COMPARING TRADITIONAL PERIOD AND SEMESTER BLOCK IN HIGH SCHOOL MATHEMATICS: EFFECT ON ALGEBRA I END-OF-COURSE ASSESSMENT

by

Chad Wallace

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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ABSTRACT

Chad Preston Wallace. COMPARING TRADITIONAL PERIOD AND SEMESTER BLOCK IN HIGH SCHOOL MATHEMATICS: EFFECT ON ALGEBRA I END OF COURSE ASSESSMENT. (under the direction of Dr. Gregg Mowen) School of Education, Liberty University, March 2013.

School systems continue to explore different ways to improve student achievement to meet the high expectations of preparing our students for a global community and market. For many years, educators have explored the use of time as an avenue for change to improve student scores on state end-of-course assessments. The purpose of this causal comparative study is to explore student achievement in a modified block format with students receiving instruction on either a semester block or a traditional period where clock hours for students are the same. This study will examine student achievement for males and females. The Virginia Standards of Learning assessment for Algebra I will be used in this study. This study will attempt to determine if students are better prepared for the Virginia Standards of Learning end-of-course assessment in a traditional period or semester block. The results showed scheduling format does not significantly impact student achievement in Algebra I. Further, results showed scheduling format for males and females does not significantly impact student achievement in Algebra I. Suggestions for further research are include.

Keywords, Standards of Learning, modified block, semester block, traditional yearlong periods, block scheduling.

Dedication

I dedicate this dissertation to my loving wife, Trish. I appreciate the love and support you have given me through this process and this journey. Thank you for being there for me every step of the way. You are my rock and I appreciate all that you have given up so I could pursue this life-long dream. I could not have asked for anything more from you. When I was discouraged, you encouraged me and when I said, "I have had enough," you would not let me quit; for that, I thank you and love you. I love you and look forward to enjoying many years to come with you.

I also dedicate this dissertation to my two daughters, Taylor and Ava, my son, Blake, and my unborn child that will join the family around October 2013. Thank you for understanding on those nights that I couldn't sit down and spend time with you. It was important for me to complete this manuscript so each of you could see the pain and struggles that come with accomplishing something that is very important to you. I love each of you and will work to make up for the time that has been lost.

I also dedicate this dissertation to my parents, Larry and Donna. You have always been encouraging and supportive of me through the years; it is that love and support that motivated me to keep going forward. I love you and want to say thank you for your endless encouragement and support.

Acknowledgements

I wish to thank Dr. Gregg Mowen for his willingness to serve as my dissertation committee chair. Thank you for your guidance and wisdom. I appreciate all the constructive criticism and your not letting me get off course. I truly appreciate the encouragement shown throughout this journey. You have certainly made this dissertation possible for me, and I appreciate all you have done.

I wish to thank Dr. Martin Ringstaff and Dr. Barry Yost for serving on my committee and for the many suggestions, guidance, and feedback provided throughout this process. I appreciate your taking the time away from your own careers and families to offer your knowledge and wisdom to me.

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LIST OF ABBREVIATIONS

Adequate Yearly Progress (AYP)

Advanced Placement (AP)

Alternate Day (A/B)

Elementary and Secondary Education Act (ESEA

End of Course (EOC)

National Education Association (NEA)

No Child Left Behind (NCLB)

Non-Teaching Assignment (NTA)

Standards of Learning (SOL)

Virginia Department of Education (VDOE)

CHAPTER 1: INTRODUCTION

When the Soviet Union successfully launched Sputnik in the 1950s and then later launched a second satellite into space, these caught the attention of the American people. With the launch of Sputnik in 1957 and the concern that America's students were not taking enough rigorous subjects, school reform came to the forefront to ensure competitiveness of United States high school students (Conant, 1959). This was the start of America needing to look at how the education system was structured and how students were learning. For many years, the education system in the United States operated on a traditional schedule with some unsuccessful attempts at alternate scheduling (Goldman, 1983). Recent reports comparing achievement levels of teenagers in France, Germany, Scotland, and United States indicate that achievement levels in European countries are higher (Cawelti, 1995). "American society is undergoing profound changes, largely as a result of the combined effects of demographic changes affecting the family, the workforce, and the schools, as well as changes in America's competitive position in the world economy" (Cohen, 1988, p.1). If America wants students to have the best chance for success in life and to be competitive in the work force, educators must ensure that our students have the opportunity to achieve academically (Cavanagh, 2007).

After the release of *A Nation at Risk* (National Commission on Excellence in Education, 1983), education reform was imperative if the United States were to remain competitive globally. The report urged educators to look at three big issues: time, content, and expectations (Greenan, 1994; National Education Commission on Time and Learning, 1994; Arnold, 1998). America needed to take a look at the education system

and also look at what and how students were learning. This needed to happen quickly, since the stronghold the United States had on the world was diminishing. The educational foundations of which our society has been built upon are eroding due to the education system producing students who only achieve mediocrity (National Commission on Excellence in Education, 1983). This report called for the high schools in our country to look at ways to reform our system and to find ways to better prepare and enhance student learning, as well as look at how time is used in schools. In order for this type of reform to be successful, it would need to include an increase in graduation requirements, better utilization of time for instruction of students, and higher expectations for all students. With the need to increase rigor and expectations and with the increase in requirements to receive an advanced studies diploma, school systems must find ways to meet the needs of the students.

> A report by the National Education Commission on Time and Learning focused on the need to raise the expectations for graduation. The areas of focus were English, mathematics, science, social studies, computer science, raising the requirements of colleges and universities, increase the rigor of standards, longer school days and years, improved teachers preparation, create more effective leadership, and requesting public fiscal support. These basics were believed to better prepare students for college by providing more academics with higher standards for success (Arnold, 1998; Greenan, 1994, p.68).

Those most involved with education agreed that time was the most important resource available to schools (Goodlad, 1984). "The amount of instructional time needed

for student learning is an ongoing educational issue in American high schools" (Hughes, 2008, p.1). The common thought was that students needed a deeper understanding of the material. One way to meet the needs of the students was to attempt a change in the school format. The way time was structured came into question in the 1950s and 1960s, as some school systems began to look at the way in which time was utilized during the instructional day. There was an attempt at flexible modular scheduling, but due to the amount of time students had for independent studying (which students and teachers weren't able to manage) the format did not last (Canady & Rettig, 1995). Today, in typical high schools across the country, up to seven different classes will meet each day leaving little time for teachers to differentiate instruction in order to meet students' diverse needs. These classes typically meet for approximately 50 minutes each day. For years schools have not changed the amount of time used to educate our students (Arnold, 1998; National Education Commission on Time and Learning, 1994). "The way time in schools is used should vary to ensure that schools rely less on a traditional schedule, that has been in place for more than a century, and focus more on block scheduling and the use of two or more periods of extended exploration of complex topics" (Arnold, 1998; National Education Commission on Time and Learning, 1994, p.67).

By increasing the amount of time that students are in a single class each day, teachers should be able to provide a deeper understanding of material. A crucial component to this being successful is to ensure that teachers appropriately prepare for longer periods of instruction. "Increasing time will in fact be counterproductive unless there is, simultaneously, marked improvement in how time is used" (Goodlad, 1984,

p.283). "Training needs to occur in a meaningful format, and the best training arrangement is one that begins before blocking starts and extends through the first year" (Mowen & Mowen, 2004, p.52). Providing teachers with longer periods of time will enable them to utilize a wide range of activities and instructional strategies to give students a deeper understanding of the material being taught.

Problem Statement

This study will research a school offering semester blocks and traditional periods and then compare student achievement for each format based on students' end-of-course assessment results in Algebra I. The problem of this study will be to compare student achievement based on the instruction they received from a traditional period versus semester block in a high school Algebra I class. A high school in rural Southwest Virginia, where the schedule consists of two traditional periods and three semester blocks, will be utilized for this study. This particular school has been utilizing this schedule format since 1998. The results of this study will provide schools and school systems with data about the effects scheduling has on end-of-course assessment in Algebra I. For school systems that begin their study about different types of scheduling, the results of this study will provide additional data about the success or failure of students receiving instruction on a traditional period or semester block on state assessments.

Statement of the Purpose

The purpose of this study will be to determine if students, on average, score higher on the state end-of-course assessment in Algebra I after having received

instruction on a traditional period or after having received instruction on a semester block. Preston High School currently utilizes a schedule where students take two periods of traditional instruction of approximately 47 minutes and three blocks of semester instruction at approximately 94 minutes. A portion of the students taking Algebra I for the first time receive instruction in a traditional period setting. The rest of the students taking Algebra I for the first time receive their instruction in a semester block. This study will provide information about which students score higher on the end-of-course assessment in Algebra I based on how they received their instruction. For the purpose of this study a different high school name will be utilized to maintain confidentiality.

In order for students to receive three mathematics credits to earn a Standard Diploma in Virginia, they have been able to take Algebra I Part 1, Algebra I Part 2, and geometry (Virginia Department of Education, 2011). Beginning with the current juniors or the class of 2013, students will not be allowed to receive a credit for each part of Algebra I Part 1 and Algebra I Part 2. This will mean that students are going to have to earn higher level credits in mathematics compared to years past. This makes the base or foundation that students receive in Algebra I crucial. To help students successfully succeed, as they progress through geometry, Algebra II, and/or Algebraic Functions and Data Analysis, there is a need for a solid foundation provided by the instruction they receive in Algebra I. This study will provide data about the retention of information covered in Algebra I based on the type of instruction received.

Hypothesis and Research Questions

To determine whether students are better prepared for the end-of-course state assessment in Algebra I, based on whether they received their instruction in a traditional period or a semester block, the following research question were used.

Research Question 1: Is there a significant difference in the end-of-course scores in Algebra I between students receiving instruction on a traditional yearlong period and those receiving instruction on a semester block?

Null Hypothesis 1: There is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between students who received instruction on a traditional yearlong period and those receiving instruction on a semester block.

Research Question 2: Is there a significant difference in the end-of-course scores in Algebra I between female students receiving instruction on a traditional yearlong period and those receiving instruction on a semester block?

Null Hypothesis 2: There is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between female students who received instruction on a traditional yearlong period and those receiving instruction on a semester block.

Research Question 3: Is there a significant difference in the end-of-course scores in Algebra I between male students receiving instruction on a traditional yearlong period and those receiving instruction on a semester block?

Null Hypothesis 3: There is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between male students who received instruction on a traditional yearlong period and those receiving instruction on a semester block.

Definition of Terms

The following definitions describe terms used throughout this study. Some of the following definitions are specific to mathematics, and others are specific to Virginia.

4 x 4 Block:

The school day is divided into four instructional blocks of approximately 90 minutes each, and the school year is divided into two semesters. During the first semester, students are enrolled in four courses which meet daily for 90 consecutive school days. During the second semester, students take four different courses which will meet daily for 90 consecutive school days.

Achievement:

The extent to which a person in a group has acquired certain skills or information as measured by the Standards of Learning Tests for Virginia Public Schools (Alderman, 2000).

Adequate Yearly Progress (AYP):

A rating that indicates the progress being made toward the goals of the Elementary and Secondary Education Act (ESEA), also known as the No Child Left Behind Act of 2001. This federal law requires states to set annual achievement benchmarks in reading and mathematics leading to 100 percent proficiency by 2014. The

law also requires testing in science at least once in elementary, middle school and high school. Schools and school divisions that meet or exceed all annual benchmarks are rated as having made AYP. States, as well as individual schools, receive AYP ratings (Virginia Department of Education, 2011).

Alternating Block (A/B) Schedule:

Alternating block (A/B) scheduling can be offered by schools offering 6 or 8 courses, half of the classes meet in double instructional blocks (approximately 90 minutes) one day, while the other three or four classes meet in double blocks the next day. (Canady & Rettig, 1995).

Assessment:

Method of measuring the learning and performance of students; examples include achievement tests, minimum competency tests, developmental screening tests, aptitude tests, observation instruments, performance tasks, etc. (Virginia Department of Education, 2012).

Block Scheduling:

A way of organizing the school day into blocks of time longer than the typical 50-minute class period; with the 4x4, block students take four 90 minute classes each day allowing for completion of four entire courses in one semester instead of a full year; with an A/B or rotating block, students take six to eight classes for an entire year but classes in each subject meet on alternate days for 90 minutes (Virginia Department of Education, 2011).

Carnegie Unit or Standard Unit of Credit:

A standard unit of credit is awarded for a course in which the student successfully completes the objectives of the course and the equivalent of 140 clock hours of instruction (Virginia Department of Education, 2012).

