and educational rewards associated with the outcome of the exam, the AP Exam undoubtedly qualifies as a high stakes test (Stemler et al., 2006).

Researchers and educators have identified methods to improve student performance on high stakes tests. One such method involves the modification of course scheduling to make more appropriate use of class time. Introduced by Joseph M. Carroll in 1990, the Copernican Plan of scheduling quickly became commonly known as block scheduling (Gee, 1997). This course scheduling method promotes fewer classes per day, and devotes more time on task or time for instruction for each class period. The alternative block course schedule developed from the criticisms that a traditional class period of less than an hour was insufficient in meeting modern learner needs, and a subsequent demand for more instructional time (McLeod, Fisher, & Hoover, 2003). The traditional yearlong course schedule typically divides a school day into seven or eight periods that run approximately fifty-minutes to one hour in length, while a block scheduling approach has four or five class periods that run longer than this time in length (Murray, 2008). The block scheduling method uses approximately ninety minutes for each class period, but in some block course schedule types students may not take these extended courses for an entire school year.

Increased instructional time or time on task for each class period is central to all block schedule models. Although there are different types of block scheduling formats all of the block schedule types increase the amount of time dedicated for instruction by extending classes beyond the traditional fifty-minute to one-hour class period (Lewis, Dugan, Winokur, & Cobb, 2005). Supporters of block schedules advocate that because of this increased time there are more opportunities in a block class period for instruction, remediation, intervention, practice, and meeting modern learner needs than in a traditional fifty-minute to one-hour class period.

The block schedule has grown in popularity since Carroll introduced the plan. Within two decades of its introduction approximately one-third (34.5 %) of public schools in the United States reported utilizing some variation of block scheduling (National Center for Educational Statistics, 2008). Research has found that a change to the block schedule tends to produce a higher frequency of students who feel more academically focused, achieve honor roll status, successfully complete AP courses, and exhibit lower occurrence of academic failure (Evans, Tokarczyk, Rice, & McCray, 2002). Research also indicates that block scheduling may have important non-academic advantages, including a calmer school atmosphere, better discipline, and improved student attitude (Kramer, 1997).

One of the most prevalent block models used by schools is the four-by-four, or 4×4, block schedule (Lewis et al., 2005). The 4×4 block schedule consists of approximately four ninety-minute class periods each day, and the additional time means course hours are completed in one semester rather than over the span of an entire school year (Queen, 2003). In the 4×4 block schedule, students complete four traditionally yearlong courses, which meet for about ninety minutes every day, over a single semester; teachers teach three courses each semester, and students enroll in four new courses (teachers teach three) for the second semester (Rettig & Canady, 1997).

### **Need for the Study**

Despite the increased interest and value of AP Exam results and the rise in alternative course schedule types, like the 4×4 block schedule, the current body of research studying the relationship between course schedule type and AP Exam score performance is limited and inconclusive (Zepeda & Mayers, 2006; College Board, 1998). The literature has yet to clearly identify which course schedule type, if any, is most associated with strong performance on the

AP Exam. Shortcomings of existing studies include use of data limited to a short period, often only one academic school year, and frequent failure to identify the specific block schedule type analyzed (Zepeda & Mayers, 2006). Additionally, existing literature examining the relationship between course schedule type and AP Exam score performance is considered to be inconclusive as results are often characterized as inconsistent (Zepeda & Mayers, 2006). The College Board stated in 1998 (as cited in Benham, 2006) there is a need for controlled, longitudinal studies of the impact of block scheduling upon learning. Due to the limited and incomplete nature of the existing studies there is a need for additional controlled research in search of reliable findings.

There is a need for more research to be done about what is occurring in the course schedule type and AP Exam score performance interaction, particularly if both block schedule and AP growth continue their current growth trends in educational settings (Zepeda & Mayers, 2006). When viewed independently both block scheduling and AP Exams tend to be viewed positively. However, when the two mesh the outcomes are not always positive. There is some evidence the consequences of block scheduling use are negative rather than positive in comparison to the traditional yearlong schedule. Zepeda and Mayers (2006) found some studies with results in which the block scheduling system led to decreased AP Exam scores (Snyder, 1997; Knight, De Leon, & Smith, 1999). Zepeda and Mayers (2006) also found other studies in which results indicate the block schedule led to increased AP Exam scores (Evans et al., 2002). In spite of the previous negative interactions, the demand for AP Exams or the block schedule as a course scheduling preference is unlikely to cease. If that is the case, should students, instructors, and parents be concerned about the interactions between course schedule type and AP Exam performance?

A possible cause for concern for AP students enrolled in 4×4 fall block and 4×4 spring block is related to the AP Exam date. Because the AP Exams are annually administered in early May, students in the 4×4 fall block course schedule will experience a time lapse consisting of several months between the end of their course and the AP Exam and students in the 4×4 spring block course schedule will likely be unable to cover all course content in time for the May AP Exam date. The College Board, as the developer, administrator, and grader of the AP Exam, has received numerous requests to alter the AP Exam schedule to accommodate students attending 4×4 block schedule schools (College Board, 1997). In response the College Board agreed to a single accommodation made by delaying the May test dates by one week, thus allowing second semester block schedule AP students to complete more course work prior to the AP Exam (College Board, 1997). However, it has been more than fifteen years since the College Board first addressed the matter of course schedule type and AP Exams. The College Board has been, and is still, studying the matter related to the possibility of a second, January test date to accommodate the appeals of many school districts to the College Board; these appeals have asked for a January test date to avoid the time lapse between course completion and assessment (Gullat, 2006). Instead of adding another AP Exam date the College Board has suggested that more controlled studies using many years of data are required to investigate the full effects of block scheduling on learning before any permanent decisions or accommodations will be made (College Board, 1998).

In spite of the above recommendation by the College Board (1998) the current body of existing research has failed to address the recommendation; instead, much of the existing research has been limited, ambiguous, and lacking controls, and have often yielded inconclusive results (Zepeda & Mayers, 2006). Very few studies have focused on AP Exam score

performance for students in specifically identified course schedule types over many years. Based on the limited existing research and the recommendations of the College Board (1998) and Zepeda and Mayers (2006) there is a clear need for more controlled research to be done exploring the relationship between the course schedule type and AP Exam score variables over time.

### **Purpose Statement of the Study**

The purpose of this study was to examine the relationship between course schedule type and AP Exam score performance results over an extended period of time while controlling for potentially confounding variables. Specifically, this study conducted an analysis of the relationship between course schedule type and AP Exam score performance over five years (2008-2012). Additionally, specific variables were controlled including institution, course instructor, course subject, and AP Exam subject. It is not unusual for a single instructor at the same institution to teach the same course subject over multiple course schedules types. Unlike prior studies, this study presented and capitalized on such a scenario in which the same instructor taught the same course over a period of five years at the same institution using multiple course schedule types.

The research approach in this study was consistent with the suggestions and recommendations of both the College Board (1998) and Zepeda and Mayers (2006). The College Board (1998) suggests a need for more controlled research as well as additional research using data collected from more than one year. Zepeda and Mayers (2006) advocate studies that specifically identify the course schedule types examined in the study as many of the existing studies fail to identify the specific course schedule types. Zepeda and Mayers (2006) also found most of the existing studies examining the relationship between course schedule type and AP

Exam score performance use data from a single year. Additionally, Zepeda and Mayers (2006) propose studies that depict block scheduling over time may yield more conclusive results, and then perhaps some of the existing contradictions in the current body of research could be resolved. Zepeda and Mayers (2006) suggest these types of studies could help to clarify the mixed messages that we are currently receiving about AP student achievement and performance, and generate more stable findings.

### **Research Questions**

In support of this study's purpose the following research questions were designed to explore data and provide a more detailed description of the relationship between AP Exam score performance and course schedule type over multiple years while controlling for potentially confounding variables:

1. When controlling for institution, instructor, course subject, and AP Exam subject, is there a statistically significant difference in AP Exam performance for students operating under fall block, traditional yearlong, and spring block schedules when examined over a five-year period of time?
2. When controlling for institution, instructor, course subject, and AP Exam subject, are the yearly results consistent with five-year results regarding AP Exam performance for students operating under fall block, traditional yearlong, and spring block schedules?

### **Significance of the Study**

This study attempted to determine if AP students are advantaged or disadvantaged on the AP Exam based on their course schedule type. The last fifteen years of investigation into the course schedule type and AP Exam score performance relationship has produced limited research and inconclusive findings (Zepeda & Mayers, 2006; College Board, 1998). This research was

designed to search for more conclusive findings, and attempted to meet the suggestions and recommendations of both the College Board (1998) and Zepeda and Mayers (2006) by conducting controlled and specific research, and analyzing multiple years of data. A study of AP Exam score performance and specifically identified course schedule types like this is important for several stakeholders. First, understanding the relationship between course schedule type and AP Exam score performance can help AP students and parents evaluate which schedule is most accommodating to AP Exam performance. Second, the decision facing educators and administrators concerns the type of course schedule to encourage and employ at their institution. Knowledge of the AP Exam results for each specific course schedule type can serve as input in that decision. Third, researchers have studied the relationship between AP Exam score performance and course schedule type, but their findings have been both limited and inconsistent. Results of this study can hopefully clear up some of the inconsistencies in the current literature, and contribute to current research by conducting a study consisting of multiple years of data.

This study may also help instructional designers improve student performance and determine the relationship course schedule type may have with student performance on the AP Exam. Students and their performance are the focal point of the principles of instructional design (Branch, 2010). In educational settings there is a need to prepare both instructors and learners to interact with available resources in the most efficient way, and one purpose of instructional design theory is to identify what methods are most efficient. When designing an efficient blue print for academic success the course schedule type is a central component of the delivery method, curriculum planning, and any instructional modifications. By shedding some light on the relationship between course schedule type and AP Exam performance, this study

should help instructional designers, instructors, students, and other educators more accurately identify how, or if, these factors pose challenges in preparing for the AP Exam.

