Alternative Scheduling Models and Their Effect on Science Achievement at the High School Level

By

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Abstract

ALTERNATIVE SCHEDULING MODELS AND THEIR EFFECT ON SCIENCE ACHIEVEMENT AT THE HIGH SCHOOL LEVEL

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This study will evaluate alternative scheduling methods implemented in secondary level schools. Students were selected based on parent selection of programs. Traditional scheduling involves numerous academic subjects with small increments of time in each class and block scheduling focuses on fewer academic subjects and more instructional time. This study will compare office referral numbers, absence frequency, and Essential Learner Outcome (ELO) science strand scores in the 8th-grade (pretest) to the same students office referrals, absence frequency, and ELO science strand scores in the 11th-grade (posttest) between Seven Period Traditional Scheduling (SPTS) and Four Period Block Scheduling (FPBS) in the hopes that no matter what schedule students are a part of, the achievement results will be similar. (Study participants had completed both grade level ELO assessments and were continuously enrolled in one high school through their junior year.

Acknowledgements

Completion of this Dissertation is not just the work of one man, but rather, the collective input of a number of people who provided encouragement along the way and kept the dream alive. I thank the Lord Jesus Christ for giving me the strength and fortitude to accomplish this feat and I know that without his guidance, I would not have the ability to finish this work.

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CHAPTER ONE

Introduction

Literature Related to the Study Purpose

When teachers look closely at their profession, they make important decisions about what and how to teach and within what timeframe (Zitlow, 2003). The scheduling process can seem daunting at times, but it is extremely important to realize that developing a schedule serves major functions in schools. These functions include matching students with human resources such as teachers and classmates and intellectual resources such as the curriculum (Pallas, Natriello, & Riehl, 1999). Traverso writes that curriculum is only words on paper and this curriculum requires a systematic vehicle for implementation or more specifically, the master schedule (1996). Weiss states that although the creation of the master schedule needs to be completed to begin a school year, it is often inefficient for students and teachers (2001). Scheduling is a program that brings students, teachers, curriculum, materials, and space into a systematic arrangement that optimizes the learning environment (Traverso, 1996). One might ask why hasn't there been one scheduling model developed that meets the needs of all students? The reason for this is that all schools are unique and through scheduling, all community stakeholders have a say in developing an integrated and efficient learning environment (Traverso, 1996). In effect, developing a master schedule is typically done by administrative staff or specialists who are loosely connected to the primary function of schools, which is instruction (Weiss, 2001).

In order to understand the basics of scheduling, it is important to go back in time to the one-room school houses and get an understanding of how far schools have come in regard to utilizing time during the day. In the early nineteenth century, teachers with limited education had to teach all subject areas at any time of the day (Schroth, 2008). In the late 1800s, the Carnegie unit, a single subject class period of approximately 50-minutes was implemented in American schools and allowed teachers to specialize in particular subject areas (Schroth, 2008). For the remainder of the nineteenth and twentieth century's and into the new millennium, this type of scheduling still is the dominant scheduling model used in modern educational structures.

There were a number of scheduling experiments in the 1960s and 1970s such as the Open School concept in which the divisions between classrooms disappeared and students progressed from grade to grade at their own speed or the modular flexible schedule in which the seven-period traditional day was divided up into 20-minute modules (Schroth, 2008). These scheduling experiments led to the fluid block scheduling model that became popular in the 1970s and continues to be a popular schedule today (Schroth, 2008).

With the publication of *A Nation at Risk* by the National Commission on Excellence in Education (1983), different scheduling models once again became in vogue based on following recommendations:

- Compared to other nations, American students spend much less time on school work.
- Time spent in the classroom and on homework is often used ineffectively.
- Schools are not doing enough to help students develop either the study skills required to use time well or the willingness to spend more time on school work. (1983, pg. 17)

This report has been the guiding light in terms of school reform and modifying how time is used during the school day. The follow up from the National Education Commission on Time and Learning (1994) only added fuel to the fire when they stated, "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" (National Education Commission on Time and Learning, 1994, pg. 5).