Curriculum Framework:

The Curriculum Framework serves as a guide for Standards of Learning assessment development. It provides additional guidance to school divisions and their teachers as they develop an instructional program appropriate for their students. It assists teachers as they plan their lessons by identifying essential understandings, defining essential content knowledge, and describing the intellectual skills students need to use. This supplemental framework delineates in greater specificity the minimum content that all teachers should teach and all students should learn (Virginia Department of Education, 2012).

Elementary and Secondary Education Act (ESEA):

ESEA, which was first enacted in 1965, is the principal federal law affecting K-12 education. (U. S. Department of Education, 2012).

Instructional Time:

Instructional time is the length of time (in minutes) that a student spends in a single class per day, week, or term (Danielson, 2002; Hughes, 2008).

Modified Block:

Scheduling format that utilizes a combination of traditional periods and semester blocks.

Pearson:

"The most comprehensive provider of educational assessment products, services and solutions for states, large school districts, and national assessments, offering a full range of assessment and information solutions in all subjects, grades, and content areas" (Pearson Education Inc., 2012).

PowerSchool:

PowerSchool provides the full range of features needed by administrators at the district and school level. Some of those features include, but not limited to, attendance, state reporting, student records, discipline management, assessment reporting, and student information. (Pearson Education Inc., 2012).

SOL End-of-Course test:

Criterion based test that assess student progress and mastery of core subject areas as defined by the Virginia Standards of Learning.

Standards of Learning (SOL):

"The Standards of Learning for Virginia Public Schools describe the Commonwealth's expectations for student learning and achievement in grades K-12 in English, mathematics, science, history and social science, technology, the fine arts, foreign language, health and physical education, and driver education" (Virginia Department of Education, 2012).

Test Blueprints:

"Serves as a guide to teachers, parents, and students in that they show

Standards of Learning covered by a test, reporting categories of test items, number of test items, and general information about how the test questions are constructed" (Virginia Department of Education, 2012).

Traditional Period:

A single period of time where classes meet daily for approximately 47 to 55 minutes.

Traditional Schedule:

A single period schedule consisting of six, seven, or eight classes that meet daily for approximately 45 to 55 minutes.

Verified Credit:

"A verified unit of credit is awarded for a course in which the student earns a standard unit of credit and achieves a passing score on a corresponding end-of-course SOL test or a substitute assessment approved by the Board of Education" (Virginia Department of Education, 2012).

CHAPTER TWO: LITERATURE REVIEW

Introduction

As school systems struggle to find ways to meet the needs of students, scheduling has become a main topic as a means for increasing student achievement. In America, block scheduling has emerged as a trend for high schools; this trend is fueled by the potential for block scheduling to increase student achievement (Payne & Jordan, 1996; Biesinger, Crippen, & Muis, 2008). The historical background provides information about the history of public education in our country through the present day. As many school systems across the country explore the possibility of changing schedule formats, a historical background provides documentation of where the concept of block scheduling began. After examining the different school schedules, 4 x 4 block schedule, alternating A/B day block, seven-period, and a modified block with a mixture of traditional periods and semester blocks, the advantages and disadvantages of block scheduling are discussed and explored. An example of each type of schedule is provided to help illustrate the differences of each schedule and to show the logistics of each format.

The purpose of this study is to explore student achievement, within a mixed block and traditional schedule, in Algebra I classes. The success of students, based on their state end-of-course assessment, will be evaluated to see if students score higher in a traditional period or a semester block class. After the data are collected for all students and each sub-group's data are collected for male students and females students, scores will be evaluated to determine the mean score for each group. The scores for males and females receiving instruction on a traditional schedule or block schedule will be

collected, and the means of the scores will be used to determine which group scored higher on average.

Theoretical Background

Public education in the United States dates back to the early 19th century and the origins of universal American education which began with Horace Mann's vision of public schooling (Bohan, 2003). Some of the first forms of public education were known as American common schools. In the late 19th century, a movement known as the progressive movement began. As late as 1890, this movement was just at its inception and came at a time when the people needed something to stabilize the country and improve their lives (Cremin, 1962). During this period, the people not only wanted to improve education, but they also wanted to make education more accessible. One of the results of the progressive education movement, from the 1890s, is the high school model which is still being used today (Wraga, 2001). In 1892, the National Education Association authorized a committee to recommend standards for various subjects in the secondary curriculum (Bohan, 2003). The nine subjects came from the areas of foreign languages, English, mathematics, sciences, and various forms of social studies. By 1900, the progressive movement began to make an impact as America saw graduation rates double from approximately 3 percent to 6 percent. This era also saw the need for subject areas to offer sequences to students. "For example, a three- or four-year sequence of social science courses remains the typical program of study in most of the nation's public high schools" (Bohan, 2003, p.83). In 1884, at John Hopkins University, the American Historical Association was founded; from this association came The Committee of Seven.

In 1896, the American Historical Association asked this committee to provide a detailed report about the practice of teaching in American schools (Saxe, 1991). The Committee of Seven felt the need for schools to provide more study time for history. "Members decided that 'one year' of study would represent five exercises a week throughout the school year, but that 'in framing its program, make possible to arrange the work in combinations of three or five periods a week, as may be convenient to particular schools'" (Bohan, 2003, p.89). If a class met five times a week, one year of study would be enough; however, if the class only met three times per week, then the class would need to be extended for two years. In 1892, the National Education Association compiled the Committee of Ten and asked them to report on different aspects of education. One of the results of this Committee of Ten and their report was to encourage high schools to focus student learning around five or six academic areas in each of a student's four years in high school (Gorman, 1971).

With the work that the National Education Association did through the Committee of Ten and the Committee of Seven and the development of the Carnegie Unit, secondary education began to take shape. In the early 1900s, The Carnegie Foundation suggested that high school work be measured on the amount of time spent in a course or subject area (Alderman, 2000). "A total of 120 hours in one subject—meeting four or five times a week, for 40 to 60 minutes, for 36 to 40 weeks each year earns for the student one 'unit' of high school credit" (Boyer, 1983, p.60). With the creation of the Carnegie Unit, academic progress could be measured as the student completed courses. Schools still today calculate these Carnegie units to determine the

type of degree students can earn. In Virginia, students complete 20 Carnegie units to earn a Modified Diploma, 22 Carnegie units with six verified credits to earn a Standard Diploma, and 24 Carnegie units with nine verified credits to earn an Advanced Studies Diploma (Virginia Department of Education, 2011). To earn a verified credit, a student must earn a Carnegie unit by meeting the requirements of the state for time and passing the course in addition to the student verifiying his/her knowledge by passing a test to ensure understanding based on standards created by the state. If he/she passes the end-of-course (EOC) test, then the course has been verified.

For years, and most of the 20th century, education saw virtually no change to the structure of the school day. In 1959, just before the period of experimentation provided by the 1960s and early 1970s, J. Lloyd Trump proposed that schools eliminate the traditional schedule and explore classes of varying lengths (Queen, 2000). This idea became known as "The Trump Plan." He encouraged teachers to utilize different instructional techniques to maximize instruction while varying the amount of time students were in class. This schedule format did not exist very long, but it did begin to open educators' eyes to exploring other schedule possibilities. In the late 1970s, after nearly 100 years of secondary schools operated on a traditional 50-55 minute schedule, a reform initiative began to look for a different way to utilize time in education (Rikard & Banville, 2005). With this schedule, "The high school tradition was called into question in 1983, when A Nation at Risk reported that American students were academically lagging behind their counterparts in a number of other industrialized nations" (Queen, 2000, p. 215).

"We are now beginning to know more about the effects on learning of other more precise factors such as neuropsychologic characteristics, learning styles, biorhythms, and relevance of elapsed time and time on task, knowledge of which will create still more obvious need for flexible educational methods" (Goldman, 1983, p.209; Alderman, 2000). Traditional scheduling for years has been the schedule of choice for many educational systems. For many reasons, scheduling has remained the same for several years. "You can implement any innovation you want in your classroom as long as you don't mess with the schedule. Traditional, inflexible scheduling is based on administrative and instructional needs" (Zepeda & Mayers, 2006, p.140; Goodlad, 1984; Sizer, 1984).

How time is used in schools is being questioned, and educators are encouraged to find better ways to utilize time. Learning in America has been referred to as a "prisoner of time" (National Education Commission on Time and Learning, 1994, p.7). Schools must begin to look at ways to better utilize their instructional time. Some of the ways in which schools are looking to combat this need for increased achievement is to examine scheduling. Restructuring of the school day into blocked periods of approximately 90 minutes helps to alleviate many of the problems associated with a traditional schedule (Carroll, 1990). As the country becomes aware that our education system is in need of change, we begin to see the need for alternate schedules. "Block scheduling was a viable choice for over 40 years, but it was not until the late 1980s that block scheduling became more widespread in secondary schools throughout the United States" (Lewis, Dugan, Winokur, & Cobb, 2005, p.72). Schools across America explored other options for

scheduling, but it was not until about 30 years ago that educators really took a hard look at moving away from the traditional schedule of six or seven periods to different forms of block scheduling. Canady and Rettig (1995) estimated that some states had more than 50 percent of schools using some form of block schedule. Educators and school systems are faced with the challenges of today and the comfort levels of what has been around for a long time. Change is not easy, but it is a necessity with the world changing at a rapid pace. Schools must adapt just as other industries have. "The 1990s called for different thinking, behaviors, and practices. Society and its expectations have changed drastically" (Lawrence & McPherson, 2000, p.2).

Forms of Block Scheduling

A definition of block scheduling is "a way of organizing the school day into blocks of time longer than the typical 50-minute class period; with the 4 x 4 block students take four 90-minute classes each day allowing for completion of an entire course in one semester instead of a full year; with an A/B or rotating block students take six to eight classes for an entire year but classes in each subject meet on alternate days for 90 minutes" (Virginia Department of Education, 2012). Block scheduling provides more time each day for diverse instruction than the traditional six- or seven-period day. "The shorter class sessions exacerbated existing problems in hands-on courses, such as art, laboratory sciences, and physical education." (Canaday & Rettig, 1999, p. 14).

Many schools over the last 15 years have made the change from traditional scheduling to block scheduling. The first of the following two tables indicates the different scheduling formats being used in Virginia and the number of school using each

format for the 1994-1995 school year. The second table indicates the different scheduling formats used in Virginia for the 2009-2010 school year.

Table 1

Schedule Format For Schools In Virginia 1994-1995

Schedule Format	Number of High Schools	Percentage of High Schools
7 A/B – Alternating Block	39	13.5
8 A/B – Alternating Block	10	3.5
4x4	28	9.7
Not Provided/Other	4	1.4
Traditional 6 Period	55	19.1
Traditional 7 Period	133	46.2
Traditional 8 Period	3	1
Total	288	

(York County School Division, 2011), Data Source: Directory of High School Scheduling Models in Virginia; Study of Innovative High School Scheduling in Virginia, JMU, Michael D. Rettig, Fall 2005

Table 2

Schedule Format For Schools In Virginia 2009-2010

Schedule Format	Number of High Schools	Percentage of High Schools
7 A/B – Alternating Block	67	21.8
8 A/B – Alternating Block	48	15.6
4x4	114	37.0
Not Provided/Other	24	7.8
Traditional 6 Period	2	0.6
Traditional 7 Period	52	16.9
Traditional 8 Period	1	0.4
Total	308	

(York County School Division, 2011), Data source: Virginia Department of Education.

Of the 308 high schools in Virginia in 2009-2010, 229 schools operated on some form of block schedule. This means that more than 74 percent of the schools utilize a form of block schedule. Only 55 schools, or less than 18 percent of schools in Virginia, still remain on a six-, seven-, or eight-period traditional schedule format. In 1994-1995, 77 of Virginia's 288 high schools operated on a seven- or eight-A/B day, or 4x4 block schedule. This means that in 1994-1995, less than 27 percent of Virginia's high schools utilized one of these forms of block schedule, while 191 of the 288 high schools still operated on a six-, seven-, or eight-period traditional schedule format. This equates to more than 66 percent of the schools in Virginia in 1994-1995 operating on a traditional schedule format compared to less than 18 in 2009-2010.

To explore the different types of block schedules that are being used in Virginia high schools, one must examine the alternating day. There are a couple of different

formats of alternating days of schools where students take six or eight courses, where half of the classes meet in extended blocks of time one day, while the other three or four classes meet in extended blocks the next day. More than 15 percent of high schools in Virginia used the eight-course schedule format in 2009-2010. There were no schools operating on a six-course schedule in Virginia in 2009-2010.