### **Organization of the Document**

This document is organized around five chapters. Chapter One provides the background of the research, an introduction to the study, the purpose of the study, significance of the study, and the research questions posed in the study. Chapter Two provides a review of the literature relevant to the topics of the study with four primary elements: The AP program, AP Exams, course schedule types, and the existing empirical studies. Chapter Three describes the methodology employed in the study, including the general design of the study, and the data collection and analysis procedures employed. Chapter Four presents the results of the data analysis. Chapter Five, as the final chapter, discusses these results and their possible implications for future practice and research.

## **Chapter Two: Review of Literature**

This chapter presents and examines the literature associated with the four primary elements of this study. Specifically, this chapter provides a review of literature in the following four relevant areas: (a) the Advanced Placement program; (b) AP Exams; (c) school course schedule types; and (d) the existing empirical studies examining the relationship between course schedule type and AP Exam performance. This chapter concludes with a summary of how these four areas of the literature meet at a nexus, and support a demand in the research to meet the research suggestions and recommendations of the College Board (1998) and Zepeda and Mayers (2006) to conduct more controlled research over time in search of more valid and conclusive findings.

### **The Advanced Placement Program**

The College Board, a non-profit association, was formed in 1900 and is composed of numerous schools, colleges, universities, and other educational associations of learning (College Board, 2011). As an institution, the College Board's stated goal is to promote excellence and equity in education through programs for K-12 and higher education institutions and by providing students a path to college opportunities (College Board, 2011). The College Board also serves the education community through research and advocacy on behalf of students, educators, schools and colleges (College Board, 2011). The College Board's stated purpose is to ensure that all students have access to a high quality education (College Board, 2011).

Collectively, the College Board maintains relationships with more than nine hundred school divisions in the United States (College Board, 2011). The widespread notoriety of the College Board name resulted in over fifty million registered hits on their website in 2010 (College Board, 2011). The College Board administers numerous different standardized tests

used by academic and education institutions to measure student ability and competence (Stemler et al., 2006). The most widely recognized of these standardized assessments are the Scholastic Assessment Test (SAT), the Preliminary SAT (PSAT), and the Advanced Placement (AP) Exams (College Board, 2011). In the 2010 academic year the College Board administered more than three million SAT exams, and in the same year more than half of all U.S. public school district students completed the PSAT (College Board, 2011). Also in 2010, the College Board facilitated 130,000 AP teachers, administered more than 3.2 million AP Exams at 23,000 high schools, and reported scores to approximately 3,800 colleges (College Board, 2011). Overall, in 2010 the College Board had an influence on more than seven million students. Due to the expansive scope of testing services the College Board works in conjunction with the Educational Testing Service, commonly known as the ETS, to successfully administer this growing number of assessments (College Board, 2011).

The College Board's Advanced Placement Program is a comprehensive program that offers students the chance to participate in college-level classes while still enrolled in high school or a similar college prep institution (College Board, 2011). The Advanced Placement program is commonly known as the AP program (Byrd, 2007). The AP program was established in 1955 and was originally designed as a mechanism for granting exceptional high school students the opportunity for advanced study that would be equivalent to college-level course work (Stemler et al., 2006). The AP program is named for the initial program objective in which advanced achievement tests were to be offered to high school students and the colleges and universities that supported the program could grant these entering students advanced placement into courses beyond those of typical first year college students (Jones, 2001). Since the earliest days of the

College Board the AP program has taken on a life of its own, and has spread widely throughout American high schools (Lichten, 2000).

Over fifty years ago, when the Advanced Placement program was created at the intersection of interests between elite schools and a small number of highly selective colleges, few onlookers could have predicted that the AP program would burgeon into the single largest determiner of college freshman course credit in American higher education (Jones, 2001). AP courses and associated AP Exams provide an opportunity for high school students to obtain college credit if they pass the exams with sufficiently high scores. AP courses and AP Exams can be of great importance for students interested in going to college and obtaining course credit while meeting graduation requirements of their high school. The results of the AP Exams also have potentially significant financial implications, as placing out of a college course can save a student thousands of dollars in tuition in subsequent years (Stemler et al., 2006). In addition, although the AP program was designed as a college placement incentive, taking AP courses has clearly become a significant factor in the highly selective college admissions process (Jones, 2001). High school counselors often tell students that they must complete a certain number of AP courses and AP Exams to be deemed plausible candidates to enter America's best colleges and universities (Byrd, 2007). The AP program has experienced rapid growth as a result of the programs acceptance in educational settings and potential opportunities for students, parents, and educators often hinge on the results of the program's AP Exams.

### **AP Exams**

At the core of the College Board's AP program are its examinations, which are administered at the end of each academic year (Lichten, 2000). These examinations are commonly known as the AP Exams. The College Board develops and produces the AP Exams.

In the event of a successful AP Exam performance, a student may receive verified college course credit and advanced placement beyond that of most first year college students.

The College Board is committed to providing access to AP Exams to all students, including homeschooled students and students whose schools do not offer AP classes (College Board, 2011). International students attending American colleges and universities may also take AP Exams. Students in these cases do not have to take an AP course before taking an AP Exam, and therefore many more AP Exams are administered beyond those in American high school classrooms (College Board, 2013b).

Each AP Exam consists of two sections, multiple-choice and free-response, except for the three AP Studio Art exams, which are portfolio-based assessments (College Board, 2011). Multiple-choice questions consist of a question stem and five possible response options, with only one being correct. Free-response questions can take the form of essays, oral responses, or problems to solve (Jones, 2001). With slight variances for each AP exam, equal weight is generally given to each section in the exam-scoring process (College Board, 2011). The free-response and multiple-choice questions are then both used to create a composite AP Exam score.

Success on AP Exams requires learners to demonstrate they possess an in depth understanding and expertise of the assessed material, concepts, and course content (Stemler et al., 2006). Through the widespread use of the AP program millions of high school students attempt to gain verified college credit for their high performance on the AP Exams annually (College Board, 2011). AP Exams also play a large part in the college admissions process, showing a students' intellectual ability, interest in learning, genuine desire to achieve academically, and the scores on AP Exams are used as a standardized measure of performance when evaluating applicants (Stemler et al., 2006). Granting college course credit for AP courses,

however, is still at the discretion of each prospective college or university. Colleges will typically grant verified credit to students who score a 4 or 5, however all college policies vary by AP course and exam score (Byrd, 2007).

The AP Exams are given annually, typically during the first two to three weeks of May. For most students, taking the AP exam in May serves as the natural culmination of their AP course experience (Byrd, 2007). This spring test date is typically near the end of most school schedules. The lone test date permits the College Board to coordinate the massive task of grading millions of AP Exams, and assemble trained readers to score the exams each year following the single May exam date. The grading process involves bringing in graders from around the world to the U.S for a one-time grading of all AP Exams administered in that academic year (Byrd, 2007). Every year in June AP teachers and college faculty members from around the world gather in the United States for the annual AP Reading to grade the AP Exams (College Board, 2011). There they evaluate and score the free-response, or written sections, of the AP Exams.

Grading AP Exams produces composite scores and these composite scores ultimately are translated into exam scores ranging from 1 to 5 based on a statistical technique called equating (College Board, 2013a). Equating is accomplished by looking at how well AP students performed on a set of multiple-choice questions that is common to more than one AP Exam year (College Board, 2013a). These particular multiple-choice questions cover the curriculum content and provide information about the ability level of the current group of students and indicate the current exam's level of difficulty (College Board, 2013a). The overall goal of equating is for the AP Exam scores to reflect an absolute scale of performance which can be compared from year to year (College Board, 2008). AP Exam equating is necessary to ensure that scores across

multiple test administrations are equivalent, can be used interchangeably, and the reliabilities of all the AP Exams are high with no significant differences in the reliabilities among the tests (Lee, Lee, & Brennan, 2012).

### **Course Schedule Types**

Improving student performance on high stakes exams like the AP Exam has been of increased interest to students, parents, educators, administrators, and legislators. The focus of the interest has been to identify factors that influence performance. One factor that has been examined is course schedule types. Educators and administrators have learned a great deal about how to improve student learning and performance, but for a variety of reasons many of these theories have not been put into practice (Mistretta & Polansky, 1997). One of the major obstacles has been the limitation imposed by limited class time (Mistretta & Polansky, 1997). Recently, the No Child Left Behind legislation has produced a focus on many educational topics such as the intensity of class time and the restructuring of the school day (Dexter, Thai, & Sadler, 2006). Educators, administrators, parents, and students are now in search of a course schedule type that provides adequate class time and, in turn, produces high academic achievement and performance (Dexter et al., 2006).

The Carnegie Unit of class scheduling was established in the early twentieth century and quickly became the prevailing course schedule type. This school scheduling system was designed to homogenize high school credits by assigning one unit of value to a subject taught one hour a day, five days a week, for one school year (DiMartino & Clarke, 2008). This method of scheduling, also known as the traditional or yearlong schedule, has been the standard in American K-12 educational settings for nearly a century. The traditional yearlong course schedule is presently active in all levels of K-12 educational settings in the United States. The

traditional yearlong schedule used in many schools today is similar in structure to, and derived from, the Carnegie Unit of scheduling (DiMartino & Clarke, 2008).

In the last few decades trends and reforms in K-12 institutions have resulted in an exploration of alternate course schedule types, and the criticisms of the Carnegie Units as the basis for school course scheduling have resulted in an increased interest in alternative scheduling options (Knight, De Leon, & Smith, 1999). Opponents of the traditional yearlong schedule and those in favor of schedule reform claim the Carnegie Unit type of traditional yearlong scheduling may not allow some students enough time for learning, and may prevent others from accelerating their coursework (Knight et al., 1999). In response, innovative scheduling methods have provided a means of varying learning time, increasing opportunities for quality instructional time which is less fragmented than the traditional yearlong schedule, improving the transition for students through primary school to high school, and improving school climate (Canady & Rettig, 1995). Emerging course scheduling methods have also challenged the total time on task and time for instruction in each class period that is available in a traditional yearlong course schedule type.