A number of research studies discuss the role of scheduling and its effect on student achievement. One of the more interesting areas where there has been considerable research on the role of scheduling and achievement is in the academic content area of science (Dexter, Tai, & Sadler, 2006; Lee, 2001; Gullatt, 2006; Randler, Kranich, & Eisele, 2007; Salvaterra, Lare, Gnall, & Adams, 1999). While conventional wisdom would say that longer class periods would allow science teachers to have more meaningful lab based work, the research poses confounding results. These findings may be due to the fact that block scheduling alone does not ensure meaningful change (Staunton, 1997). Instead, the move to this type of scheduling must be accompanied by changes in instruction and curriculum delivery, for real achievement gains to be made (1997).

Purpose of the Study

The purpose of this comparative efficacy study is to determine the impact of two scheduling models, seven-period traditional schedule (SPTS) and four-period block schedule (FPBS), on the science Essential Learner Outcome (ELO) strand scores, proficiency levels, office referrals, and absence frequencies of 11th-grade students attending suburban schools with equivalent race, gender, socioeconomic status, and curriculum offerings.

Research Questions

The following pretest-posttest research questions will be used to analyze academic achievement as measured by criterion-referenced Essential Learner Outcome (ELO) scores in science for students enrolled in a seven-period traditional schedule (SPTS) or for students enrolled in a four-period block schedule (FPBS).

Overarching Pretest-Posttest Criterion-Referenced Science ELO Achievement Research Question #1. Do students who participate in seven-period traditional schedule (SPTS) lose, maintain, or improve their beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) strand scores converted to standard scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry?

Sub-Question 1a. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO earth science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule?

Sub-Question 1b. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO life science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule?

Sub-Question 1c. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO physical science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule?

Sub-Question 1d. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO scientific inquiry strand scores converted to standard scores for students enrolled in a seven-period traditional schedule?

Overarching Pretest-Posttest Criterion-Referenced Science ELO Achievement Research Question #2. Do students who participate in four-period block schedule (FPBS) lose, maintain, or improve their beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) strand scores converted to standard scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry?

Sub-Question 2a. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO earth science strand scores converted to standard scores for students enrolled in a four-period block schedule?

Sub-Question 2b. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO life science strand scores converted to standard scores for students enrolled in a four-period block schedule?

Sub-Question 2c. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO physical science strand scores converted to standard scores for students enrolled in a four-period block schedule?

Sub-Question 2d. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO scientific inquiry strand scores converted to standard scores for students enrolled in a four-period block schedule?

Overarching Posttest-Posttest Criterion-Referenced Science ELO Achievement Research Question #3. Do students who participate in a seven-period traditional schedule (SPTS) compared to students who participate in a four-period block schedule (FPBS) have congruent or different posttest 11th-grade science Essential Learner Outcome (ELO) strand scores converted to standard scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry?

Sub-Question 3a. Is there a statistically significant different between posttest 11th-grade science Essential Learner Outcome scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule on the earth science strand score converted to a standard score?

Sub-Question 3b. Is there a statistically significant difference between posttest 11th-grade science Essential Learner Outcome scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule on the life science strand score converted to a standard score?

Sub-Question 3c. Is there a statistically significant difference between posttest 11th-grade science Essential Learner Outcome scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule on the physical science strand score converted to a standard score?

Sub-Question 3d. Is there a statistically significant difference between posttest 11th-grade science Essential Learner Outcome scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule on the scientific inquiry strand score converted to a standard score?

The following pretest-posttest research questions were used to analyze academic achievement as measured by criterion-referenced Essential Learner Outcome (ELO) scores in science for students who participate in a seven-period traditional schedule (SPTS) or for students who participate in a four-period block schedule (FPBS).