The following tables show how an alternating-day schedule would look to a student. Students would participate in four blocks each day, and for the purposes of this table, each class is labeled with a number. There are eight numbers representing the eight classes that a student would take during a given year. On day 1, Monday, a student would go to A day classes 1, 3, 5, and 7; then on day 2, students would go to B day classes 2, 4, 6, and 8. This pattern would continue for 180 days, allowing each class to have 90 sessions over 180 school days. During a given week, A classes might meet three times while B classes only meet two times. During the next week, the schedule would flip, and B classes would meet three times while A classes only meet 2 times.

Table 3

A/B (Alternate Day) Block Schedule for 6 or 8 Courses

	Monday	Tuesday	Wednesday	Thursday	Friday	Monday
Days	A	B	A	B	A	B
Block I	1	2	1	2	1	2
Block II	3	4	3	4	3	4
Block III	5	6	5	6	5	6
Block IV	7	8	7	8	7	8

Note: (Schools utilizing 6 courses would stop with Block III and schools utilizing 8 courses would go through Block IV) (Canady & Rettig, 1995).

Each block within this schedule would meet for approximately 94 minutes each session. This would give a student enough seat time to earn four credits, one for each block. With this being an alternating-day schedule, a student could earn four credits in A-day courses and four additional credits in B-day courses. Schools that use an alternating day schedule for three blocks would have classes that meet for longer periods of time each day. With this format, students would spend more time in class but would only be able to earn six credits each school year.

Another popular form of the alternating day is the 7-A/B day scheduling format. With this format students meet in alternating blocks for three course on A day and three different courses on B day, with one period meeting every day for the entire year. More than 21 percent of high schools are using this type of format. Table 4 shows an example of this type of schedule format.

Table 4

A/B (Alternate Day) Block Schedule for 7 Courses

	Monday	Tuesday	Wednesday	Thursday	Friday	Monday
Days	A	B	A	B	A	B
Block I	1	2	1	2	1	2
Block II	3	4	3	4	3	4
Single I Approx. 50 min.	5	5	5	5	5	5
Block III	6	7	6	7	6	7

(Canady & Rettig, 1995).

This format offers the alternating days where classes meet for approximately 90 minutes. It also has a period where a class meets for approximately 50 minutes every day of the year for the entire year. This yearlong traditional class is referred to as a "single" or "skinny" schedule (Childers & Ireland, 2005). With this schedule format, the single or skinny class can be placed between any of the blocks, before the first block, or after the last block, creating some flexibility depending on the school's needs. This format limits the number of credits that a student can accumulate to seven per school year.

One of the more common forms of block schedule is the 4 x 4 semester plan, sometimes referred to as the accelerated schedule (Canady & Rettig, 1995). "In this scheduling format, students complete four yearlong courses in one semester by attending the same four 90-minute classes every day of the week for an entire semester (Lewis, Dugan, Winokur, & Cobb, 2005, p.75). With this block format students take four courses for the first semester and then four new courses the second semester. In 2009-2010, 37 percent of high schools in Virginia operated on this format making it the most utilized scheduling format in Virginia. In a 4 x 4 schedule format, students are able to earn four

credits per semester for a total of eight credits per year. Table 5 shows that a student would take classes 1, 2, 3, and 4 during the first semester and take classes 5, 6, 7, and 8 during the second semester.

Table 5

Basic 4 x 4 Semester Block Schedule for (8 courses)

	Semester 1	Semester 2
Block I	1	5
Block II	2	6
Block III	3	7
Block IV	4	8

(Canady & Rettig, 1995).

With this schedule format, classes meet for approximately 94 minutes every day for 90 days or a semester. This format allows students the opportunity to accumulate eight credits over the course of a school year.

The final block format to be reviewed will utilize a different schedule model known as blending-schedule models. Canady & Rettig (1995) discuss a model that implements three singles and two blocks to give students the opportunity to earn seven credits during a school year. The schedule format has been utilized at Holston High School, in Washington County, Virginia, for more than 10 years (Canady & Rettig, 1995). Table 6 demonstrates an example of this type of schedule format.

Table 6

Combination Single-Period and Semester-Block Schedule (2 Semester Blocks; 3 Single Yearlong Periods)

	Fall Semester	Spring Semester
Period 1 approximately 50 min	1	1
Block I approximately 94 min.	2	3
Period 2 approximately 50 min.	4	4
Block II approximately 94 min.	5	6
Period 3 approximately 50 min.	7	7

(Canady & Rettig, 1995)

With this type of schedule format, students will take three singles that will meet 180 days for approximately 50 minutes and two blocks that will meet for 90 days and approximately 94 minutes. In 1998, Holston High School, one of four highs schools in Washington County, Virginia, began utilizing this particular scheduling format. With this schedule format students have the opportunity to earn seven credits per year, three from the singles and four from the two blocks that meet each semester.

In 2011, Washington County Public Schools decided to make uniform all four high schools by adopting a similar version of the combination single-period and semester-block scheduling format being used at Holston High School. This new form of combination single-period and semester block has two singles that will meet for approximately 47 minutes and three blocks that will meet for approximately 94 minutes each day. This will give student the opportunity to earn two total credits for singles and

three total credits each semester for the blocks, totaling eight credits per year. Figure 7 demonstrates a student's schedule utilizing this format.

Table 7

Combination Single-Period and Semester-Block Schedule (3 Semester Blocks; 2 Single Year-Long Periods)

	Fall Semester	Spring Semester
Period 1 approximately 47 min.	1	1
Block I approximately 94 min.	2	3
Block II approximately 94 min.	4	5
Block III approximately 94 min.	6	7
Period 2 approximately 47 min.	8	8

(Washington County Public Schools, 2011).

Advantages of Block Scheduling

There can be many advantages to a block format, each providing its own unique advantages. "Positive trends developed for the students in the alternating-day block schedule by the end of the second year" (DiRocco, 1999, p.83). Block scheduling provides students with extended periods of time to gain understanding without having to stop and start lessons due to class ending. Students found, that because of block scheduling, typically they had less homework (Gruber & Onwuegbuzie, 2001). Having less homework from a student's perspective was beneficial, and having fewer classes to prepare for eased their load. Block schedule lessens the course load on students. Even in an alternating-day schedule, students are only focusing on four classes a day, and those

four classes typically meet every other day. "According to Carroll (1990), short instructional periods cause students to feel overwhelmed by the variety of academic material, numerous sets of class rules, multiple homework assignments, and disjointed curricula" (Gruber & Onwegbuzie, 2001, p.2).

Canady and Rettig (1995) note the following as benefits with block scheduling:

- Teachers have the ability to plan lessons to extend past what a traditional period would allow.
- Less class changes result in fewer discipline referrals.
- Use of a variety of instructional models is encouraged.
- Students prepare for less classes daily and have less tests, quizzes, and homework assignments to prepare for.
- Teachers work with fewer students during any one semester.
- There is less preparation for teachers daily.
- Students who fail have an early opportunity to retake it allowing them to remain with their cohort.
- There are greater opportunities for acceleration.
- Fewer textbooks are required.

The advantages listed above are not for one form of block scheduling but are rather a list compiled of the advantages of the different forms of block scheduling. There is not one form of block scheduling that has all the advantages listed above.

Disadvantages of Block Scheduling

As with most components of an educational system, there is not one answer to fix all of the problems. If educators are looking for a block schedule as a fix for their low test scores, lower student/teacher ratios, or greater graduation rates, to name a few, then they should not implement any changes without first doing some research. A commonly-cited problem or limitation with block scheduling is when students miss a class once, it is equal to missing the equivalent of two classes on a traditional schedule (Gruber and Onwegbuzie, 2001). One teacher from a previous study indicated that a block provided more time for activities to take place during class but less time to plan field trips and activities outside of class (Hurley, 1997). A big concern of teachers is the amount of time they need to cover material. In one study, teachers inevitably covered less material because the number of instructional hours was decreased (O'Neil, 1995). "Zepeda and Mayers (2006) concluded there is good evidence that blocked classes are easier than traditional period scheduled classes because less content is typically covered in block classes" (Zelkowski, 2010, p.12). Some teachers will argue that class sizes did not decrease and classroom climate did not improve with either format of block scheduling (Lewis, Dugan, Winokur & Cobb, 2005). Finding places in the schedule for the fine arts that allows teachers the ability to see and educate their students is a challenge on block schedule. The sequencing of certain classes creates unique challenges for the administration. The sequencing of courses, such as music, foreign languages, and AP classes, presents a challenge in a block format (Shortt & Thayer, 1995; Lewis, Dugan, Winokur & Cobb, 2005). In order for the block to be implemented effectively, teachers

need to change their instructional strategies and practices. The block becomes ineffective when this does not take place or if teachers try to utilize strategies and practices that were in place while on a traditional schedule.

> Traditional and AB Block were almost identical in terms of frequency of various instructional practices. This finding certainly supports the contention among Block proponents that teachers are not altering their teaching to best exploit the advantages of extended class time. (Dexter, Tai, & Sadler, 2006)

It is essential that teachers change and re-evaluate their instructional practices and the way they prepare for a block class. If they do not, then the block becomes ineffective and potentially even worse for students, staff, and other stakeholders.

Advantages of Traditional Scheduling

With traditional scheduling having been around for many years, it is easy to pinpoint the advantages this schedule format has to offer students. In an online article, Lit (2009) states the following as advantages of block scheduling:

- Students are able to have direct contact with teachers on a daily basis.
- Traditional schedule typically provides more class time for students.
- Students with disabilities are able to focus better with shorter periods of instruction.
- Students with disabilities benefit from daily interaction with teachers.

Most traditional schedules, or seven-period-day formats, require teachers to teach five periods with a planning period and an NTA (non-teaching assignment). In situations where teachers are able to have both the planning and NTA periods where no teaching

occurs as unencumbered, they see the seven-period-day as advantageous. "Even though a teacher's number of students is increased on the seven period a day format, teachers would still have the same amount of time to prepare for their classes as do teachers on block schedules" (Lit, 2011, p.1).

Another advantage to the traditional schedule allows students to not fall too far behind for missed days, thereby missing less instructional time. The curriculum tends to be less watered down; students believe the day goes by faster; and the drop-out rate decreases (Bonner, 2012).

In studies done focusing on science classes and the multiple scheduling formats that exist, it was found that students actually had more time in class using a traditional format versus any other format. It was reported that traditional scheduling provided students with 22 percent more in-class time than those on block scheduling (Maltese, Dexter, Tai, & Sadler, 2007). An area of focus, when comparing schedule formats, is student achievement. When comparing grades among the different schedule formats, it was found that students in science classes earned on average 3 points higher in a traditional schedule (Maltese et al, 2007).

Disadvantages of Traditional Scheduling

As with any form of scheduling, there are disadvantages that come with the many advantages. "One major disadvantage of a seven-period day is that students have seven classes to prepare for, seven textbooks to carry, and possibly seven homework assignments" (Lit, 2009 p. 1). Many students struggle to balance the preparation for seven classes at a given time. This could mean seven homework assignments each night,

or it could mean seven tests/quizzes for which to prepare. Most see this as a disadvantage, but the argument could be made that it helps students learn to balance and manage their lives (Lit, 2009).

From a teacher's perspective there can be disadvantages to a seven-period day as stated by Lit (2011). Those disadvantages are as follows:

- Teachers have to prepare for more classes, five versus three on block scheduling.
- Teachers have less time to prepare for classes.
- Teachers having students who are a constant disruption have to endure these students all year.

It is important to note that some of the disadvantages listed could be the result of how the administration of the school or school system implements the schedule format.

Other disadvantages are the students having to adapt to more classroom environments, more classroom expectations, and more classroom rules each day (Bonner, 2012). A final disadvantage with traditional scheduling is that students have to change classes more often than with block scheduling. "Throughout the school day more students are in the halls due to several class changes" (Cromwell, 2006; Bonner 2012, p. 48). Typically, more discipline referrals are the result of more students being in the hallways, thus increasing administrative duties (Mathews, 2008; Bonner, 2012).

To Block or Not To Block

The reason school systems decide to block or not can vary from school system to school system based on what their needs are. These needs can range from better preparation for college to reducing the disruptions during the school day (Rikard &

Banville, 2005). Schools that are making the change to block scheduling see it as a chance to increase student achievement. "Consistent evidence shows that students' grades improve and the number of students on the honor roll increases" (Canady & Rettig, 1999, p.2).