One such scheduling method accepted as an alternative to the traditional yearlong schedule is the block schedule. Introduced by Joseph M. Carroll in 1990, the Copernican Plan is more commonly known in contemporary settings as block scheduling (Gee, 1997). The Copernican Plan is predicated on the assumption that, if the course schedule for students and teachers is reoriented to accommodate better instructional practice, more effective instruction can be implemented (Carroll, 1990). Implementation of block scheduling types resulted from the criticisms that a class period of less than an hour was insufficient in meeting modern learner needs and a demand for more instructional time (McLeod, Fisher, & Hoover, 2003). The block

schedule has been used frequently in the last two decades as a replacement or alternative to the traditional yearlong schedule. This course schedule type has quickly been established as an alternative to the traditional yearlong schedule in K-12 educational settings as supporters of education reform look to the block schedule as the principal substitute for the traditional yearlong schedule (Queen, 2003).

A traditional yearlong schedule divides a school day into seven or eight class periods that run approximately fifty minutes to one hour in length, while a block scheduling approach has four or five class periods that run approximately ninety minutes each (Murray, 2008).

Approximately one third (34.5%) of public schools in the United States have reported utilizing some variation of block scheduling (National Center for Educational Statistics, 2004), and some estimate the number to be as high as half (50%) in secondary schools (Dexter et al., 2006).

Although there are different models of block scheduling, all formats are based on the increased amount of time dedicated for instruction by extending classes beyond the traditional fifty-minute to one-hour class period (Lewis, Dugan, Winokur, & Cobb, 2005).

One of the most prevalent block models used by schools is the four-by-four, or 4×4, block schedule (Lewis et al., 2005). The 4×4 block format consists of approximately four, ninety-minute class periods each day, and the additional time means courses are completed in one semester rather than over the course of an entire school year (Queen, 2003). In this course schedule type students can complete up to eight courses in a single academic year opposed to only six or seven courses in the traditional yearlong schedule. Students in this course schedule type can also complete sequential courses in consecutive semesters within a single year, and in the traditional yearlong schedule students would likely be required to take sequential courses in two separate academic years. A sample 4×4 block schedule is presented below in Table 1.

Table 1

*Sample 4×4 Block Schedule*

<b>Time</b>	<b>Semester 1: Fall Block</b>	<b>Semester 2: Spring Block</b>
8:00 – 9:25 AM	Biology	US History
9:35- 11:00 AM	English 11	Physical Education
11:00 – 11:30 AM	Lunch	
11:35 – 1:00 PM	<i>Elective</i>	<i>Elective</i>
1:10 – 2:35 PM	Algebra	<i>Elective</i>

Another variation of block schedule is the alternate day block, commonly known as the A/B block schedule. This type of block schedule has students and teachers meet for extended time periods in assigned subject areas two or three days each week throughout the year (Queen 2003). A third category of block schedule, known as the modified block schedule formats, combine block and traditional scheduling elements by adding an additional class period of time to a specific content area on a regular basis (Queen, 2003). Multiple configurations of the modified block exist, and students take six to eight courses a year in a wide range of traditional length or block periods (Harvey, 2008). Various block scheduling configurations and models can influence the way instruction time is used, time on task, teaching practices, and learning outcomes (Danielson, 2002).

The block schedule types provide more instructional time for teaching, learning opportunities, and curriculum planning (Queen, 2003). According to a school philosophy suggested by Danielson (2002) school time should be scheduled and instruction provided in long blocks, permitting teachers the maximum degree of flexibility to meet student needs. Under the

Copernican Plan, a teacher prepares for and teaches only one or two classes at a time. Additionally, the average class size in a block schedule can be reduced by about 20 percent (Carroll, 1990). Carroll (1963) explored the relationship between learning and time, and ultimately described learning as a function of the ratio between the amounts of time spent on learning over the amount of time needed to learn. In cases where the amount of time spent on learning under a traditional scheduling approach is less than the time needed, the additional time on task in a block schedule should positively effect student achievement based on Carroll's (1963) theory about the relationship between time and learning.

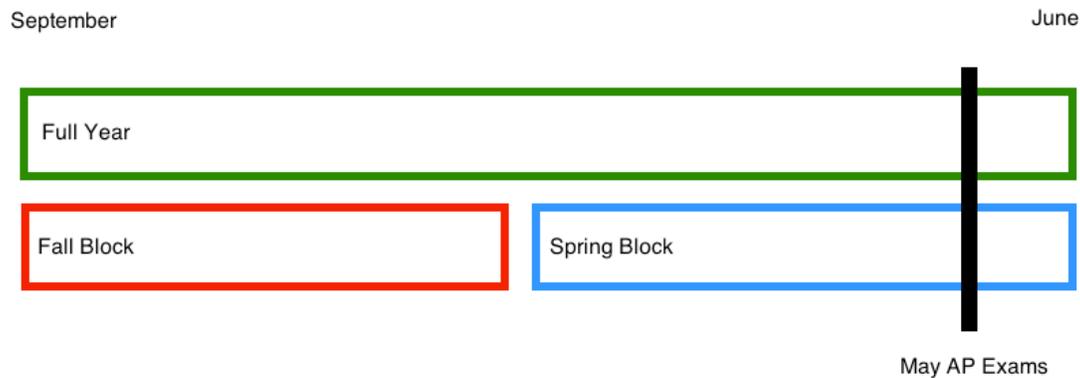
Parents tend to prefer the block schedule due to fewer courses per term therefore giving their children homework for only four courses per day instead of seven or eight in the traditional schedule (Childers & Ireland, 2005). Parents also support the block schedules as it provides students the option to complete more credits, including AP courses, than in the traditional yearlong schedule (Gullat, 2006). Research has shown the results of a change to block schedule have reliably indicated enhanced students morale, greater student satisfaction, and improved student-teacher relationships (Hackman, 2004). Block schedule programs also tend to produce a higher frequency of students who feel more academically focused, achieve honor roll status, successfully complete AP courses, and exhibit lower occurrence of academic failure (Evans et al., 2002). Evans et al. (2002) noted that block scheduling methods facilitate team teaching, allow for more student-centered activities, allow students to take additional courses, permit longer and more enhanced courses for students with disabilities, and are a better fit for schools practicing inclusion. The most common reason cited for using the block schedule is longer periods of instruction, whereby teachers can delve more deeply into content and provide students

with more learning opportunities such as laboratory experiences, cooperative group work, and project-based learning tasks (Zepeda & Mayers, 2006).

### **Course Schedule Type and AP Exam Performance**

Improved student performance and achievement is at the core of the block schedule's popularity. However, in spite of the considerable support in educational settings for the block schedule, evidence from the literature does not always support the effectiveness of block scheduling on student achievement and test performance (Gullatt, 2006). Although research has identified settings in which the block schedule is associated with improved test score performance, research has also identified settings in which the block schedule is associated with decreased test score performance (Zepeda & Mayers, 2006).

Consistent with a traditional yearlong, or full year, high school schedule, end of year high stakes assessments, like the AP Exams, are administered near the end of the school term in the spring. Often these assessments are administered only once each year based on the traditional yearlong end of course schedule. The single test date has caused concern for students enrolled in the 4×4 block course schedule type. Students who took an AP course first semester may be rusty and some material obtained during the fall block course may be forgotten before the students can take their end of year tests (Gullatt, 2006). Also, spring block courses may conclude after the end of year test date so students who took an AP course second semester might not cover all the tested material by the time the end of year test is administered (Kramer, 1996). The three course schedule types and the AP Exam date are demonstrated below in Figure 1.



*Figure 1.* AP Exam date and the three course schedule types

The College Board has received numerous requests to alter the AP Exam schedule to accommodate students attending 4×4 block schedule schools; many school districts have appealed to College Board asking for a January test date (Gullat, 2006). Formal statements concerning this issue have been issued by the College Board at regional academic conferences in September, 1996 and February, 1998. In partial response to the requests, the College Board agreed to delay the May test dates by one week thus allowing second semester 4×4 spring block schedule AP students to complete more course work prior to the Exam. However, the College Board was, and apparently is still, studying the matter related to the request for January test dates for fall block AP students. The College Board has thus far failed to approve this request (Gullat, 2006). The College Board has stated that a controlled study using data collected over time is required to investigate the full effect of block scheduling on learning before any permanent decisions or accommodations regarding the AP Exam will be made (College Board, 1998).

In the interim, the College Board has used surveys of 4×4 block schedule schools to note accommodations and common solutions that schools have deployed to mitigate any effects of the time interval between course completion and the AP Exam date. They found the primary solution is the utilization of planned review sessions prior to the actual exam (College Board, 1997). Nonetheless, there is still a concern for student AP Exam performance in such a course

schedule setting. Under most block schedules, students who take an AP class in the fall will have to wait until spring to take the AP Exam, and their teachers wonder about the impact of the delay on their scores (Queen & Gaskey, 1997). Classroom teachers have continued to express concerns regarding the retention of knowledge over varied and lengthy time intervals between instruction and assessment (Kramer, 1997). In fact, studies have found one of the chief concerns a school faces in the transition to a block schedule is voiced by teachers who prepare their students to take AP Exams each spring (Queen & Gaskey, 1997).

### **Existing Empirical Research**

The existing research of the course schedule type and AP Exam performance relationship in high school settings typically fall into three general study design categories. The first type of study typically examines and compares results of AP Exams for a single year within the same school that employs both the block and traditional yearlong course schedule types. The second type of study design assesses how the results of AP Exams were compared in consecutive academic years at a school that recently changed to a block schedule from the traditional yearlong schedule. The third type of study design looks at how different school course schedule types, both block and traditional yearlong, were used to compare student performance on AP Exams during the same academic year from different schools.