Overarching Pretest-Posttest Criterion-Referenced Science ELO Achievement Research Question #4. Is the number of students at each proficiency level congruent or different from beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) for students enrolled in a seven-period traditional schedule (SPTS)?

Overarching Pretest-Posttest Criterion-Referenced Science ELO Achievement Research Question #5. Is the number of students at each proficiency level congruent or different from beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) for students enrolled in a four-period block schedule (FPBS)?

Overarching Posttest-Posttest Criterion-Referenced Science ELO Achievement Research Question #6. Do students who participate in a seven-period traditional schedule (SPTS) compared to students who participate in a four-period block schedule (FPBS) have congruent or different posttest 11th-grade science Essential Learner Outcome (ELO) proficiency levels?

The following pretest-posttest research questions were used to analyze behavior outcomes for students who participate in a seven-period traditional schedule (SPTS) or students who participate in a four-period block schedule (FPBS).

Overarching Pretest-Posttest Behavior Research Question #7. Do students who participate in a seven-period traditional schedule have congruent or different beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior outcomes for (a) behavior office referral frequencies and (b) absence frequencies?

Sub-Question 7a. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior office referral frequencies after participating in the seven-period traditional schedule?

Sub-Question 7b. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to their ending posttest 11th-grade absence frequencies after participating in the seven-period traditional schedule?

Overarching Pretest-Posttest Behavior Research Question #8. Do students who participate in a four-period block schedule have congruent or different beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior outcomes for (a) behavior office referral frequencies and (b) absence frequencies?

Sub-Question 8a. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior office referral frequencies after participating in the four-period block schedule?

Sub-Question 8b. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to their ending posttest 11th-grade absence frequencies after participating in four-period block schedule?

The following posttest-posttest research questions were used to analyze student participation in a seven-period traditional schedule compared to student participation in a four-period block schedule measuring behavior outcomes.

Overarching Posttest-Posttest Behavior Research Question #9. Do students who participate in a seven-period traditional schedule and students who participate in a four-period block schedule have congruent or different ending posttest 11th-grade behavior outcome data for (a) behavior office referral frequencies and (b) absence frequencies?

Sub-Question 9a. Are behavior outcome scores the same for students who participate in a seven-period traditional schedule and for students who participate in a four-period block schedule as measured by the ending posttest 11th-grade behavior office referral frequencies?

Sub-Question 9b. Are behavior outcome scores the same for students who participate in a seven-period traditional schedule and for students who participate in a four-period block schedule as measured by the ending posttest 11th-grade absence frequencies?

Importance of the Study

This study contributes to research, practice, and policy. The study is of significant interest to parents who are interested in finding out what scheduling model provides high achievement results and to secondary school leaders that are considering different scheduling models in the hopes of raising student achievement.

Assumptions of the Study

This study has several strong features. All students in this study have been continuously enrolled from the beginning of 9th-grade through the end of 11th-grade in their respective research high schools (a) seven-period traditional schedule high school and (b) a four-period block schedule high school. Both schools have highly qualified staff members, have implemented their schedules based on best practices, and are equally supported by the district at large through financial resources, school leadership, faculty, and curriculum. All study students completed a beginning of 8th-grade and beginning of 11th-grade science Essential Learner Outcome assessment. The research school district Essential Learner Outcome science assessment cutscores are the result of teachers within the district attending a rigorous "standard setting workshop". The standards for ELO assessments are set by teachers who work in the district and are familiar with the students and the curriculum (Millard Public Schools, 2008). Students who are at or above that cutscore are presumed to be proficient enough in that area to proceed in their education without specially-designed additional instruction (Millard Public Schools, 2008). The cutscores are the results of a rigorous "standard setting workshop" and are established by the combined judgment of 20-25 teachers in each workshop (Millard Public Schools, 2008). The research district schools have been guided through this process by testing experts from the Buros Mental Measurement Institute at the University of Nebraska and Alpine Testing Solutions (Millard Public Schools, 2008).