> Block scheduling can be an effective tool under the right circumstances. Block schedules can ease the transition from homelike atmosphere of the elementary school to the departmentalized environment of the high school by reducing the need for constant class changes and then number of classes students have on any given day, while providing increased content emphasis and time on task. The blocked time schedule also gives even disorganized students a fighting chance to keep abreast of assignments and projects (Mowen & Mowen, 2004).

In 1995 there were 77 schools in Virginia operating on some form of block scheduling. In 2010 there were 229 out of 303 schools operating on some form of block scheduling (York County School Division, 2001). This is an increase of more than 50 percent of the schools making the change to some form of block scheduling in just 15 years. "This type of data indicates positive results from the implementation of block scheduling" (Bonner, 2012, p.29). Mowen & Mowen (2004) provide details and suggestions on implementing a new schedule format .

- Consider different schedules.
    - Start with a survey to schedule type being used by other schools that are being effective.
- Determine your school's needs.

    - Student achievement
    - Review improvement plans and assessment data to focus on areas of need
- Draft several different schedules.
    - Gather feedback from the staff about the different types of scheduling and discuss the merit of each has.
- Conduct a pilot.
    - Narrow your search down to potentially two that could meet your needs and implement those two schedules in on a short term basis.
- Make the decision.
    - Based on discussions with parents, students, and staff members.
- Provide Training
    - All stakeholders need to be a part of the training process. Teachers need to be provided with lots of professional development.
- Inform everyone about the schedule.
    - Make it the focus for the new year.
- Gather feedback.
    - Allow staff to provide feedback about the effectiveness of the new schedule.
- Make necessary modifications.
    - Willingness to amend and improve

Watauga High School followed similar procedures when the decision came to explore and potentially implement a new schedule format. When it came to their attention that the community felt children were not enjoying their high school experience they decided to explore other options for scheduling. "A series of community meetings throughout the county had shown a degree of dissatisfaction among parents about their children's experience in high school" (Childers & Ireland, 2005 p.43-44). The need for change became imperative and school leaders began to investigate the possibility of change for their school. "The impetus to look at alternative types of scheduling came from several members of the board of education, who felt Watauga should investigate new block scheduling models other high schools were using" (p.43). The first step was to explore other options for schedule format based on the needs of the community, parents, students, and school. The faculty initially was split on whether to change or not, but as more schools across the state made the change more faculty members bought in to the idea of change (Childers & Ireland, 2005).

Before deciding to fully implement a new schedule the decision was made to allow a few courses to be offered as block classes for the next school year. The board encouraged Watauga to try scheduling block classes for faculty who wanted to try block scheduling in their content areas and the remaining courses would stay in a traditional period setting (Childers & Ireland, 2005). From simply attempting or piloting block scheduling for a few courses with selected teachers the mixed schedule format was created for this high school. "Watauga's composite schedule concept was born" (p.44). Now that the decision was final about the type of schedule the school would operate on

the next step was to provide training for all stakeholders. The talent and experience of other key professionals, many within the high school, a few from the central, and one from out from different state provided training and knowledge for the new schedule (Childers & Ireland, 2005).

By gathering feedback from different stakeholders the composite schedule is still well received and modifications are being made each year to the schedule. "Watauga is doing something different with its schedule, and we feel good about what has been accomplished" (Childers & Ireland, 2005, p.49). With any new schedule there are unique problems that need to be resolved once the schedule has been put into place. English and social studies, offer classes as a traditional period and as a semester block, creating some alignment problems that are still being evaluated. Even though a lot of progress has been made to get the composite schedule to work, the schedule is constantly being reviewed, researched, experimented with, and debated to determine what works best (Childers & Ireland, 2005).

Both Mowen and Mowen (2004) and Watauga schools followed similar paths when attempting to install a new schedule format in their schools. Each considered possible schedules that existed, determined needs, and conducted pilot programs before implementing a totally new schedule. After making the decision to change schedule formats each then provided training to the appropriate stakeholders and also took the time to proper inform everyone. After gathering feedback and making adjustments as needed the attempt to successfully implement a new schedule was in place. Only time will prove

whether the schedule is successful and whether it was properly implemented to meet the needs of students.

Achievement of Scheduling Formats

One study compares the frequency of instructional practices among different schedule formats, and explores the association between high school scheduling plans and college science preparation (Dexter, Tai, & Sadler, 2006). The results of this study showed that there was no difference with instructional practices based on different schedule formats. This study also showed that teachers, regardless of their schedule format, do not altering their instructional strategies and techniques. When talking about student achievement in college science classes, this study revealed only a 3-point difference among scheduling plans when teachers do not alter their instructional techniques. This amounted to only about a third of a letter grade for with traditional format over 4 x 4 (Dexter, Tai, & Sadler, 2006).

A study was conducted in a particular school district utilizing three different types of schedule formats comparing student achievement based on the effects of each type of format. Of the three schools, one utilized A/B days, another used a traditional schedule, and the third used a 4 x 4 block schedule. The standardized mean differences in mathematics were negative for both traditional and the A/B block scheduling format, which indicates a decline in achievement over time, while 4 x 4 showed an increase over time in mathematics (Lewis, Dugan, Winokur, & Cobb, 2005). "For mathematics, 4 x 4 students outperformed traditional students as evidenced by a positive, albeit small, effect size (d=0.19). Not only did these students improve their mathematics achievement, but

they outperformed both A/B and traditional students on the 11th grade ACT test after trailing both groups on the 9th-grade Levels test" (Lewis, Dugan, Winokur, & Cobb, 2005, p.82-83). This study provides information that a 4 x 4 block schedule may give students an advantage over traditional or A/B day schedules in mathematics. This study does not indicate why students performed better, but that the 4 x 4 did show signs of improvement for students in mathematics.

In a study done to compare the academic achievement of high school students on the block schedule and students on the traditional schedule, the goal was to determine what impact each had on student achievement. This particular study examined a school that was on a traditional schedule for two years and then decided to make the change to block scheduling. Data were collected in Algebra I, biology, English, and U.S. History (for two years on a traditional schedule and then for two years on block scheduling) (Lawrence & McPherson, 2000). The results showed that the mean scores on the traditional schedule were consistently higher than the mean scores on the block schedule. Lawrence and McPherson (2000) listed areas that could have impacted the data areas such as the following:

- the length of time in which the block was implemented;
- data gathered based on the results of end-of-course assessments, with not as much material covered by the teacher in the first year with implementation of the block.

Results did suggest that students taking Algebra I had a higher failure rate on block scheduling than traditional scheduling.

In a study done to compare the instructional practices being used in a traditional period compared to a semester block, the goal was to see if the type of instruction and the amount of student engagement changed after switching schedule formats. "This study investigates differences in eighth-grade mathematics students' engagement in standards-based curriculum and instruction practices between block- and traditional-schedule schools" (Flynn, Lawrenz, & Schultz, 2005, p. 14). Do teachers change their instructional practices based on the amount of time they have each day? As a result of this change, if it occurs, are students more engaged? The results were that no differences between traditional and block schedule teachers use of small group and class discussions; were found however, despite increases in the use of a variety of instructional activities with block scheduling (Khazzaka, 1998, Queen & Isenhour, 1998, Staunton, 1997), these increases did not produce significant differences between the instructional practices of teachers (Flynn, Lawrenz, & Schultz, 2005). As a result of the few differences between schedule formats, it is difficult to determine if more student engagement occurred as a result of other factors or block scheduling.

In a study done to compare the effects on student academic achievement after changing to block scheduling, the goal was to determine, in large the effects on student achievement in urban high schools. The study was designed with the intentions to monitor student behavior and student achievement after the first year of implementing block scheduling. This was a pilot program for one school in the district. The intention of the study was to get research-based data to help motivate the other schools to make the change to block scheduling. Data concerning test results and information about students

were gathered through the use of student information databases, surveys, and an interview of the principal of the high school. The results showed a significant increase in the number of A's earned and students earned higher grades in mathematics courses, teachers implement a variety of new teaching techniques, increased the number of learning activities, and provided more individualized attention (Deuel, 1999). After only one year of implementation, a greater percentage of teachers would preferred to remain in a block schedule.

In a study conducted to compare traditional period and semester block and the effects on achievement, the focus was to investigate the alternating A/B and compare the result to a traditional seven-period schedule. The target group for this particular study was eleventh grade students with a focus on reading comprehension, mathematics measures, written expression, social studies, and science. Standardized tests were administered to the students to produces scores for all areas to be researched. Data were collected using questionnaires and information from the state's Department of Education website. The results comparing seven-period A/B block-schedule schools and seven-period traditional-schedule schools supported the findings that there were no meaningful differences between the schools (Arnold, 2002).

Summary

With the increase of diploma requirements in the Commonwealth of Virginia and No Child Left Behind mandates established by the federal government, many school systems are trying to find ways to meet the needs of the students and provide a world-class education. Many different areas of education have been explored, but few areas

have drawn more attention than schools' schedule formats. The way time is used in schools has been a focus for the past two decades.

> Learning in America is a prisoner of time. For the past 150 years, American public schools have held time constant and let learning vary. The rule, only rarely voiced, is simple: learn what you can in the time we make available. It should surprise no one that some bright, hard-working students do reasonably well. Everyone else—from the typical student to the dropout—runs into trouble. Time is learning's warden (National Education Commission on Time and Learning, 1994, p.7).

This review of literature provides a foundation of where our education system began and important information concerning alternative scheduling formats. Different schedule formats are discussed to provide information on the many different types of block scheduling that exist in Virginia and across the country. In the past 20 years more than 50 percent of the schools in Virginia have made the change to some form of block schedule. Based on the needs of the school, many variations of block can be utilized. Educators look to organize instructional blocks of time to improve the quality of education for students. Each format is discussed in detail, outlining the overall structure of each block schedule format. The decision of whether to block or not is discussed and a plan for implementation is provided based on past schools experience with switching to a form of block scheduling. Information about the advantages and disadvantages of each format are discussed along with examples of achievement from multiple school systems utilizing a form of block scheduling. Variations of block scheduling have yielded

different results. The purpose of the study will be to explore the effects that a mixed schedule format has on student achievement.

CHAPTER THREE: METHODOLOGY

Chapter three is utilized to describe the design of the research methodology. The procedures for investigating the research questions and hypotheses will be described in this chapter. The study was designed to determine if a semester block or traditional period increases student achievement on end-of-course assessments in Algebra I. The study researches the impacts on all students taking Algebra I and investigates how schedule format impacts males and females achievement on end-of-course assessments. The chapter is separated into six sections which includes the following: design of the study, overview and research questions, data gathering methods, instrumentation, sampling procedures, and data analysis procedures.

Design

Multiple sections of Algebra I from each of the 3 years were assessed. Course content, standards, and methodology were the same for both groups based on the same instructor providing instruction. The traditional group consisted of students taking Algebra I in a traditional setting. The block group consisted of students taking Algebra I in a block setting.

A single instructor, having 7 years of experience teaching on both a semester block and yearlong traditional, provided the instruction for both the block group and the traditional group. Each section was chosen based on the needs of the school in order to have a limited number of Algebra I classes. Data were gathered over the course of the past 3 years. Assignment to each group was made by the guidance counselors and/or by PowerSchool based on the requests of courses by the students. PowerSchool provides

schools with the ability to enter students' requests and create schedules where students are randomly placed in classes based upon their requests. Simply put, after analyzing the requests of each student, schedules were developed based on where classes would fit into an individual student's schedule. Ability level was not a factor in course selection. By utilizing these techniques and strategies, the validity of this study was strengthened.

Using a causal-comparative design, Algebra I scores for the block group and the traditional group within a modified schedule format were researched. The differences in the means of each group provided data about the effectiveness of each schedule format. "The critical feature of causal-comparative research is that the independent variable is measured in the form of categories" (Gall, Gall, & Borg, 2007, p. 306).

The Commonwealth of Virginia sets rigorous academic standards, known as the Standards of Learning (SOL), and measures achievement through annual SOL tests (Virginia Department of Education, 2011). Each class, pre-algebra and Algebra I, must be taught based on these standards regardless of the schedule format. Students were assessed at the end of the course based on each standard. The same amount of questions was needed for each course to reach the pass-proficient and the advanced-proficient mark for each group. The Department of Education's Enhanced Scope and Sequence guides provided sample lesson plans and instructional resources to help teachers align their classroom instruction with the standards. Test blueprints detailed specific standards covered by a test, reporting categories of test items, number of test items, and general information about how test questions were constructed. (Virginia Department of

Education, 2011). Using these blueprints, the Scope and Sequence lesson plans were developed to meet these standards and prepare students for the SOL EOC assessment.