In an example of the first type of design study Knight et al. (1999) compared the performance of AP students in 4×4 block course schedule types with that of students in traditional yearlong course schedule types on AP Exams at the same school. They found the students in 4×4 fall and spring schedule block course schedule types performed significantly lower on AP Exams than their peers on traditional yearlong course schedule types (Knight et al., 1999). One noted limitation of this study by the authors was the small student sample size, and

the authors did not specify which block course schedule type, spring or fall, performed higher on AP Exams.

In an example of the second type of study Snyder (1997) examined AP Exam score results after a 4×4 block schedule replaced the traditional yearlong schedule at an Indiana high school. Snyder (1997) found the implementation of the 4×4 block schedule lowered AP Exam scores for both of the first two years after the schools switched from a traditional yearlong schedule. Snyder (1997) additionally found the number of high AP Exam scores, a 4 or 5, decreased and the number of lower AP Exam scores, a 1 or 2, increased after the implementation of the 4×4 block schedule. Another interesting find in the study was students enrolled in the fall semester 4×4 block courses scored lower even after a review intervention was held in the spring of the second year of the schedule switch (Snyder, 1997). This finding appears to challenge the College Board's (1997) suggested solution that planned review sessions prior to the actual AP Exam should be utilized to mitigate any effects of the time lapse between course completion and AP Exam date.

In another example of the second study design Guskey & Kifer (1995) tracked AP program participation in Virginia's Governor Thomas Jefferson High School, during the 1991-1992 school year and compared these findings to the results for 1992-1993 after the school restructured its schedule. The school moved from a traditional yearlong seven periods, forty-eight minute class period day, to four, ninety-minute 4×4 block periods per day in the 1992-1993 school year. In the 1991-92 school year, the final year of the traditional yearlong course schedule, two hundred and twelve AP Exams were taken. One hundred and twenty four students, or (58%) of test takers, scored a three or better on their AP Exams (Guskey & Kifer, 1995). After moving to the block schedule in the 1992-1993 school year one hundred forty

seven students (50%) of test takers, scored a three or better on their AP Exams (Guskey & Kifer, 1995). The findings in this study are limited due to the fact only one year of data was collected and analyzed for each course schedule enrollment type.

In another example of the second type of study Hansen, Gutman, and Smith (2000) found that six years after a block schedule replaced the traditional yearlong schedule AP Exam scores increased. The statistics used in this study were based on yearly averages for the three years of the traditional yearlong schedule preceding the implementation of the block schedule (1993-95) versus the first five years on the block (1995-2000). Hansen et al. (2000) found the overall pass rate (3 or better) on AP Exams increased by 33% in the block schedule. The findings of this study are limited due to the unspecified course schedule types and the limited sample size.

Hansen et al. note the sample of AP students constitutes a small percentage of the students at the school.

In a final example of the second type of study Evans et al. (2002) compiled data from three school districts in which the 4×4 block schedule replaced the traditional yearlong schedule. The districts changed to the 4×4 block schedule in the 1997-1998 school year after each of the schools operated under a traditional yearlong schedule in the 1996-1997 school year. Evans et al. (2002) found that approximately 25% more students completed AP courses and successfully passed the AP Exams in the 4×4 block schedule. After implementing the 4×4 block schedule no students in the three schools received the lowest score of 1 on an AP Exam. Evans et al. (2002) also found the number of students achieving scores of 3, 4, or 5 increased about 30% when compared to the final year of the traditional yearlong schedule. This study also used only one year of data for each course schedule type.

In an example of the third type Smith and Camara (1998) undertook one of the first studies of the course schedule type and AP Exam score performance relationship. In this study Smith and Camara examined the 1997 results of AP U.S. History, AP English Literature, AP Biology, and AP Calculus AB Exams for students enrolled in block and traditional course schedule types in the 1996-1997 school year. Smith and Camara (1998) found a lack of consistent statistically significant evidence to support if either the block or traditional yearlong course schedule type has an impact on AP Exam score performance within these four AP Exam subject areas. This study used only one year of data, compared mean AP Exam scores, and found the results were not uniform across the AP Exam subjects (Smith & Camara, 1998).

Zepeda and Mayers (2006) conducted an influential meta-analysis of more than fifty empirically based studies about block schedule reforms and student performance. They found studies in which block scheduling was associated with decreased AP Exam scores (Snyder, 1997; Knight et al., 1999). They also found studies where block scheduling was associated with increased AP Exam scores (Evans et al., 2002). A fifty-page matrix was developed to organize each study according to methodology, research questions, findings, and limitations Zepeda and Mayers (2006). The results of this analysis yielded studies characterized with missing information and limited data. Zepeda and Mayers (2006) found that 31 of 58 (53%) studies failed to identify the specific type of block scheduling used in the research. Further, 44 of 58 (76%) studies reported using only one year of data (Zepeda & Mayers, 2006). This failure to report important details and the deficiencies in many studies makes it difficult to compare findings. The Zepeda and Mayers (2006) analysis revealed a body of research characterized by limited and inconsistent findings, and suggested further research is needed, and this research may yield more definite and conclusive results. Zepeda and Mayers (2006) suggested studies that

depict block scheduling over time might resolve some of the existing ambiguities in the current literature and may offer more definite conclusions.

Recently, Gullatt (2006) attempted to further summarize the findings of the existing and previous studies on block course schedule types in high schools settings. Student achievement, performance, and preparation for AP Exams were a few of the methods used in this analysis to measure the effectiveness of block scheduling. A conclusion of the Gullatt (2006) review states, “Regardless of the methodology utilized to determine the success of alternate scheduling, the outcome has been mixed in many areas of the country” (p. 250). These inconsistent findings are consistent with the conclusions of Zepeda and Mayers (2006). One limitation of this study is the researcher did not describe the criteria or process for selecting relevant research.

### **AP Exam Review Approaches**

Prior research does not clearly indicate what effect, if any, the type of course scheduling has on AP Exam performance. In spite of the inconclusive or contradictory research results, a perception of an AP Exam performance and course schedule type issue appears to exist and three approaches have been employed most often to address this perceived AP Exam issue. First, AP courses can be offered as semester classes during the fall or spring semester just as any other class (Canady & Rettig, 1995). In this case, review sessions are usually provided to students prior to the AP Exam in May; this approach is supported by the College Board’s (1997) suggestion that planned review sessions prior to the actual AP Exam should be utilized to mitigate any effects of the time lapse between course completion and AP Exam date. A second approach is for AP class meeting times to be modified in the context of the 4×4 schedule to meet every other day for the entire year (Canady & Rettig, 1995). This technique of embedding an alternative A/B course schedule type for students within the 4×4 schedule has been used

frequently for addressing the end of year testing concern in a 4×4 format (Canady & Rettig, 1995). In a third approach AP classes can also be scheduled as two-term classes whereby the students in a block schedule school take two AP courses in one block class period for an entire year (Edwards, 1993). Other researchers have suggested schools with students in the AP programs should return to a more traditional Carnegie Plan of course scheduling (Gruber & Onwuegbuzie, 2001).

In addition to the three most popular approaches, other AP Exam review approaches have been pursued. Some school districts provide an instructor stipend for conducting spring review sessions prior to the May AP Exams (Furman & McKenna, 1995). Kramer (1996) noted one school held AP courses in the fall semester and offered an AP seminar in the spring, and other schools held block-length AP classes either all year or for three quarters of the year in an effort to prepare students for the AP Exam. Some schools have developed other approaches such as after school and Saturday review sessions (Queen, 2000). Additionally, some schools permit students to take a related elective course in the spring block to enhance knowledge in related subjects (Queen, 2000).

It should be noted the review activities discussed above are conducted even though research does not clearly indicate what effect, if any, the type of course scheduling has on AP Exam performance. Apparently the perception of an effect of course scheduling on AP Exam performance is sufficiently strong to cause decision makers to take action without strong evidence to support their moves.

## **Summary**

For more than fifty years the College Board's AP Program has provided high school students an opportunity to take challenging courses while still enrolled in high school, and

possibly earn verified college course credit. The AP Program continues to expand and thrive in contemporary K-12 educational settings as students, educators, parents, administrators, and legislators all possess certain incentives to participate in the AP Program. The AP Exams are high stakes tests because learners with a qualifying score can earn possible verified college credit. With the mounting academic and financial significance placed on the results of AP Exams improving performance has become increasingly important.

Contemporary education reforms and increasing pressure to improve student high stakes test performance and achievement have resulted in many changes to the traditional K-12 classroom. One recurrent modification in many educational settings has focused on the specific course schedule type. In many K-12 educational settings the traditional yearlong schedule has been replaced with a block schedule (Queen, 2003). There are many academic reasons given for a school to adopt the block schedule (Kramer, 1997). There also are concerns expressed regarding the negative effects of block scheduling. One of those concerns deals with the perception of an effect of block scheduling on AP Exam performance. However, the existing body of research examining the relationship between course schedule types and AP Exam score performance is limited and the results of these studies are characterized as inconsistent (Zepeda & Mayers, 2006; College Board, 1998).

Zepeda and Mayers (2006) and the College Board (1998) offer suggestions and recommendations for future research of the course schedule type and AP Exam performance relationship. Existing studies often include only one year of data, lack control for certain variables, and fail to specifically identify which schedule types are analyzed (Zepeda & Mayers, 2006). To address these shortcomings, Zepeda and Mayers (2006) suggest research that uses more than one year of data and specifically identifies the course schedule types analyzed may

yield more conclusive results, and then perhaps some of the existing ambiguities in the current body of research could be resolved. Zepeda and Mayers (2006) further suggest this type of study could also help to clarify the mixed messages that researchers are currently producing about student performance and generate more stable data. The College Board (1998) also asserts that more controlled research using many years of data must be conducted before any definitive conclusions can be drawn between AP Exam performance and student schedule type. The College Board (1998) suggests controlled research like this may lead to more consistent findings.