Other strong features included: (a) testing protocols in the two research schools were the same, (b) accommodations were made for those students with an Individualized Education Plan (IEP), (c) curriculum was consistent among both buildings and teachers followed the same table of specifications for courses that students were enrolled, (d) assessment, attendance, and behavior data collection systems from both buildings were consistent with one another, (e) students who did not have science ELO scores for both 8th and 11th grade were excluded from the study, and (f) students who were not enrolled continuously in the same high school for grades 9-11 were excluded from the study.

Delimitations of the Study

The study findings, results, and discussion will be delimited to two affluent, high achieving suburban high schools with a grade 9 through 12 arrangement that operate on a 4x4 block (n = 30) and a traditional schedule (n = 30). The findings of this study are delimited to these high schools only. Due to different building administration organization structures and individual teacher's classroom management practices, the consistency of how office referrals are handled is a delimitation. Also, one of the research high schools is a closed school that does not enroll students if they live outside the school's designated attendance zone.

Limitations of the Study

This comparative efficacy study is limited to students (N = 60) who attend two high schools in a district of over 22,000 students and whose parents report middle to upper socioeconomic status. The study presents a sample of students who are predominantly White/Caucasian and live in a suburban area of a large metropolitan city. Using the test results from two suburban schools may skew the statistical results and reduce the utility and generalizability of the findings.

Definition of Terms

Absence frequency. Absence frequency refers to the total number of complete day of absences. Individual periods of absence are excluded from this count.

Behavior office referrals. Behavior office referrals are those behaviors that are negative and are sent to the administration for consequences. Students receive office referrals after all efforts in the classroom have been exhausted.

Barely proficient rating. Barely proficient rating is defined as an indicator of student performance on a particular criterion-referenced assessment based on an established cutscore. A student with a barely proficient rating scores within a range of scores just above the lowest cutscore on a multi-level proficiency scale. Students scoring in this range are perceived to have below average academic ability in the related assessment area. The research district schools have been guided through this process by testing experts from the Buros Mental Measurement Institute at the University of Nebraska and Alpine Testing Solutions (Millard Public Schools, 2008).

Below proficient rating. Below proficient rating is defined as an indicator of student performance on a particular criterion-referenced assessment based on an established cutscore. A student with a below proficient rating scores within a range of scores below the lowest cutscore on a multi-level proficiency scale. Students scoring in this range are perceived to be below or significantly below average academic ability in the related assessment area. The research district schools have been guided through this process by testing experts from the Buros Mental Measurement Institute at the University of Nebraska and Alpine Testing Solutions (Millard Public Schools, 2008).

Beyond proficient rating. Beyond proficient rating is defined as an indicator of student performance on a particular criterion-referenced assessment based on an established cutscore. A student with a beyond proficient rating scores within a range of scores above the highest cutscore on a multi-level proficiency scale. Students scoring in this range are perceived to have above average academic ability in the related assessment area. The research district schools have been guided through this process by testing experts from the Buros Mental Measurement Institute at the University of Nebraska and Alpine Testing Solutions (Millard Public Schools, 2008).

Criterion referenced test (CRT). Criterion referenced test is defined as a test in which the questions are written according to specific predetermined criteria such as an established academic curriculum in which students have received instruction prior to the administration of the test.

Essential Learner Outcomes (ELOs). Essential learner outcomes exams are criterion-referenced tests given to all students in grades one through eleven in the Millard Public Schools in Omaha, Nebraska. The purpose of these assessments is to determine the level of proficiency that students have achieved with the local curriculum that is aligned with state standards. Results of these tests are used to inform educators and parents of the progress of children, which includes required intervention for students below proficient performance. The results for students in certain grades are also used for No Child Left Behind requirements as well as for state reporting. The Millard Essential Learner Outcomes Exams are also high stakes graduation requirements.