Each course was taught using lesson plans developed from the blueprints and Scope and Sequence. Students attended the same school and instruction was provided by the same instructor. The same grading policies and practices were utilized in both the block group and the traditional group.

The pre-test was given at the conclusion of the eighth-grade year in pre-algebra for all students. Instruction was provided by the same instructor on the same schedule format at the same middle school for all students.

The post-test was given at the conclusion of the Algebra I course and was administered to all students enrolled in an Algebra I course.

Overview and Research Questions

As educators are pressed for change to meet the needs for better educated citizens and more competent workers (Boyer, 1983; Carroll, 1994; Fullan, 1993; Lewis, 1989; National Commission on Excellence in Education, 1983), education reform literature focuses on the limitations of a traditional schedule (Jenkins, Queen, & Algozinne, 2002). "The block schedule has emerged as one answer to the call for restructuring schools" (p. 200). A composite schedule is more effective for students since neither all block nor all traditional schedules best serve all students, teachers, and subjects (Childers & Ireland, 2005). Each program, student, and teacher is able to operate, learn, and teach differently. Schedule formats need to meet the diverse needs of public education and those that make up public education.

This study will investigate student achievement in Algebra I on a traditional yearlong-schedule format and also on a block-schedule format within the same building and the same year. A description of the data analysis, procedures for sampling, selection of subjects, and methods being utilized will be covered in this chapter.

Students in this study participated in Algebra I in high school. For this quantitative research study a causal-comparative design will be utilized. Data were analyzed from the 2009-2010, 2010-2011, and 2011-2012 school years. For this study, two groups were formed: the traditional group and the block group. The traditional group consisted of students who received instruction in a traditional yearlong class that meets for approximately 47 minutes per day for 180 days. The block group consisted of students who received instruction on a semester block for approximately 94 minutes per day for 90 days. Students receiving instruction in a traditional class met each day for 180 days, and students receiving instruction in a block met each day for 90 days.

Instruction for both groups was provided by the same teacher, with 7 years of experience teaching on both formats. For schools that have adopted a modified block schedule, this study will provide data about the success of students receiving instruction on a traditional or a block period within a modified-schedule format. Thus, the findings of a study like this could have implications about how administrators schedule courses within modified block-schedule formats.

Pretest data were collected from the Standards of Learning (SOL) end-of-course (EOC) assessment provided by the Virginia Department of Education for eighth grade mathematics. The data gathered from these tests were utilized to compare students who

were scheduled in a traditional and a block to ensure comparison of similar groups. At the conclusion of the Algebra I course, data were collected from the SOL EOC and analyzed using SPSS software.

Research Question 1: Is there a significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between students receiving instruction on a traditional yearlong period and those receiving instruction on a semester block?

Null Hypothesis 1: There is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between students who received instruction on a traditional yearlong period and those receiving instruction on a semester block.

Research Question 2: Is there a significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between female students receiving instruction on a traditional yearlong period and those receiving instruction on a semester block?

Null Hypothesis 2: There is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between female students who received instruction on a traditional yearlong period and those receiving instruction on a semester block.

Research Question 3: Is there a significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between

male students receiving instruction on a traditional yearlong period and those receiving instruction on a semester block?

Null Hypothesis 3: There is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between male students who received instruction on a traditional yearlong period and those receiving instruction on a semester block.

Data Gathering Methods

Data were gathered from a school in rural Southwest Virginia that has been on a modified block since the 1998-1999 school year. Permission was granted by the middle and secondary supervisors and the principals of the high school and middle school to collect data on individual students taking pre-algebra in the middle school and Algebra I at the high school. Data were retrieved from Pearson, a system used by this particular school to store data for end-of-course assessments based on the Virginia Standards of Learning. Data were gathered on all students who took the end-of-course assessment in pre-algebra from the 2008-2009, 2009-2010, and 2010-2011 school years. Data were then gathered about the same group of students from the 2009-2010, 2010-2011, and 2011-2012 school year that were promoted to Algebra I and received instruction on either a traditional or a semester block. The master schedules for each of the three school years were viewed to ensure there was an equivalent number of Algebra I classes offered on a traditional and a semester block that could be researched.

Instrumentation

The Commonwealth of Virginia has established EOC assessments used to measure student success as compared to the national standards. The Virginia Department of Education and the Virginia Board of Education are ensuring that expectations for teaching and learning in Virginia schools are comparable to or exceed national standards (Virginia Department of Education, 2011). To assess what students across the state are learning and to ensure that students are being educated comparably, these standards were created. These standards lay out in specific detail what students need to learn in the four core areas of mathematics, science, history/social science, and English. The Department of Education created a curriculum framework for each core area to detail the specific knowledge and skills students must possess to meet standards in each area (Virginia Department of Education, 2011). Teachers can use the curriculum framework along with the enhanced Scope and Sequence Guide to ensure course content aligns appropriately with the final EOC assessment. Test blueprints provide teachers with specific information about the number of test items that will appear on the EOC assessment.

Mathematics SOL assessments at the high school level measure student work in three subject areas: Algebra I, geometry, and Algebra II. Each test is graded on a scaled score ranging from 0 to 600. A score of 400 to 499 shows proficiency on the test, and a score of 500 to 600 shows advanced proficiency. Students are required to score at least a 400 on the EOC to verify the credit to meet graduation requirements set by the state. Appendix A explains the difference between a verified credit and a non-verified credit

and illustrates expectations of students to earn a standard or advanced diploma. The Algebra I EOC test contains 60 multiple choice questions, 50 for assessment and 10 field test items, that may be used on later tests. In order for students to earn a proficiency rating, they must answer a minimum of 25 questions correctly, and in order to earn an advanced proficiency, they must answer minimum of 45 questions correctly.

Alpha-reliability coefficients can range from 0 to 1, values that are greater than .70 are considered acceptable (Nunnaly, 1994). The following table represents Cronbach's alpha internal consistency reliability estimate for Virginia Algebra I EOC assessment.

Table 8

Students testing online in Algebra I.

Subject	Core	N	Alpha
Algebra I	1	37,353	0.91
Algebra I	2	26,253	0.89
Algebra I	3	8,877	0.89

(Virginia Department of Education, 2009, Cronbach, 1951).

Core 1 from the table represents the main EOC test, and cores 2 and 3 represent alternate forms of the assessment. With Algebra I, Core 1 having an alpha score of 0.91 and Cores 2 and 3 having an alpha score of 0.89, all are greater than .70 and are considered acceptable. Therefore, each test in this study has exceeded the benchmark of .70. To establish content validity, a content review committee deemed questions valid, and they were used as field question (Rayfield, 2002, Virginia Department of Education, 2009). "This direct relationship between the SOL Curriculum Frameworks, the SOL Test

Blueprint, and the SOL assessments lends support to the content validity of the SOL assessments" (Virginia Department of Education, 2009, p.39).

Sampling Procedures

This study examines the learning results of more than 140 students receiving instruction for Algebra I, either in a traditional or semester block. Since data were gathered from previous years where students were not randomly selected for classes and classes were already established, this study will be a non-randomized sample.

The superintendent of the school system granted permission for this study to be performed and also provided permission to speak with the Technology Department and principals of the participating schools. After permission was granted by the superintendent, permission of the participating principals was requested. Student data were collected with assistance from the principal and the Guidance Department, as well as the Technology Department. Students were identified over the last 3 years who had taken pre-algebra in the eighth grade at the middle school and then completed Algebra I at the high school in the ninth grade. Every student in the Commonwealth of Virginia is required to participate in the EOC assessment at the end of the year if enrolled in pre-algebra and Algebra I. The only exception is if the student has taken the course previously and successfully passed the EOC assessment. Therefore, all students participated in the EOC assessment at both levels. Students were separated into two groups: those receiving instruction in a traditional period and those receiving instruction in a semester block from 2009-2010, 2010-2011, and 2011-2012 school years. Once it was determined where students received their instruction, Algebra I EOC test scores were

collected from Pearson through the Guidance Department and the Technology Department.

Data Analysis Procedures

This is a quantitative Causal-Comparative design. "Analysis of covariance is useful in causal-comparative studies because the researcher cannot always select comparison groups that are matched with respect to all relevant variables except the one that is the main concern of the investigation" (Gall, Gall, & Borg, 2007, p.321). To analyze the data from this study, an ANCOVA will be used. Pre-test scores will be used as the covariate; this will reduce the error variance and eliminate systematic bias. Using an ANCOVA will adjust the post-test means based on the differences from the pre-test. "The statistical technique of analysis of covariance (ANCOVA) is used to control for initial differences between groups before a comparison of the within-groups variance and between-groups variance is made" (p. 320). An ANCOVA will be used to determine the pre-test and post-test differences for the traditional group and the block group. In this study, the dependent variable is student achievement measured by performance on the Algebra I Virginia SOL EOC assessment administered at a rural school in Southwest Virginia. The independent variables are students receiving instruction in a traditional period course and students receiving instruction in a semester block. A school in rural Southwest Virginia was chosen for this study due to having utilized a modified schedule format for more than 10 years. The modified schedule format began as pilot program for the school and has had only minor changes throughout the 10 year span. During that time period, Algebra I classes have been offered to students as a traditional period as well as a

semester block. SPSS will be used to run an ANCOVA once the data have been collected.

CHAPTER FOUR: RESULTS

The purpose of this study was to determine whether block scheduling or traditional scheduling better prepared students for the state end-of-course assessment given in Algebra I over the last 4 years. It was also the purpose of this study to determine which scheduling format proved to be the most successful for each gender. Data were collected from the following school years, 2009-2010, 2010-2011, and 2011-2012 for the EOC for Algebra I.

This chapter is comprised of three sections: demographics, results, and results summary. The demographics data are presented in the first section. The second section covers the results of the three ANCOVAs used to examine student achievement based on whether instruction was received in a block format or traditional format. The first ANCOVA examines all students tested; the second examines female students tested; and, finally, the third examines male students tested. The third section provides a summary of the results.

Demographics

The participants for this study were 139 students from a rural school in Southwest Virginia. Of the 139 students, 76 received their instruction in a semester-block format, and 62 students received their instruction in a traditional-schedule format. There were 63 female students tested, 38 of whom received instruction in semester format with the remaining 25 receiving instruction in a traditional format. There were 76 male students tested, 39 of whom received instruction in a semester format with the remaining 37 receiving instruction in traditional format.

Students were enrolled in pre-algebra in the eighth grade and completed the EOC assessment in pre-algebra. The following year, the same students took Algebra I in either a block format or traditional format, completing the EOC assessment for Algebra I at the conclusion of the courses. Students, regardless of schedule format, received instruction from the same teacher. Scores were collected from the EOC test, and each score ranged from 0 to 600.

Research Question 1

Is there a significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between students receiving instruction on a traditional yearlong period and those receiving instruction on a semester block?

Null Hypothesis 1

There is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between students who received instruction on a traditional yearlong period and those receiving instruction on a semester block.

Results Analysis 1

A one-way analysis of covariance (ANCOVA) was utilized to determine if there was a difference in the mean scores on the Algebra I EOC for students who received their instruction in block format and for students who received their instruction in a traditional format. The independent variable was schedule format which included block format and traditional format. The dependent variable was the student's score on the EOC

assessment given at the conclusion of the Algebra I course. The pre-algebra EOC assessment score served as the covariate.

Based on the information provided by the Virginia Department of Education, the reliability of the covariate, EOC assessment for pre-algebra, was assumed. The report produced by the Virginia Department of Education, using Cronbach's alpha-internal reliability estimate, provided reliability information (Virginia Department of Education, 2009, Cronbach, 1951). Each assessment provided by the VDOE exceeded the benchmark needed for reliability.

Prior to conducting an ANCOVA, the homogeneity of regression (slope) assumption was tested. The results suggest the interaction between the covariate, and the factor is not significant. $F(1,134) = 1.584$, $p = .210$. Based on the findings that p (.210) > α (.01), the ANCOVA analysis can be conducted. Table 9 below shows the output generated by SPSS.

Table 9

Tests of Between-Subjects Effects

Source	df	F	Sig.1
Instructional Type * Pre-Algerbra	1	1.584	.210

After conducting the ANCOVA analysis, the following descriptive statistics are generated and presented in Table 10. The descriptive statistics give the mean scores for the semester block and the yearlong courses, standard deviation, and the number of students participating in each format.