With respect to these suggestions and recommendations the existing research and studies since 1998 have not adequately met the suggestions of the College Board (1998) to conduct more controlled studies and use many years of data. Furthermore, research conducted since 2006 has not sufficiently met the recommendations of Zepeda and Mayers (2006) to specifically identify course schedule type and also include multiple years of data. Because of the problems associated with previous research, there is a clear need for additional and controlled research into this relationship in search of more decisive findings (Zepeda & Mayers, 2006). The research conducted in this study will extend the existing body of research examining course schedule type and AP Exam score performance by accounting for the recommendations and suggestions of the both the College Board (1998) and Zepeda and Mayers (2006) for more controlled research, using specified schedule types, and data from more than one year.

### **Chapter Three: Research Methodology**

This chapter features the research methodology and design that were developed in response to the research questions proposed in this study. In this chapter the purpose statement and research questions are restated first. Then this chapter specifically introduces and describes the research design, participants, instrumentation, data collection procedures, and the data analysis procedures. Finally, this chapter concludes with a summary of the research methodologies utilized in this study.

#### **Purpose Statement**

The purpose of this study was to examine the relationship between course schedule type and AP Exam score performance results over an extended period of time while controlling for potentially confounding variables. Specifically, this study conducted an analysis of the course schedule type and AP Exam score performance relationship over a five year period from 2008 through 2012. Additionally, the following variables were controlled: institution, course instructor, course subject, and AP Exam subject. Therefore, this study conducted controlled research, explicitly identified variables and their possible values, and statistically examined the relationship between course schedule type and AP Exam score performance results over a period of time.

#### **Research Questions**

In support of this study's purpose two research questions were designed to explore data and provide a more definitive description of the relationship between AP Exam score performance and course schedule type over multiple years:

1. When controlling for institution, instructor, course subject, and AP Exam subject is there a statistically significant difference in AP Exam performance for students operating under

fall block, traditional yearlong, and spring block schedules when examined over a five-year period of time?

2. When controlling for institution, instructor, course subject, and AP Exam subject, are the yearly results consistent with five-year results regarding AP Exam performance for students operating under fall block, traditional yearlong, and spring block schedules?

### **Research Design**

Using a quantitative statistical analysis method, this study was designed to explore the relationship between AP Exam score performance and student course schedule type. The dependent variable in this study, AP Exam score, is ordinal (Camara & Michaelides, 2005; Lee et al., 2012). Therefore, a nonparametric statistical analysis was appropriate (Howell, 2012). The independent variable, course schedule type, is nominal. Since both variables in this study are categorical a chi-square ( $\chi^2$ ) statistical test was used (Creswell, 2009). The data analysis procedures that were employed in this study are intended to (1) describe the AP Exam score performance and AP student course schedule type variables and (2) determine what relationships exist between AP Exam score performance and specific course schedule types over time.

Descriptive statistics were used in this study to examine the dependent and independent variables, appropriately explore the data, and provide a comprehensive description of the sample (Creswell, 2009). In an effort to move beyond descriptive statistics cross-tabulation analyses were performed and contingency tables created to explore the research questions proposed in this study. In a contingency table analysis the focus is on whether the distribution of one variable is contingent on a second variable (Howell, 2012). This analysis presents the distribution of the dependent variable, AP Exam score performance, at each level of the independent variable, course schedule type. Finally a Pearson's chi-square ( $\chi^2$ ) test was conducted on all AP Exam

score data from 2008-2012 to determine if there was a statistically significant difference between the obtained frequencies of AP Exam scores and the expected AP Exam scores over a five-year period of time. The five-year passing and not passing AP Exam scores for participants enrolled in the three course schedule types were also examined using the Pearson's chi-square ( $\chi^2$ ) test. Lastly, the Pearson's chi-square ( $\chi^2$ ) test was conducted for each of the individual years to determine if yearly passing and not passing AP Exam score results were consistent with the five-year results.

### **Participants**

The participants involved in this study were a nonrandom convenience selection from student enrollments at a public institution located in a southeastern state in the United States. Only a convenience sample was possible for this study because the researcher elected to use naturally formed class groups (Creswell, 2009). This institution offers online courses and other distance learning opportunities for middle and high school students. One of the principal applications of this institution is Advanced Placement instruction in an online course format. The total population of the institution is between 3000 and 4000 students annually. Most of the enrollments are AP, foreign language, or honors courses. The online courses offered by this institution are generally asynchronous, but do incorporate synchronous instructional sessions as well.

Students at this particular institution are enrolled in one of three different course schedule types during course registration; the traditional yearlong, the 4×4 fall block, and the 4×4 spring block schedules. Each participant in this study enrolled and completed the same AP course subject, completed the AP Exam related to the AP course subject, and had the same instructor while enrolled in the same public institution sometime during a period beginning in fall 2007 and

concluding in spring 2012. Participants in this study were permitted to take the AP course and AP Exam only once, therefore any repeating AP course and AP Exam students were removed, and there is no sample repetition or exam score bias for the participants who had previous course or AP Exam attempts.

The participants in this study include 428 participants (N=428) who completed the same subject AP course and AP Exam during one of the five years included in the time period from 2008-2012. This researcher used the existing data of AP Exam scores, AP Exam year, and course schedule type of these participants in this study. The use of existing data in this research enabled this researcher to study the relationships between student AP Exam performance and the student schedule enrollment type variables as they naturally occurred and no manipulation of the variables was possible. Existing data was also used in this study to ensure the sample participants were not unfairly targeted, recruited, or exploited for the purpose of this research. The data collection methods used in this study also protected student privacy, and there was no compensation for any sample participants or the researcher in this study.

### **Instrumentation**

The sole instrument used to determine an AP Exam score is the College Board's AP Exam. AP Exams are created, administered, and scored with rigor and attention to statistical standards for reliability and score validity (College Board, 2012). A set number of multiple-choice questions are reused from year to year, making it possible for statisticians to compensate for differences in difficulty among AP Exams of different years, and further those reading the AP Exam free response section are carefully monitored to ensure that scoring guidelines are followed and scores are consistent (College Board, 2012). The AP Exam scores are equated and scaled so the results are comparable year after year (Lee et al., 2012). Sadler et al. (2010)

suggest high levels of consistency and validity in the AP Exam.

### **Data Collection Procedures**

The data collection procedure was completed in three phases: (1) data acquisition from the institution; (2) data entry into Excel 14.0.2 spreadsheet; and (3) data entry to JMP version 10.0 spreadsheet for analysis. The Director of the institution where the students were enrolled in AP courses provided AP Exam score, AP Exam year, and course schedule type data to this researcher for the purpose of this study. The participants involved in this study included only those enrolled in the same AP course taught by the same instructor in the same institution at some time during the five-year period covered by this study. By using AP Exam score, AP Exam year, and course schedule type as the variables of interest in this study there was no need for any additional academic participant information or data to be included in the analysis phase.

The AP Exam score data from years 2008-2012 was acquired, organized, and transferred to Microsoft Excel 14.0.2 spreadsheet in preparation for organization and clean-up. As part of this procedure the student first and last names were removed and a researcher created identification number was generated for each participant in order to protect individual student confidentiality throughout the data analysis process. The data was then exported to a JMP (SAS Institute) version 10.0 spreadsheet format in preparation for coding and statistical analysis. Additionally, the JMP spreadsheet files and the study results were stored separately from the Excel spreadsheet files to further enhance participant privacy.

### **Data Analysis Procedures**

The two research questions proposed in this study were answered by performing cross tabulation analyses, generating contingency tables, and performing Pearson's chi-square ( $\chi^2$ ) tests. The data analysis phase typically starts from the general analysis and then becomes a more

specific statistical analysis (Creswell, 2009). Specifically, the data in this study was analyzed in the following four phases: (1) coding data; (2) conducting a descriptive statistical analysis; (3) performing cross tabulation analyses and generating contingency tables; and (4) performing Pearson’s chi-square ( $\chi^2$ ) tests. The cross tabulation analyses and contingency tables conducted in response to Research Question Two were separated and analyzed by each of the individual AP Exam years (2008-2012) to examine if the yearly results were consistent with five-year results. In all statistical tests the level of significance was set as  $\alpha = .05$ . The strategies of data analysis for the research questions and variables proposed in this study are summarized in the following table.

Table 2

*Summary of The Research Questions, Variables, and Statistical Analysis Methods*

<b>Research Question:</b>	<b>Statistical Analysis</b>	<b>Dependent Variable</b>	<b>Independent Variable</b>
1.	Contingency Table; Pearson’s chi-square test	AP Exam score performance, possible values: 1-5 and P/F	Course schedule type, possible values: Fall block, spring block, and the traditional yearlong schedules for a five year period
2.	Contingency Table; Pearson’s chi-square test	AP Exam score performance, possible values: 1-5 and P/F	Course schedule type, possible values: Fall block, spring block, and the traditional yearlong schedules examined by individual AP Exam year (2008-2012)

The first phase of analysis required coding and categorizing the data. The course schedule type, AP Exam year, and AP Exam score data for each participant was first entered into Microsoft Excel 14.0.2 spreadsheets. Then, this data was exported to a JMP (SAS) version 10.0 spreadsheet in preparation for further analysis. The course schedule type data was coded in both Excel and JMP spreadsheet as Fall Block, Traditional, and Spring Block. The AP Exam year

data from 2008-2012 was also coded in both Excel and JMP spreadsheets using the four numerical digits of each year as 2008, 2009, 2010, 2011, and 2012. Then the course schedule type and AP Exam year variables were categorized as nominal variables in the JMP spreadsheet. Finally, the corresponding AP Exam score data (N=428) ranging from 1-5 was exported into the same JMP spreadsheet, and categorized as an ordinal variable.

The second phase of the data analysis explored and described the features of the data sample through descriptive statistics analysis. The procedures primarily aimed at describing data are called descriptive statistics analysis (Howell, 2012). In keeping with Creswell (2009) descriptive statistics analysis were used to identify and describe both the dependent and independent variables in this study, and organize and describe the data in a meaningful way that helps to summarize the characteristics of the sample. Descriptive data is not only useful for developing an understanding of the characteristics of the sample; it also provides the starting point to support additional methods of statistical analysis that explore variable comparisons and relationships between the variables (Howell, 2012). After the data was analyzed, measured, and described in detail it was presented in tabular format in Chapter Four.

The third and fourth phase of the data analysis was then conducted, and statistical analyses were performed on the study data. Since both the independent and dependent variables of interest in the two research questions are categorical a cross tabulations, contingency table, and Pearson's chi-square ( $\chi^2$ ) analyses were appropriate (Howell, 2012).

In response to Research Question One a 3×5 a cross-tabulation analysis was conducted, and a contingency table was generated. This was used to analyze and present the AP Exam scores ranging from 1 to 5 over the entire five-year period from 2008-2012 for participants enrolled in different course schedule types. An example of the analysis is illustrated below in

Table 3.

Table 3

*Cross Tabulation of AP Exam Scores and Course Schedule Type*

Schedule	AP Exam Score					Totals
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	
Fall Block	X	X	X			
Traditional	X	X				
Spring Block	X					
<b>Totals</b>						

Then, the Pearson’s chi-square test ( $\chi^2$ ) was used to determine if there is a significant relationship between the data, and specifically measure if the distribution of AP Exam scores is contingent, or conditional, on the three course schedule type variables over multiple years. Other calculations in this analysis were also produced, and are presented in Chapter Four. This summary of results includes the N, the degrees of freedom, and the p-value.

Additionally, the five-year data was further examined based on the passing and not passing AP Exam scores and course schedule type enrollment. As mentioned in Chapter Two, AP Exam scores of 3, 4, and 5 are typically considered passing scores. Correspondingly, AP Exam scores of 1 and 2 are viewed as not passing. To examine what relationship exists between passing and not passing AP Exam scores and course schedule type a cross tabulations analysis was conducted and a 3×2 contingency table was created. This was used to analyze and present the passing and not passing AP Exam scores over the entire five-year period from 2008-2012 for participants enrolled in different course schedule types. An example of the cross tabulation analysis is presented below in Table 4.

Table 4

*Cross Tabulation of Five-Year Passing and Not Passing AP Exam Scores by Schedule*

Schedule	Not Pass	Pass	Totals
Fall Block	X	X	X
Traditional	X	X	
Spring Block	X		
Totals			

Lastly, a chi-square ( $\chi^2$ ) test was performed based on the designation of passing and not passing AP Exam scores. This test examined if there is a significant relationship between passing and not passing AP Exam scores and course schedule type when viewed over a five-year period. An explanation of the results, including the N, the degrees of freedom, and the p-value is presented in Chapter Four.

In response to Research Question Two a cross tabulations analysis was conducted and a 3x5 contingency table was generated for each of the individual five years examined this study (2008-2012). This was used to analyze the distribution of actual and expected values of AP Exam scores at each level of the three course schedule types. Next, the Pearson's chi-square test statistic ( $\chi^2$ ) was computed to determine if each of the yearly results was consistent with the five-year results regarding AP Exam performance for students operating under the three course schedule type variables. However, due to low cell counts for the expected frequencies in two of the five annual contingency tables, using the full range (1-5) of AP scores would not meet one or more of the minimum requirements associated with a chi-square test. Because it was determined that the conditions of Pearson's chi-square test were suspect when using a range of AP Exam scores from 1-5 and were not met for each individual year, the differences in passing and not

passing AP Exam scores by individual year were examined.

To determine if each yearly result was consistent with the five-year results a cross tabulations analysis was conducted and a 3x2 contingency table was generated for each year based on the number of passing (scores ranging from 3-5) and failing (scores of 1 or 2) AP Exam scores. Results of this analysis were presented in a tabular format similar to Table 4. A subsequent chi-square ( $\chi^2$ ) test was then conducted on the passing and not passing data for each year. This test examined if there is a significant relationship between passing and not passing AP Exam scores and course schedule type when viewed by individual year from 2008-2012. Results of the individual year analysis included the N, the degrees of freedom, and the p-value. Lastly, this analysis was used to determine if the yearly results were consistent with five-year results.

The two research questions proposed in this study aimed to identify if a significant relationship exists between AP Exam score performance and specific course schedule type variables over a multi-year period and if each of the yearly results was consistent with, or differed from, the multi-year results. The data analysis procedures employed in this study were intended to answer these questions and, in the process, provide a more thorough understanding of the relationship between AP Exam score performance and the three course schedule types. The results of this analysis are presented in Chapter Four.

### **Summary**

In this chapter the general design and methodology for this study was planned, outlined, and described. This study employed a quantitative methodology to explore the relationship between AP Exam score performance and student course schedule type over multiple years. Specifically, the two research questions were designed to explore if any statistically significant

differences exist between student AP Exam score performance and specifically identified student course schedule types, in the same subject, taught by the same instructor, and the same institution, over a period of multiple years (2008-2012). The participants of this study were limited exclusively to AP students enrolled in a southeastern academic institution in the United States, who completed the same AP course, with the same instructor, and the same associated subject AP Exam from 2008-2012. The AP Exam scores of interest in this study are created, administered, and scored with rigor and attention to statistical standards for reliability and score validity (College Board, 2012). Existing data was acquired for purpose of analysis in this research. The study data was collected in a manner that ensured student privacy and functioned to eliminate any volunteer, participation, or response bias. The specified research questions proposed in this study were explicitly addressed and answered by performing a descriptive statistical analysis, generating contingency tables, a cross tabulation analysis, and a Pearson's chi-square ( $\chi^2$ ) test. The study findings, which are presented in the following chapter, were organized by the two research questions governing this study.

## **Chapter Four: Results**

This research investigated the relationship between specific course schedule types and AP Exam score performance over a period of five years (2008-2012). This study was conducted using the research design described in Chapter Three, and the statistical analysis methods outlined in Table 2. The quantitative data of the dependent variable and independent variable were collected, explored, and analyzed in this study based on the proposed methodology presented in Chapter Three. Descriptive statistical analyses, cross tabulation analyses, contingency tables, and Pearson's chi-square ( $\chi^2$ ) tests were used to conduct the data analysis. The results of the analysis addressed the two proposed research questions in this study. This chapter first restates the study purpose and research questions, then presents the findings, analyses, evaluations of the findings of this study, and finally concludes with a summary of the findings.

### **Introduction**

The purpose of this study was to examine the relationship between course schedule type and AP Exam score performance results over an extended period of time while controlling for potentially confounding variables. Specifically, this study conducted an analysis of the course schedule type and AP Exam score performance relationship over the years 2008-2012. In support of this study's purpose the following research questions were designed to explore the relationship between AP Exam score performance and course schedule type over a five-year period of time and by individual years:

1. When controlling for institution, instructor, course subject, and AP Exam subject, is there a statistically significant difference in AP Exam performance for students operating under fall block, traditional yearlong, and spring block schedules when examined over a five-

year period of time?

2. When controlling for institution, instructor, course subject, and AP Exam subject, are the yearly results consistent with the five-year results regarding AP Exam performance for students operating under fall block, traditional yearlong, and spring block schedules?

### **Descriptive Statistics**

The sample participants used in this study were students from a single school in the southeastern United States. The total sample for this study consisted of 428 AP Exam participants who completed the same AP course subject and its corresponding AP Exam, with the same instructor, at the same institution, sometime during a five-year period from 2008 to 2012.

The frequency distribution of AP Exam participants by year is presented in Table 5. The percent of the total sample is also included for each of the five individual AP Exam years.

Table 5

*Frequency Distribution of AP Exam Participants by Year*

AP Exam Year	N	%
2008	67	15.7
2009	69	16.1
2010	110	25.7
2011	101	23.6
2012	81	18.9
Totals	428	

The independent variable employed in this study was course schedule type. The independent variable had three possible values: fall block, traditional yearlong, and spring block.

Participants enrolled in the fall block course schedule who met the criteria outlined in Chapter 3 were coded as Fall Block, participants enrolled in the traditional yearlong course schedule type were coded as Traditional, and lastly, the participants who were enrolled in the spring block course schedule were coded as Spring Block. The distribution of participants by course schedule type over the entire 2008-2012 period is presented in Table 6. The percent of the total sample is also included for each of the three possible course schedule types.

Table 6

*Frequency Distribution of AP Exam Participants by Course Schedule Type*

Schedule	N	%
Fall Block	64	14.9
Traditional	248	57.9
Spring Block	116	27.2
Totals	428	

The dependent variable in this study is AP Exam score performance. Possible AP Exam scores are whole numbers ranging from 1 to 5. The AP Exam score distribution for the entire 2008-2012 period is presented in Table 7. The percent of the total sample is also included for each of the five possible AP Exam scores.

Table 7

*Frequency Distribution of AP Exam Participants by AP Exam Score*

AP Exam Score	N	%
1	64	14.9
2	112	26.2
3	108	25.2

4	69	16.1
5	75	17.6
<b>Totals</b>	<b>428</b>	

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### **Research Questions**

This study involved two research questions dealing with participant AP Exam scores and course scheduling type from 2008-2012. Research Question One examined the data from the collective five-year results and Research Question Two examined data from each of the five individual AP Exam years.

**Research Question One.** When controlling for institution, instructor, course subject, and AP Exam subject, is there a difference in AP Exam performance for students operating under fall block, traditional yearlong, and spring block schedules when examined over a five-year period of time?

One approach to answering this research question involved an analysis of the distribution of individual AP Exam scores by course schedule type over the five-year period from 2008-2012. With this approach, an individual's AP Exam scores could be expressed as a whole number ranging from 1 to 5 and the individual's schedule type could be fall block, traditional, or spring block. Cross tabulations were conducted to create a 3×5 contingency table of actual AP Exam scores by course schedule type and expected values were calculated for each combination of AP exam score and schedule type. This information is presented below in Table 8; expected frequencies are displayed in parentheses in Tables 8-11.