Table 10

Descriptive Statistics

Instruction Type	Mean	Std. Deviation	N
Semester	441.09	41.210	76
Yearlong	443.08	36.208	62
Total	441.73	38.888	139

Using the Levene's Test of Equality of Error Variances, the underlying assumption of homogeneity of variance for the one-way ANCOVA has been met as evidenced by $F(2,136) = 2.015$, $p = .137$; therefore, $p (.137) > \alpha (.01)$. Table 11 below shows the output generated by SPSS.

Table 11

Levene's Test of Equality of Error Variance

F	df1	df2	Sig.
2.015	2	136	.137

The pre-algebra scores (covariate) are used to control for the differences on the types of instruction received. The purpose of this test is to assess the relationship between the pre-algebra scores and the Algebra I scores (dependent variable), controlling for the factor. Table 12 shows the SPSS output for this particular test. The results of this test show that the relationship is significant based on the following, $F(1,135) = 20.937$, $p < .001$. This shows a relationship between the pre-algebra scores and the Algebra I scores.

Table 12

Tests of Between-Subjects Effects

Source	df	F	Sig.	Partial Eta Squared
Pre-Algebra	1	20.937	.000	.134
Instruction Type	2	1.161	.316	.017
Error	135			

Table 12 above shows the results as follows: Instructional Type, on the SPSS output, evaluates the null hypothesis that the adjusted means are equal. The researcher failed to reject the null hypothesis. $F(2,135) = 1.161$, $p > .05$. Table 13 below shows the adjusted means for each instructional type using the covariate to adjust the means.

Table 13

Adjusted Means For Each Instructional Type

Instructional Type	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Semester	438.440	4.223	430.088	446.791
Yearlong	446.294	4.684	437.031	455.558

Research Question 2

Is there a significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between female students receiving instruction on a traditional yearlong period and those receiving instruction on a semester block?

Null Hypothesis 2

There is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between female students

who received instruction on a traditional yearlong period and those receiving instruction on a semester block.

Results Analysis 2

A one-way analysis of covariance (ANCOVA) was utilized to determine if there was a difference in the mean scores on the Algebra I EOC for female students who received their instruction in block format and for female students who received their instruction in a traditional format. The independent variable was schedule format which included block format and traditional format. The dependent variable was each student's score on the EOC assessment given at the conclusion of his/her Algebra I course. The pre-algebra EOC assessment score served as the covariate.

Based on the information provided by the Virginia Department of Education, the reliability of the covariate, EOC assessment for pre-algebra, was assumed. The report produced by the Virginia Department of Education using Cronbach's alpha-internal reliability estimate provided reliability information (Virginia Department of Education, 2009, Cronbach, 1951). Each assessment provided by the VDOE exceeded the benchmark needed for reliability.

Prior to conducting an ANCOVA, the homogeneity of regression (slope) assumption was tested. The results suggest the interaction between the covariate and the factor is not significant. $F(1,58) = .982$, $p = .326$. Based on the findings that p (.326) > α (.01), the ANCOVA analysis can be conducted. Table 14 below shows the output generated by SPSS.

Table 14

Tests of Between-Subjects Effects

Source	df	F	Sig.1
Instructional Type * Pre-Algebra	1	.982	.326

After conducting the ANCOVA analysis, the following descriptive statistics were generated and presented in Table 15 below. The descriptive statistics give the mean scores for the semester block and the yearlong courses, standard deviation, and the number of students participating in each format.

Table 15

Descriptive Statistics

Instruction Type	Mean	Std. Deviation	N
Semester	439.00	44.774	37
Year-Long	448.08	33.395	25
Total	442.10	40.445	63

Using Levene's Test of Equality of Error Variances the underlying assumption of homogeneity of variance for the one-way ANCOVA has been met as evidenced by $F(2,60) = 3.562$, $p = .035$; therefore, $p (.035) > \alpha (.01)$. Table 16 below shows the output generated by SPSS.

Table 16

Levene's Test of Equality of Error Variance

F	df1	df2	Sig.
3.562	2	60	.035

The pre-algebra EOC scores (covariate) are used as control for the differences on the types of instruction received. The purpose of this test is that it assesses the relationship between the pre-algebra scores and the Algebra I scores (dependent variable), controlling for the factor. Table 17 shows the SPSS output for this particular test. The results of this test show that the relationship is significant based on the following: $F(1,59) = 12.859$, $p < .001$. This shows that there is a relationship between the pre-algebra scores and the Algebra I scores.

Table 17

Tests of Between-Subjects Effects

Source	df	F	Sig.	Partial Eta Squared
Pre-Algebra	1	12.859	.000	.179
Instruction Type	2	3.695	.031	.111
Error	59			

Table 17 above shows the results as follows: Instructional type, on the SPSS output, evaluates the null hypothesis that the adjusted means are equal. The researcher rejected the null hypothesis. $F(2,59) = 3.695$, $p < .05$. Table 18 shows the adjusted means for each instructional type using the covariate to adjust the means.

Table 18

Adjusted Means For Each Instructional Type

Instructional Type	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Semester	431.083	6.487	418.101	444.064
Yearlong	459.559	8.082	443.387	475.731

Research Question 3

Is there a significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between male students receiving instruction on a traditional yearlong period and those receiving instruction on a semester block?

Null Hypothesis 3

There is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between male students who received instruction on a traditional yearlong period and those receiving instruction on a semester block.

Results Analysis 3

A one-way analysis of covariance (ANCOVA) was utilized to determine if there was a difference in the mean scores on the Algebra I EOC for male students who received their instruction in block format and for students who received their instruction in a traditional format. The independent variable was schedule format which included block format and traditional format. The dependent variable was each student's score on the

EOC assessment given at the conclusion of his/her Algebra I course. The pre-algebra EOC assessment score served as the covariate.

Based on the information provided by the Virginia Department of Education, the reliability of the covariate, EOC assessment for pre-algebra, was assumed. The report produced by the Virginia Department of Education using Cronbach's alpha-internal reliability estimate, provided reliability information (Virginia Department of Education, 2009, Cronbach, 1951). Each assessment provided by the VDOE exceeded the benchmark needed for reliability.

Prior to conducting an ANCOVA, the homogeneity of regression (slope) assumption was tested. The results suggest the interaction between the covariate and the factor is not significant. $F(1,72) = .802$, $p = .374$. Based on the findings that p (.374) > α (.01), the ANCOVA analysis can be conducted. Table 19 below shows the output generated by SPSS.

Table 19

Tests of Between-Subjects Effects

Source	df	F	Sig.1
Instructional Type * Pre-Algebra	1	.802	.374

After conducting the ANCOVA analysis, the following descriptive statistics are generated and presented in Table 20 below. The descriptive statistics give the mean scores for the semester block and the yearlong courses, standard deviation, and the number of students participating in each format.

Table 20

Descriptive Statistics

Instruction Type	Mean	Std. Deviation	N
Semester	443.08	38.004	39
Yearlong	439.70	38.063	37
Total	441.43	37.817	76

Using Levene's Test of Equality of Error Variances, the underlying assumption of homogeneity of variance for the one-way ANCOVA has been met as evidenced by $F(1,74) = .169$, $p = .682$; therefore, $p (.682) > \alpha (.01)$. Table 21 below shows the output generated by SPSS.

Table 21

Levene's Test of Equality of Error Variance

F	df1	df2	Sig.
.169	1	74	.682

The pre-algebra EOC scores (covariate) are used to control for the differences on the types of instruction received. The purpose of this test is to assess the relationship between the pre-algebra scores and the Algebra I scores (dependent variable), controlling for the factor. Table 22 shows the SPSS output for this particular test. The results of this test show that the relationship is significant based on the following: $F(1,73) = 13.114$, $p < .001$. This shows that there is a relationship between the pre-algebra scores and the Algebra I scores.

Table 22

Tests of Between-Subjects Effects

Source	df	F	Sig.	Partial Eta Squared
Pre-Algebra	1	13.114	.000	.152
Instruction Type	1	.202	.655	.003
Error	73			

Table 22 above shows the results as follows: Instructional Type, on the SPSS output, evaluates the null hypothesis that the adjusted means are equal. The researcher failed to reject the null hypothesis. $F(1,73) = .202$, $p > .05$. Table 23 below shows the adjusted means for each instructional type using the covariate to adjust the means.

Table 23

Adjusted Means For Each Instructional Type

Instructional Type	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Semester	443.204	5.646	431.952	454.456
Yearlong	439.568	5.796	428.016	451.120

Summary of Results

Chapter 4 presented the findings of the research questions using a one-way analysis of covariance (ANCOVA). An ANCOVA was utilized to test if there were a significant difference between block scheduling and student achievement compared to traditional period scheduling and student achievement on end-of-course assessments in Algebra I. The first ANCOVA run examined student achievement for all students, the second examined student achievement for females and the third examined student achievement for males.

Null hypothesis 1, there is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between students who received instruction on a traditional yearlong period and those receiving instruction on a semester block. This was supported by the data derived by the ANCOVA ($p = .316$, $p > .05$). Therefore, there was no significant difference on the end-of-course assessment based on students taking Algebra I in a semester block or a traditional period.

Null hypothesis 2, there is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between female students who received instruction on a traditional yearlong period and those receiving instruction on a semester block. This was supported by the data derived by the ANCOVA ($p = .031$, $p < .05$). Therefore, there was significant difference on the end-of-course assessment among female students taking Algebra I in a semester block or a traditional period.

Null hypothesis 3, there is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between male students who received instruction on a traditional yearlong period and those receiving instruction on a semester block. This was supported by the data derived by the ANCOVA ($p = .655$, $p > .05$). Therefore, there was no significant difference on the end-of-course assessment among male students taking Algebra I in a semester block or a traditional period.

Chapter 5 discusses the findings of the study, implications it may have, limitations of the study, and possibilities and recommendations for future research.

CHAPTER FIVE: DISCUSSION

Chapter four gives the results of the data collected along with an analysis of the comparison of traditional period and semester block in high school presenting its effect on Algebra I end-of-course assessment. This study examined three research questions and corresponding null hypotheses to determine if schedule format made a difference on end-of-course assessment for students taking Algebra I. In 1995, 77 out of 288 high schools were operating on some form of block schedule (York County School Division, 2011). That means that only about 25 percent of the high schools were operating on a block while the rest were still utilizing a traditional schedule format. By 2010, 229 high schools out of 308 were operating on some form of block schedule (York County School Division, 2011). That means that almost 75 percent of the high schools were operating on a form of block scheduling. In 15 years the percent of school utilizing block scheduling had increased by almost 50 percent. Although many schools have made the change to block scheduling, there is not enough evidence that student achievement on standardized tests is impacted by the type of schedule the school is on (Bonner, 2012). The study was driven by the need to determine if schedule format significantly impacts student achievement in Algebra I. School administrators are rushing to try block scheduling based on the perceived thought of the advantages, but without any data on its actual benefits (Arnold, 2002). Research is needed to determine effectiveness block scheduling has on student achievement.

Permission to gather information for this study was granted by the superintendent of Washington County Public Schools. Permission to gather information for this study

was also granted by the principal at the high school where the data would be collected. Student scores were gathered using Pearson, a system used to store SOL assessment information. SOL information was gathered over a time period of three years ranging from the 2009-2010 through 2011-2012 school year. Along with needing SOL information for each student, their gender, and whether they were in a semester block or a traditional period were needed to investigate each research question and null hypothesis. While Pearson was used to obtain individual SOL scores, a different information system was needed to obtain each student's gender and class setting. PowerSchool, a student information system, provided the information needed to obtain each student's gender along with whether they were in a semester block or traditional period setting. The Virginia Department of Education website provided all needed information about the end-of-course assessment in Algebra I. This chapter will provide a summary and discussion on the findings of the analysis, study implications, study limitations in light of the relevant research, and recommendations for future research on the comparison of semester-block and traditional-period scheduling.

Summary and Discussion

Hypotheses Results Summary and Discussion

This study investigated three different research questions. The first of the three questions was to investigate whether student achievement on SOL assessments improved with semester-block or traditional-period scheduling. Research question 1 asked is there a significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between students receiving instruction on a

traditional yearlong period and those receiving instruction on a semester block. The question was designed to study achievement for all students regardless of gender.

Null hypothesis 1 stated there is no significant difference in scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between students who received instruction on a traditional yearlong period and those receiving instruction on a semester block. This study examined scores on EOC assessments in Algebra I of students who received instruction in a semester block and students who received instruction on a traditional period for the 2009-2010, 2010-2011, and 2011-2012 school years. Data for the covariate were collected from the 2008-2009, 2009-2010, and 2010-2011 school years based on the EOC SOL assessment for pre-algebra. The research sample included 139 identified students who took pre-algebra in the eighth grade at the middle school and Algebra I in the ninth grade at the high school. All students received instruction from the same teacher at the same school.