Table 8

*Actual and Expected Frequencies of AP Exam Scores by Course Schedule Type*

Schedule	AP Exam Score					Totals
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	
Fall Block	11 (9.57)	13 (16.7)	17 (16.1)	11 (10.3)	12 (11.2)	64
Traditional	32 (37.1)	66 (64.9)	63 (62.6)	45 (40.0)	42 (43.5)	248
Spring Block	21 (17.3)	33 (30.4)	28 (29.3)	13 (18.7)	21 (20.3)	116
Totals	64	112	108	69	75	428

Based on the above information, a chi-square ( $\chi^2$ ) test of independence was performed. The test showed no significant relationship between AP Exam scores and course schedule type when viewed over a five-year period,  $\chi^2 (8, N=428) = 5.41, p = .71$ .

AP Exam performance also may be analyzed on the basis of passing or not passing scores. As mentioned in Chapter Two AP Exam scores of 3, 4, and 5 are considered passing. Cross tabulations were conducted to create a 3×2 contingency table as presented below in

Table 9.

Table 9

*Actual and Expected Frequencies of Passing and Not Passing AP Exam Scores by Course Schedule Type*

Schedule	Not Pass	Pass	Totals
Fall Block	24 (26.3)	40 (37.7)	64
Traditional	98 (102.0)	150 (146.0)	248
Spring Block	54 (47.7)	62 (68.3)	116
Totals	176	252	428

A chi-square ( $\chi^2$ ) test of independence was conducted based on passing and not passing AP Exam scores. The results of the test showed no significant relationship between pass/no pass AP Exam scores and course schedule type when viewed over a five-year period,  $\chi^2 (2, N=428) = 2.02, p = .36$ .

**Research Question Two.** When controlling for institution, instructor, course subject, and AP Exam subject, are the yearly results consistent with five-year results regarding AP Exam performance for students operating under fall block, traditional yearlong, and spring block schedules?

When attempting to respond to Research Question Two using the full range (1-5) of AP Exam scores on an annual basis, the conditions of Pearson's chi-square ( $\chi^2$ ) were not met due to a number of the yearly contingency table cells having a low number of actual values. An example of the problem encountered when examining annual data is presented in Table 10.

Table 10

*Actual and Expected Frequencies of 2008 AP Exam Scores by Course Schedule*

Schedule	AP Exam Score					Totals
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	
Fall Block	3 (2.30)	3 (1.78)	1(1.88)	0 (.42)	0 (.63)	7
Traditional	10 (11.20)	8 (8.63)	10 (9.13)	2 (2.03)	4 (3.04)	34
Spring Block	9 (8.54)	6 (6.60)	7 (6.99)	2 (1.55)	2 (2.33)	26
<b>Totals</b>	<b>22</b>	<b>17</b>	<b>18</b>	<b>4</b>	<b>6</b>	<b>67</b>

A common rule of thumb when dealing with chi-square tests is no expected frequency should be less than one in SAS (Version 10.0). The expected frequencies in two of the five

annual contingency tables using the full range (1-5) of AP scores did not meet this minimum requirement. Because of this, any chi-square results obtained through the use of a full range of scores with annual data could be viewed as suspect. Fortunately, the use of passing and not passing AP Exam score data provided an acceptable alternative in this situation.

The second approach used to respond to Research Question One involved the use of passing and not passing AP Exam data to determine if any relationship existed between AP Exam scores and course schedule type when examined over one, five-year period. The purpose of Research Question Two was to determine if any such relationships existed when AP Exam scores and course schedule types were examined over five, one-year periods. In order to avoid confounded results, the number of passing AP Exam scores, ranging from 3-5, were computed for participants in each of the three course schedule types for each of the five years included in this study. In like manner, the number of failing AP Exam scores of 1 and 2 by course schedule type were also computed for each individual year (2008-2012). A 3x2 contingency table was generated for each year from 2008-2012 based on the number of passing and failing AP Exam scores and corresponding expected frequencies were calculated. The results of the 2008 passing and not passing AP Exam score cross tabulation are presented below in Table 11.

Table 11

*Actual and Expected Frequencies of 2008 Passing and Not Passing AP Exam Scores by Course Schedule Type*

Schedule	Not Pass	Pass	Totals
Fall Block	6 (4.07)	1 (2.93)	7
Traditional	18 (19.80)	16 (14.2)	34
Spring Block	15 (15.10)	11 (10.9)	26
<b>Totals</b>	<b>39</b>	<b>28</b>	<b>67</b>

A chi-square ( $\chi^2$ ) test of independence was conducted based on passing and not passing AP Exam scores for 2008. The results of the test showed no significant relationship between passing and not passing AP Exam scores and course schedule type when viewed over this one-year period,  $\chi^2 (2, N=67) = 2.57, p = .28$ . The results of similar tests for 2009 ( $\chi^2 (2, N=69) = 0.47, p = .79$ ), 2010 ( $\chi^2 (2, N=110) = 2.73, p = .26$ ), 2011 ( $\chi^2 (2, N=91) = 0.99, p = .61$ ), and 2012 ( $\chi^2 (2, N=81) = 2.61, p = .27$ ) showed no significant relationships between passing and not passing AP Exam scores and course schedule type when viewed over those one-year periods.

In response to Research Question Two the results of the five chi-square tests based on annual data were consistent with the single chi-square test using a five-year collection of results regarding AP Exam performance for participants operating under fall block, traditional yearlong, and spring block schedules. In both cases, participant passing and not passing AP Exam scores, whether investigated separately by individual years from 2008 through 2012 or as a single collection of data for the five-year period from 2008 through 2012, were found to have no significant relationship to course schedule enrollment.

## **Summary**

This study controlled for institution, instructor, course subject, and AP Exam subject and determined if there is a statistically significant difference in AP Exam performance for students operating under fall block, traditional yearlong, and spring block schedules when examined over a five-year period of time. This chapter reported and analyzed data from 428 (N=428) participants from a single institution, who took the same AP course, with the same instructor, and completed the subject associated AP Exam over a period of five years (2008-2012). The analysis in this study investigated the relationship between specific course schedule types and

AP Exam score performance based on five-year results. It also examined individual years to determine if yearly results were consistent with the five-year results. Descriptive statistical analyses, cross tabulation analyses, contingency tables, and Pearson's chi-square ( $\chi^2$ ) tests were used to conduct the data analysis.

Results of this study indicate there is no significant difference in AP Exam score performance for students operating under fall block, traditional yearlong, and spring block schedules when controlling for institution, instructor, course subject, and AP Exam subject examined over a five-year period of time. Additionally, under the same set of controls, the five individual year passing and not passing AP Exam score results are consistent with five-year results for participants operating under fall block, traditional yearlong, and spring block schedules. Participant AP Exam scores, when investigated by year, were found to have no relationship to course schedule enrollment. Final study conclusions, recommendations, and issues facing future research will be discussed in Chapter Five.

## **Chapter Five: Discussion**

The purpose of this study was to examine the relationship between course schedule type and AP Exam score performance results over an extended period of time while controlling for potentially confounding variables. This chapter presents a review of the study, the results and findings presented in Chapter Four, and then a discussion of the findings. This chapter also includes a discussion of any implications for further research and practice, and concludes with a summary of Chapter Five.

### **Review of the Study**

This research investigated the relationship between course schedule types, specifically the fall block, traditional yearlong, and spring block schedules, and AP Exam score performance over a five-year period from 2008-2012. The research was situated in a single institution, in a single AP course, taught by the same instructor, over a five-year period of time (2008-2012). In total, 428 AP students from the same academic institution in a southeastern state in the United States were participants in this study (N=428). The AP Exam scores from participants who were enrolled in one of three course schedule types and who completed the same subject AP Exam from 2008-2012 were used as units of analysis in this research. The participants were enrolled in the fall block, spring block, or traditional yearlong course schedule types. The research included an analysis of the distribution of individual AP Exam scores by course schedule type over the five-year period from 2008-2012. The differences in passing and not passing AP Exam scores for participants enrolled in fall block, traditional yearlong, and spring block course schedule types were also examined over a five-year period, and by individual years 2008, 2009, 2010, 2011, and 2012.

## Results and Findings

Two research questions were the foundation of this study. The first research question examined AP Exam results for a single, five-year period, and the second research question examined five individual AP Exam years. Both questions attempted to control for institution, instructor, course subject, and AP Exam subject by using data from the same institution, instructor, course subject, and AP Exam subject for all years of the study.

The first research question explored the possibility of a statistically significant difference in AP Exam score performance for students operating under fall block, traditional yearlong, and spring block schedules when examined over a five-year period of time. A cross tabulations, 3×5 contingency table, and a chi-square ( $\chi^2$ ) test based on individual AP Exam scores ranging from 1 to 5 were performed to answer this research question. Results of the chi-square analysis ( $\chi^2$ ) indicated there was no significant difference in AP Exam score performance for participants in the three different course schedule types. Additionally, results of a chi-square ( $\chi^2$ ) analysis based on passing AP Exam scores of 3-5 and not passing AP Exam scores of 1-2 also indicated there was no significant difference in AP Exam score performance for participants in the three different course schedule types.

In examining individual years the second research question explored if the yearly results from 2008 through 2012, when viewed from the perspective of passing or not passing, were consistent with the five-year results regarding AP Exam performance for students operating under fall block, traditional yearlong, and spring block schedules. For each of the individual years a cross tabulations, a 3×2 contingency table, and a chi-square ( $\chi^2$ ) test were performed in response to this research question. Results of a chi-square ( $\chi^2$ ) analysis of passing and not passing data for each individual year from 2008 through 2012 indicated there was no significant

difference in AP Exam score performance for participants in the three different course schedule types for any of the five individual years. These findings suggest that the yearly AP Exam score results were consistent with the five-year results regarding AP Exam performance for participants operating under fall block, traditional yearlong, and spring block schedules. Participant AP Exam scores, when investigated by five-year and individual year results, appeared to have no consistent relationship to course schedule enrollment type.