To investigate the hypothesis, an ANCOVA test was performed. The results of the ANCOVA demonstrated no significant difference between semester block and traditional period and the effects each schedule format had on student achievement in Algebra I. "Despite the popularity of block scheduling, research findings are mixed and show no clear advantage of one schedule over the other" (Bottge, Gugerty, Serling & Moon, 2003, p. 1). The mean score for semester-block students was 441, and for traditional-period students, the mean score was 443 before accounting for the covariate. After accounting for the covariate, the mean scores for Algebra I were 438 for semester-block and 446 for traditional-period students. While there was a greater difference in the

mean scores between semester block and traditional period, the difference was not significant enough to determine that one format was better than the other, which compares favorably to other studies. In studies conducted for the Georgia Department of Education results showed no significant difference between semester block scheduling and traditional period for student achievement (Gruber & Onwuegbuzie, 2001). The result of the ANCOVA run was evidenced by the following: $F(2,135) = 1.161$, $p > .05$, where $p = .316$.

The second of the three questions was to investigate whether student achievement for female students on SOL assessments improved with semester-block or traditional-period scheduling. Research question 2 asked if there were a significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between female students receiving instruction on a traditional yearlong period and those receiving instruction on a semester block? This question was designed to investigate whether schedule format impacted results on SOL assessments for female students.

Null hypothesis 2 stated there is no significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between female students who received instruction on a traditional yearlong period and those receiving instruction on a semester block. Students receiving instruction in a semester block and students receiving instruction on a traditional period were examined for the 2009-2010, 2010-2011, and 2011-2012 school years. Data for the covariate were collected from the 2008-2009, 2009-2010, and 2010-2011 school years based on the EOC

SOL assessment for pre-algebra. The research sample included 63 identified students who took pre-algebra in the eighth grade at the middle school and Algebra I in the ninth grade at the high school.

To investigate the hypothesis, an ANCOVA test was performed. The results of the ANCOVA demonstrated there were a significant difference between semester block and traditional period and the effects it had on student achievement in Algebra I. The students' mean score for semester block students was 439, and for traditional period students, the mean score was 448 before accounting for the covariate. After accounting for the covariate, the mean scores for Algebra I was 431 for semester block and 459 for traditional period. The results show that there is a statistically significant different in the mean scores for females after controlling for the covariate. This validates that there is a significant impact on female students that take Algebra I in a traditional period setting compared to a semester block setting. Results of a study done comparing traditional period to semester block on student achievement in mathematics showed that there is a significant difference in the mean scores for students based the schedule format they received instruction in. "The mean scores on the traditional schedule were consistently higher than the mean scores on the block schedule which came as a surprise" (Lawrence and McPherson, 2000, p.5). This was evidenced by the following: $F(2,59) = 3.695$, $p < .05$, where $p = .031$. For female students taking Algebra I, based on the results of this study they are better served in a traditional setting.

The third of the three questions was to investigate whether student achievement for male students on SOL assessments improved with semester-block or traditional-

period scheduling. Research question 2 asked if there were a significant difference in the end-of-course scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between male students receiving instruction on a traditional yearlong period and those receiving instruction on a semester block? This question was designed to investigate whether schedule format impacted results on SOL assessments for female students.

Null hypothesis 3 stated there is no significant difference in scores on the Virginia Standards of Learning end-of-course assessment in Algebra I between male students who received instruction on a traditional yearlong period and those receiving instruction on a semester block. Students receiving instruction in a semester block and students receiving instruction on a traditional period were examined for the 2009-2010, 2010-2011, and 2011-2012 school years. Data for the covariate were collected from the 2008-2009, 2009-2010, and 2010-2011 school years based on the EOC SOL assessment for pre-algebra. The research sample included 76 identified students who took pre-algebra in the eighth grade at the middle school and Algebra I in the ninth grade at the high school.

To investigate the hypothesis, an ANCOVA test was performed. The results of the ANCOVA demonstrated no significant difference between semester block and traditional period and the effects it had on student achievement in Algebra I. "Lockwood's (1995) research found no significant difference in standardized test scores in algebra and geometry between block- and traditional-scheduling patterns" (Arnold, 2002, p.47). The students' mean score for semester-block students was 443, and for traditional-period students, the mean score was 439 before accounting for the covariate.

After accounting for the covariate, the mean score for Algebra I was 443 for semester block and 439 for traditional period. "The author reported only a slight overall increase for student achievement after conversion of these schools to a Block schedule" (Maltese, Dexter, Tai, & Sadler, 2007, p.1). While there was a bigger difference in the mean scores between semester block and traditional period, it was not significant enough to determine that one format was better than the other as evidenced by the following: $F(1,73) = .202$, $p > .05$, where $p = .655$.

Study Implications

The literature review is the basis or foundation for this study. The researcher gathered information on how the current educational system originated and how it has evolved over the last 100 years. One of the results of the progressive education movement, from the 1890s, is the high school model which is still being used today (Wraga, 2001). While parts of this model still exist today the use time in high schools is being researched and investigated to increase student achievement. As far back as 1909 The Committee of Seven had research conducted on how time was used in schools. The Committee of Seven worked to increase the amount of time students studied different subjects (Bohan, 2003). The increase in the amount of time allotted was based on the need for students to have a better understanding of the material being taught. Schools for the past two decades have been exploring was to use time differently to increase student achievement. Educational leaders have investigated ways to use time more productively and changes are occurring in high schools, one option has been block scheduling (Canady & Rettig, 1999). Schools need options as demographics and dynamics of each school are

different, but before choices are made about how to use time, there needs to be researched based data to support the choices. For this study, the researcher gathered information based on prior studies conducted on the need to expand research in this area and to explore the impacts it has on student achievement on end-of-course assessments in Algebra I. "Cawelti (1994) provided a broad overview of high school restructuring movements with the innovation that has come to be known as "block scheduling" within the reform movement" (Nichols, 2005, p. 299). The literature review also provided a foundation about the different forms of scheduling, as well as the advantages and disadvantages that each scheduling format provides. Each schedule format is defined by the number of periods or blocks available, amount of credits a student can earn, and the amount of time that a student will spend in each course. There are different variations of block scheduling; these include 4 x 4, in which the school day is divided into four equal blocks of time, and alternating block, also called the A/B block, where students have up to 4 classes a day meeting every other day (Zepeda & Mayers, 2006). The different aspects and details of each schedule type were researched and outlined in the literature review. With the variety of schedule formats existing educational leaders need researched based data about the impacts each has on students. Multiple research studies were reviewed about the successes and failures of block scheduling. Each provided information about the impacts scheduling has on students, teachers, and the school. Several different studies were provided in the literature review to discuss the successes and failures of each study that was conducted.

The result of this study did not represent findings similar to those of other studies in regard to scheduling format and the effects they have on student achievement. In a study comparing A/B days, 4x4 block, and traditional period, results favored a particular format based on student achievement in mathematics. "Not only did students improve their mathematics achievement, but they outperformed both A/B and traditional students on the 11th grade ACT test after trailing both groups on the 9th grade Levels test" (Lewis, Dugan, Winokur, & Cobb, 2005, p.82-83). In another study comparing a seven-period A/B day schedule to a seven-period traditional schedule investigating student achievement, the results again did not compare favorably to this study. Schools that had been on a on a seven-period A/B schedule for one to two years outperformed the seven-period, traditional-schedule schools.

While there are several studies that demonstrate block scheduling improved student achievement, this does not doesn't compare favorably to this study. There are other studies that indicate traditional scheduling improves student achievement. In a study comparing scheduling formats and the effects they have on student achievement, results were negative toward block scheduling. The results showed that the mean scores on the traditional schedule were consistently higher than the mean scores on the block schedule for mathematics (Lawrence & McPherson, 2000). Other studies imply the same that traditional scheduling is better for student achievement than forms of block scheduling. In a study conducted by Maltese, Dexter, Tai, & Sadler (2007), the effect of block scheduling on mathematics achievement was investigated, and it was determined

that students taking part in block courses performed below those students in traditional classes.

The results of this study show that there is not a significant impact on student achievement in mathematics for male students based on the schedule format, but there is a significant impact on female students. For males students after controlling for the covariate the mean scores were approximately 443 for semester block and 439 for traditional period. While there was not a statistically significant difference in the scores it is clear that male student achievement increased in a block setting compared to a traditional period setting. For female students the adjusted mean scores were approximately 431 for semester block and 459 for traditional period after controlling for the covariate. This is a statistically significant difference in mean scores, based on the educational standard of significance of .05 or 5 percent. The differences in grades was not great, amounting to not more than a third of a letter grade, but it was significant at the $\alpha = .05$ level (Dexter, Tai, & Sadler, 2006). While the significance level was only .031 it is clearly in the allowable level that is less than .05. Therefore the null hypothesis was rejected indicating that female students, based on achievement, score higher in a traditional period setting than in a semester block setting. Female students not only had a significance level that indicated schedule format does impact student achievement, but in examining the results of males and females it is just the opposite of the male students. Male students while not statistically significant do perform better in a semester block setting while female students perform better in a traditional period setting. Research has shown that female students that receive instruction in a traditional period significantly

outperform female students in a semester block setting by approximately 28 points, on a scale of 0 to 600, or by almost 5 percent. This statistically significant impact on achievement should be enough to motivate educational leaders to examine the impacts scheduling has on student achievement before making a decision about changing schedule formats.

Additional research is needed to compare block scheduling to traditional scheduling and the subsequent effects on student achievement, particularly in mathematics. The focus of future research should also closely look at the impacts each schedule format has on male and female students. Future research should examine why male students have higher achievement in a semester block setting and why female students significantly have higher achievement in a traditional period setting. The results of prior research, stated in the previous paragraphs, indicate that schedule format does impact student achievement. While there are very limited studies conducted about the impacts on gender it is clear that male and female students have different achievement levels based on scheduling. In a study conducted that focused on courses taught at a high school using traditional and block scheduling it was discovered that there successes and failures with both scheduling models (Maltese, Dexter, Tai, & Sadler, 2007). The results of this research indicate that there is *not* a significant difference in student achievement for male students based on schedule format, but male students do slightly achieve higher in semester block setting than a traditional period setting. The results of this research show that female students significantly achieve higher in a traditional period setting than a semester block setting. Further, after conducting the literature review, the researcher

expected to find that one schedule format was best for both female and male students. The results of this research indicate that the assumption made by the researcher is not correct and further research needs to be done to explore why there is a difference in achievement levels for each gender.

This study may be useful to school systems that are exploring options of changing schedule formats. The results of this study indicate that there is not a significant difference in student achievement for male students based on schedule format, but that there is a significant difference for female students. The results of this study are based on a modified block schedule where both traditional period and semester blocks are offered with in the same schedule. The results indicate that schedule format does impact student achievement on the end-of-course assessment in Algebra I based on gender. As school systems explore options of how to use time more effectively in schools this study helps provide a foundation for the impacts scheduling has on student achievement for male and female students. With very limited research conducted on the impacts scheduling has on male and female students the different schedule formats should be researched prior to a decision being made about which format is best for school systems to utilize.

This study defined student achievement based on how students scored on the Virginia Standards of Learning end-of-course assessment administered at the conclusion of Algebra I for both male and female students. The results of this study should prove to be beneficial, but more research should be conducted in other areas that could impact student achievement. The results of this study indicate that female students significantly achieve higher on the end-of-course assessment based on the type of setting instruction

was received in for Algebra I and male students do not. While scheduling has proven to impact student achievement for female students there are other factors that could potentially impact achievement and those other factors should be researched. Additionally, more research should be done on how different schedule formats impact students with different academic ability levels. When researching the different ability levels and content areas the difference in male and female students needs to be a part of the study as each gender is impacted differently.

The implications of this study were focused on student achievement in Algebra I and put emphasis on a specific type of schedule format as well as the impacts on each gender. With the increased demand of meeting federal and state benchmarks this study provides information about the impacts schedule format has on student achievement for both female and male students. With males and female students achieving at different levels based on the schedule format instruction was received in, further research needs to be conducted and geared towards gender.