### **Discussion of the Findings**

Overall, the findings of this study indicate that course schedule type does not have an impact on AP Exam score performance, and AP students are neither advantaged or disadvantaged on the AP Exam based on their course schedule type enrollment. These findings are consistent with those of Smith and Camara (1998) described in the Chapter Two. Smith and Camara's (1998) one-year analysis found a lack of consistent statistically significant evidence to support if either the block or traditional yearlong course schedule type has an impact on AP Exam score performance. With regard to the analysis of individual AP Exam years (2008-2012) the findings of this study additionally suggest that when AP Exam scores are analyzed on a yearly basis results are consistent with the five-year results.

The results and findings of this study hold significance for a number of stakeholders. First, the findings of this study contribute to the existing body of literature exploring and understanding any relationship between course schedule type and AP Exam score performance. Much of the literature is limited, inconclusive, and only includes one year of data (Zepeda & Mayers, 2006). Second, these findings can also help AP students and parents evaluate which schedule is most accommodating to AP Exam performance. Lastly, educators and administrators can look to the findings when addressing concerns about the type of course schedule to

encourage and employ at their institution, and knowing there is no difference in the effect of course schedule type on AP Exam performance for the three specific course schedule types can serve as input in that decision.

### **Implications for Further Research**

This study pursued clear, controlled, and explicit research of the current knowledge of AP Exam score performance and any relationship to course schedule type using more than one year of data. In order to accomplish this objective study and participant data was limited to a single institution, AP course, taught by the same instructor, over a period of five years (2008-2012). When considering the findings the first recommendation for further research is to use data from additional years of academic data. This study used five years of academic data; however utilizing additional years of data would be interesting to determine if longer-term findings are similar. Although the overall five-year findings and results were not significant the results, when explored by individual year, were consistent with the five-year results. Using data collected over a longer period than five years may help determine similar or different results for each individual year, or collectively over a longer period of time.

A second recommendation would be to conduct a similar study with a larger participant sample size. This study examined five-year results on AP Exam score 1-5, however due to low cell values in some of the individual year cross tabulation analysis the scores were combined to form passing and not passing categories. It would be interesting to examine AP Exam performance within the pass scores and not passing scores, and determine if the overall findings based on scores 1-5 of the individual year analysis were consistent with the overall multi-year results.

A third and final recommendation for further research includes expanding the participant data and analysis to include additional course instructors, AP course subjects, and AP Exam subject scores. This study participant data in this study was limited to a single AP course, taught by the same instructor, over a period of many years. Similar situations may exist where the same instructor taught the same course under same course schedule type conditions. It would be interesting to explore additional AP Exam course subjects in a similar scenario to see if results are consistent with those found in this study. Smith and Camara (1998) performed research consisting of multiple AP subjects, however the data was limited to one academic year and the course schedules were not taught by same instructor. In depth research exploring multiple AP course subjects and AP Exams with the same instructor over many years may now be possible due to the recent growth of online course providers offering AP courses in different course schedule types with the same instructor.

### **Recommendations for Future Practice**

This study intended to identify implications for a number of stakeholders including students, parents, educators, and instructional designers to help promote and improve student AP Exam performance. In consideration of the findings of this study two recommendations for future practice have emerged.

The first recommendation for students and parents is to have a better understanding of the course schedule type options currently available, and especially the affordances and limitations of schedule types. Fall block (4×4), traditional full year, and spring block (4×4) courses all provide course schedule type options to complete AP courses and prepare students for AP Exams. When bearing in mind the findings of this study, and how none of the course schedule types provides an advantage or disadvantage on the AP Exam score results, students and parents

can benefit from this knowledge when planning and preparing for academic undertakings, especially in an era of increasing course schedule type options.

The second recommendation is for educators and instructional designers to examine the importance of course schedule type in AP Exam preparation. The findings of this study indicate that any perceived challenges students in different course schedule type may face in preparation for the AP Exam may not have an impact on AP Exam performance. The findings of this study might help designers, educators, and developers to alleviate any student course schedule type enrollment concerns and instead focus on other academic challenges, structuring effective educational activities, and using resources in the most efficient manner in preparation for the AP Exam.

### **Summary**

In summary, identifying specific variables that may be influential to AP Exam score performance is of interest to a number of stakeholders. One such variable of interest is the relationship between course schedule type and AP Exam score performance. The results of this study indicate the differences in AP Exam score performance for participants in different course schedule type were not significant over a period of five years (2008-2012). Individual year results were also consistent with five-year results when examining passing and not passing AP Exam scores. However, more research of this type needs to be done before any definitive conclusions regarding course schedule type and AP Exam score performance can be made.

The present study focused on a single AP course subject and included only participants who completed the corresponding AP Exam. In a time of increasing options and technologies for students, including course schedule type offering, researchers and practitioners will continue to address how best to prepare students for the AP Exam. With the rapid growth of AP courses

and the increasing popularity and importance of the AP Exams there is a need to identify any variables that may be influential to AP Exam score performance.

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## Appendix A

### Research Matrix

Researcher	Year	Setting/Participants	Purpose	Results
Knight, De Leon, & Smith	1999	American High School students (limited sample size)	Compared students in 4 x 4 block schedule classes with traditional classes on semester school exams and end of year AP Exams.	Students in fall and spring block schedule classes performed better academically than their peers in traditional schedule classes on end of semester and end of course exams. However, students in 4 x 4 block classes performed statistically significantly lower on AP Exams than their peers on traditional schedule classes
Snyder	1997	Indiana high school	AP Exam results after a 4 x 4 block schedule replaced the traditional schedule	Implementation of the block schedule lowered AP Exam scores for both of the first two years after the schools switched from a traditional schedule.
Guskey & Kifer	1995	Virginia's Governor Thomas Jefferson High School 1991-1993 (one year of each schedule)	AP Exam results after the school moved from a traditional schedule to block schedule in 1992-1993.	In the 1991-92 school year two hundred and twelve AP Exams were taken. One hundred and twenty four students, or 58% of test takers, scored a three or better on their AP exams. After moving to the block schedule in the 1992-1993 school year one hundred forty seven students, or 50% of test takers, scored a three or better on their AP Exams.
Hansen, Gutman, & Smith	2000	American High School students (limited sample size)	AP Exam results after the school moved from a traditional schedule 1992-1994 to block schedule in 1995-2000.	Found that six years after a block schedule replaced the traditional yearlong schedule AP Exam scores increased..
Evans Tokarczyk, Rice, & McCray.	2002	American High School students (compiled data from three school districts – one year of each schedule)	AP Exam scores after the districts changed to the block schedule in the 1997-1998 school year after each of the schools operated under a traditional schedule in the 1996-1997 school year.	After implementing the block schedule no students in the three schools received the lowest score of one on an AP Exam. Also, the number of students achieving scores of three, four or five increased about 30 percent when compared to the final year of the traditional yearlong schedule
Smith & Camara	1998	American High School students (one year of data)	Examined the 1997 results of AP U.S. History, AP English Literature, AP Biology, and AP Calculus AB Exams for students enrolled in both block and	Found a lack of statistically significant evidence to support if either the block or traditional yearlong course schedule type has an impact on AP Exam score performance within these four AP Exam subject areas.

			traditional course schedule types in the 1996-1997 school year.	
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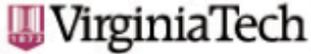
## Appendix B

### Course Description 2007-2012

Years	Goals	Topics
2007-2009	<ul style="list-style-type: none"> <li>• Know important facts, concepts, and theories pertaining to U.S. government and politics</li> <li>• Understand typical patterns of political processes and behavior and their consequences (including components of political behavior, the principles used to explain or justify various government structures and procedures, and the political effects of these structures and procedures)</li> <li>• Be able to analyze and interpret basic data relevant to U.S. government and politics</li> </ul>	<ol style="list-style-type: none"> <li>1. Constitutional Underpinnings of United States Government</li> <li>2. Political Beliefs and Behaviors</li> <li>3. Political Parties, Interest Groups, and Mass Media</li> <li>4. Institutions of National Government</li> <li>5. Public Policy</li> <li>6. Civil Rights and Civil Liberties</li> </ol>
2010-2012	<ul style="list-style-type: none"> <li>• Know important facts, concepts, and theories pertaining to U.S. government and politics</li> <li>• Understand typical patterns of political processes and behavior and their consequences (including the components of political behavior, the principles used to explain or justify various government structures and procedures, and the political effects of these structures and procedures)</li> <li>• Be able to analyze and interpret basic data relevant to U.S. government and politics (including data presented in charts, tables, and other formats)</li> <li>• Be able to critically analyze relevant theories and concepts, apply them appropriately, and develop their connections across the curriculum</li> </ul>	<ol style="list-style-type: none"> <li>1. Constitutional Underpinnings of United States Government</li> <li>2. Political Beliefs and Behaviors</li> <li>3. Political Parties, Interest Groups, and Mass Media</li> <li>4. Institutions of National Government</li> <li>5. Public Policy</li> <li>6. Civil Rights and Civil Liberties</li> </ol>

## Appendix C

### Virginia Tech Institutional Review Board Approval Letter



Office of Research Compliance  
Institutional Review Board  
North End Center, Suite 4120, Virginia Tech  
300 Turner Street NW  
Blacksburg, Virginia 24061  
540/231-4606 Fax 540/231-0959  
email [irb@vt.edu](mailto:irb@vt.edu)  
website <http://www.irb.vt.edu>

#### MEMORANDUM

**DATE:** May 28, 2013  
**TO:** Brian T Mott, Ken Potter  
**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires April 25, 2018)  
**PROTOCOL TITLE:** An Examination of the Relationship Between Course Schedule Type and AP Exam Score  
**IRB NUMBER:** 13-421

Effective May 28, 2013, the Virginia Tech Institutional Review Board (IRB) Chair, David M Moore, approved the New Application request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

<http://www.irb.vt.edu/pages/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

#### PROTOCOL INFORMATION:

Approved As: Expedited, under 45 CFR 46.110 category(ies) 5  
Protocol Approval Date: May 28, 2013  
Protocol Expiration Date: May 27, 2014  
Continuing Review Due Date\*: May 13, 2014

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.