Study Limitations

The focus of this study was to compare schedule formats and the effects they have on student achievement for male and female students within a school utilizing both semester-block and traditional-period classes. Data were collected with the help of a student information specialist located at the central office of the school being utilized for this study. It was assumed that all information provided to the researcher was accurately gathered and correctly placed with the correct student number, SOL score, gender, and schedule format. Students that were utilized for this study had to be enrolled in Algebra I

for the first time and must have taken pre-algebra in the eighth grade and completed the end-of-course assessment for both pre-algebra and Algebra I. It is also assumed that all individuals who fit the requirements of this study, as indicated, were included in the data provided.

Students were selected for each group prior to the study being performed based on the availability of the courses and how they fit into their schedule. To help control for the selection threat, pre-algebra Standards of Learning end-of-course scores were used as a covariate. This research examined students with similar demographics of locale and course load, based upon the fact that a single school located in rural Southwest Virginia was used for this study. Despite controls utilized, the assignment of students to each group, semester block or traditional period is a potential threat to validity.

Since the teacher was the same for both groups, it was assumed that the material covered in each class was consistent to the scope and sequence and Standards of Learning blueprints provided by the Department of Education which could pose an implementation threat. Neither classroom visits nor observations were conducted to ensure that the teacher used similar materials, grading systems, and activities for each schedule format being utilized within the classroom. For future research, it would be beneficial for the researcher to meet with the teacher of the course being taught to discuss the following topics: grading techniques utilized, content covered, instructional practices being utilized, academic ability level of students, make-up work, and other possible factors that impact student achievement. After having taught on a modified block schedule for seven years are different techniques or strategies being utilized for the semester block compared to

the traditional period. Each of the items mentioned are a potential implementation threat to this study.

A limitation to this study is that the study was limited to a single school in rural Southwest Virginia and may not be applicable or relative to other populations. The demographics of this particular region and school are limited in cultural and ethnic diversity. While it serves a larger population of students who are economically disadvantaged, this may not appropriately equate with other locations looking to implement a similar schedule format.

There are many variables that can affect student achievement. This study presented research on schedule format for a specific subject area which makes it a limitation to this study. There are many factors that can play a part in student achievement, such as parental involvement (Boon, 2008; Lee & Shute, 2010), leadership practices (Hoy & Sweetland, 2001), teacher experience, dedication, and effort, (May & Supovitz, 2011; Nettles & Herrington, 2007). Many other factors can have significant impacts (Noe, 2012). Each of these areas could impact how students perform on the end-of-course assessment for Algebra I. Further research needs to be conducted to control for these possible factors.

Recommendations for Future Research

The findings discovered through this research suggest that further research is needed to compare scheduling formats and the impact each has on student achievement. Earlier research indicates that schedule format did impact student achievement. One particular study indicated that block scheduling was not as effective as traditional

scheduling. Research supports that groups of high school students taking Algebra I in a block class consistently had a higher failure rate than the traditional class periods (Lawrence & McPherson, 2000). Other research suggests that block classes provides students with higher academic success. The findings from one study suggest that block scheduling provides students with an advantage over students in a traditional setting with regard to mathematics achievement (Lewis, Dugan, Winokur, & Cobb, 2005). Based on the findings of this study and similar studies, further research is needed to determine the increase, decrease, or no change in student achievement. There are many factors that could impact student achievement indicating that further research is needed. A replication of this study is needed to research other areas of high school mathematics and how they are impacted by schedule format. Factors that could impact student achievement are the type of instruction utilized, materials used for student learning, technology used within the classroom, student motivation, parental involvement, and whether the amount of experience and professional development provided to the teachers could impact the results of this study. A similar study is needed to examine the impacts on special education students in an inclusion setting, a resource setting, as well as students with different cultural, ethnic, and socio-economic backgrounds. Future studies on scheduling should continue to investigate whether students with differing backgrounds and abilities respond differently to block scheduling (Biesinger, Crippen, & Muis, 2008).

Future studies are needed that research student achievement based on schedule format for other subject areas, such as English, social studies, and science. As school systems research schedule formats to determine which is best for their system, there is a

need to make sure the format benefits all subject areas. Researchers and practitioners should examine whether reading is a more appropriate content area for block scheduling than mathematics (Lewis, Dugan, Winokur, & Cobb, 2005). The federal Elementary and Secondary Education Act (ESEA) requires states to establish annual measurable objectives (AMOs) for raising overall reading and mathematics achievement and the achievement of student subgroups (Virginia Department of Education, 2012). Schools not only need to research the impacts on each content area, but also research each subgroup, as well such as students with disabilities and students that economically disadvantaged.

Further research is needed to examine the impact schedule format has on student motivation, attitude, and involvement, and students with different levels of academic ability as well as the culture of the school. Few studies have been conducted about the impacts block scheduling has on students with disabilities. Future research to study the impact scheduling has on teachers could be beneficial as well. Studies that explore the impact of scheduling structures and the effect on teachers should be investigated (Nichols, 2005). Research about the amount and type of professional development received could prove to be beneficial when exploring the effectiveness of scheduling formats. Teachers reported receiving the same type of professional development regardless of the schedule format being used (Flynn, Lawrenz, & Schultz, 2005). Each of these factors could significantly impact student achievement on state end-of-course assessments.

Further research is needed to see the long-term effects that mixed-schedule format, block scheduling, and traditional scheduling have on student achievement. In the last two decades, many schools have made the change to block scheduling as evidenced in tables 1 and 2. Considering that most school across the country were on a traditional schedule for years and years, it could be stated that teachers were well prepared for a traditional schedule format. Professional development for years has been geared toward a traditional-period schedule format. Since block scheduling has emerged in the last two decades, professional development geared toward block scheduling has evolved over that time period. Research to investigate the long-term comparisons of semester block to traditional period could prove to be beneficial. Most studies that have been conducted have examined schools that have made a change to their schedule and have compared the results of each. This type of study limits the amount of good professional development that would be provided to the teachers, ultimately limiting how teachers effectively teach. "Teachers in block-schedule settings may need to be provided with ongoing professional development to optimize the benefits of the extended period schedule. Teachers in this study reported receiving the same type and duration of professional development in standards-based instruction regardless of their school schedule" (Flynn, Lawrenz, & Schultz, 2005, p.21).

Further research needs to be conducted on the impacts that scheduling has on female and male students with regards to disabilities, cultural, ethnic, and socio-economic backgrounds. Future studies need to be expanded to include how schedule format impacts both female and male students. Many studies have been conducted about the

impacts scheduling has on student achievement, but almost none have taken it a step further to determine if the impacts are better or worse for female and male students. The focus for most studies is to determine the impact scheduling has on all students and should be taken a step further to explore the impacts by gender. "Effects on academics have been investigated primarily by studying the following: grade point average, honor roll achievement, numbers of failures and dropout rates and students' performance on standardized tests" (Canady & Rettig, 1999). The research needs to be expanded to view female and male students separately. Further research needs to be conducted to see the impacts that different subject areas have on female and male students based on the schedule format they receive instruction in. Student motivation, attitude, involvement, and students with different ability levels such as regular compared to honors needs to be researched to determine the schedule format that provides highest level of achievement for both female and male students. As research is conducted comparing semester block to traditional period each study can simply be taken a step further to investigate the impacts each has on gender.

The most common choice of schedule format utilized in the last two decades has been some form of block scheduling. Minimal research has been conducted on the effectiveness block scheduling has on student achievement especially with regards to female and male students. This study adds to the research available on comparing schedule formats and impacts on female and male student achievement, but further research still needs to be done. Recommendations listed above are only a few of the possibilities that could be researched in relation to schedule format and the subsequent

impact it has on students. Today, most schools are judged by the success of the students. That success is based on state assessments, Carnegie units, attendance, and graduation rates. Each of these areas has potential to be increased or decreased based on the type of schedule in place. With this being said, further research is needed to determine the type of schedule that is best for student achievement.

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APPENDICES

APPENDIX A

Graduation Requirements for Class of 2007 and Beyond

8VAC20-131-110. Standard and verified units of credit.

A. The standard unit of credit for graduation shall be based on a minimum of 140 clock hours of instruction and successful completion of the requirements of the course. When credit is awarded in less than whole units, the increment awarded must be no greater than the fractional part of the 140 hours of instruction provided. If a school division elects to award credit on a basis other than the 140 clock hours of instruction required for a standard unit of credit defined in this subsection, the local school division shall develop a written policy approved by the superintendent and school board which ensures:

1. That the content of the course for which credit is awarded is comparable to 140 clock hours of instruction; and

2. That upon completion, the student will have met the aims and objectives of the course.

B. A verified unit of credit for graduation shall be based on a minimum of 140 clock hours of instruction, successful completion of the requirements of the course, and the achievement by the student of a passing score on the end-of-course SOL test for that course or additional tests as described in this subsection. A student may also earn a verified unit of credit by the following methods:

1. In accordance with the provisions of the Standards of Quality, students may earn a standard and verified unit of credit for any elective course in which the core academic SOL course content has been integrated and the student passes the related end-of-course SOL test. Such course and test combinations must be approved by the Board of Education.

2. Upon the recommendation of the division superintendent and demonstration of mastery of course content and objectives, qualified students may receive a standard unit of credit and be permitted to sit for the relevant SOL test to earn a verified credit without having to meet the 140-clock-hour requirement.

3. Students who do not pass Standards of Learning tests in science or history and social science may receive locally awarded verified credits from the local school board in accordance with criteria established in guidelines adopted by the Board of Education.

C. The Board of Education may from time to time approve additional tests for the purpose of awarding verified credit. Such additional tests, which enable students to earn verified units of credit, must, at a minimum, meet the following criteria:

1. The test must be standardized and graded independently of the school or school division in which the test is given;

2. The test must be knowledge based;

3. The test must be administered on a multistate or international basis, or administered as part of another state's accountability assessment program; and

4. To be counted in a specific academic area, the test must measure content that incorporates or exceeds the SOL content in the course for which verified credit is given.

The Board of Education will set the score that must be achieved to earn a verified unit of credit on the additional test options.

D. With such funds as are appropriated by the General Assembly, the Board of Education will provide opportunities for students who meet criteria adopted by the board to have an expedited retake of a SOL test to earn verified credit or to meet literacy and numeracy requirements for the Modified Standard Diploma.

Requirements for a Standard Diploma

Discipline Area	Standard Units of Credit Required	Verified Credits
English	4	2
Mathematics	3	1
Laboratory Science	3	1
History and Social Science	3	1
Health and Physical Education	2	
Fine Arts or Career and Technical Education	1	
Electives	6	

Student Selected Test		1
Total	22	6

Requirements for an Advanced Diploma

Discipline Area	Standard Units of Credit Required	Verified Credits
English	4	2
Mathematics	4	2
Laboratory Science	4	2
History and Social Science	4	2
Foreign Language	3	
Health and Physical Education	2	
Fine Arts or Career and Technical Education	1	
Electives	2	
Student Selected Test		1
Total	24	9

(Virginia Legislative Information System, 2011).

APPENDIX B

PERMISSION TO GATHER DATA

Washington County Public Schools

812 Thompson Drive, Abingdon, Virginia 24210
Telephone: (276) 739-3000 FAX: (276) 628-1874

August 20, 2012

To Whom it May Concern:

This letter serves to give permission to Chad Wallace to utilize data from the Holston High School (Washington County Public Schools) SOL scores as needed for informational research in regard to his needs for a doctoral dissertation with your institution. I agree to the methods of his research and presentation of the materials collected therein from our data.

Jim Sullivan, Superintendent
WASHINGTON COUNTY PUBLIC SCHOOLS

Jimmy King, Principal
HOLSTON HIGH SCHOOL

APPENDIX C

IRB APPLICATION APPROVAL

LIBERTY
UNIVERSITY™

The Graduate School at Liberty University

September 5, 2012

Chad Wallace
IRB Exemption 1394.090512: Comparing Traditional Period and Semester Block In High School Mathematics: Effect on Algebra 1 End of Course Assessment

Dear Chad,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and that no further IRB oversight is required.

Your study falls under exemption category 46.101 (b)(4), which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:

> (4) Research involving the collection or **study of existing data, documents, records**, pathological specimens, or diagnostic specimens, if these sources are publicly available or **if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects**.

Please note that this exemption only applies to your current research application, and that any changes to your protocol must be reported to the Liberty IRB for verification of continued exemption status. You may report these changes by submitting a change in protocol form or a new application to the IRB and referencing the above IRB Exemption number.

If you have any questions about this exemption, or need assistance in determining whether possible changes to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,

Fernando Garzon, Psy.D.
Professor, IRB Chair
Counseling

(434) 592-4054

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UNIVERSITY.

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