Four-Period Block Scheduling (FPBS). Four-Period Block Scheduling typically involves a four-block day, with each block receiving 85 to 90-minute time increments. There are numerous variations of FPBS, however, for the purpose of this study, the 4X4 block method will be used. The 4X4 block involves four 90-minute classes that last for 10 weeks. Core classes such as English, social studies, math, and science will last approximately 20 weeks. The ideology behind FPBS is that larger blocks of time allow for a more flexible and productive classroom environment with varied and interactive teaching methods (Irmsher, 1996). In other words, FPBS allows students to be engaged in a subject area for greater amounts of time to ensure that skills are mastered and put into use.

Individualized Education Program (IEP). Individualized education program (IEP) is a written statement that outlines special education and related services for students with a verified disability in order to assure them a free, appropriate education.

No Child Left Behind (NCLB). The No Child Left Behind Amendments, Public Law 107-110, to the Elementary and Secondary Education Act of 1964 were signed into law by President George W. Bush on January 8, 2002. This federal statute outlines definitive expectations of all schools in the United States in relation to student achievement and accountability.

Proficient rating. Proficient rating is defined as an indicator of student performance on a particular criterion-referenced assessment based on an established cutscore. A student with a proficient rating scores within a range of scores above the mid-range cutscore on a multi-level proficiency scale. Students scoring in this range are perceived to have average academic ability in the related assessment area. The research district schools have been guided through this process by testing experts from the Buros Mental Measurement Institute at the University of Nebraska and Alpine Testing Solutions (Millard Public Schools, 2008).

Seven-Period Traditional Scheduling (SPTS). Seven-Period Traditional Scheduling typically involves an eight period day with each period receiving 45-minute time increments. Students involved in this method attend the same classes in their schedule throughout an entire year. This scheduling method is the most widely used method in the United States. According to Irmsher (1996), a typical student could be in nine locations pursuing nine different activities in a single day. Irmsher notes that an average teacher might teach five classes, dealing with 125-180 students and multiple preparations (1996). For the purposes of this study, SPTS will be a seven-period day with an optional zero and eighth hour for students seeking more credit opportunities.

Standard scores. All raw scores ELO scores will be converted standard scores with a mean equal to 100 and a standard deviation equal to 15.

Standard setting. Standard setting is defined as the psychometric process of determining the cutscores that divide a range of scores on an exam into various levels of proficiency. This process includes at least three and usually four simultaneously applied methods to ensure the validity of the cutscores. The research district schools have been guided through this process by testing experts from the Buros Mental Measurement Institute at the University of Nebraska and Alpine Testing Solutions (Millard Public Schools, 2008).

Significance of Study

This study contributes to research, practice, and policy. This study is of significant interest to parents and students in view of options available for enrollment in high schools, to educators and school district officials as they consider what type of scheduling models should be implemented in high schools, and whether existing scheduling models should be reconsidered as part of a School Improvement Plan.

Contribution to research. A review of professional literature suggests that more research is needed on the subject of school scheduling models. There is also a need for more research on the most effective ways that students learn and how to provide that within the school scheduling structure. Furthermore, the results of this study may inform district central office staff of the impact of school scheduling on student achievement, student behavior, and student attendance. In addition, the findings indicate specific factors that may determine types of services that schools need to provide so that children may learn.

Contribution to practice. A suburban school district may decide whether or not to utilize a specific scheduling model for all of its buildings or may decide to provide numerous options, so that depending on a student's learning style, a school with that specific scheduling option is available for them. This approach may be considered differentiation at the systems level.

Contribution to policy. The results of this study may offer insight into why schools choose to operate on a specific schedule and how existing scheduling models affect student achievement. Given the study outcomes, the school district and its schools may choose to reconsider their current scheduling model in favor of one that promotes higher student achievement.

Organization of the Study

The literature review relevant to this research study is presented in Chapter 2. This chapter reviews the professional literature related to student achievement and other factors in schools with different types of scheduling models. Chapter 3 describes the research design, methodology, independent variables, dependent variables, and procedures that will be used to gather and analyze the data of the study. This includes a detailed synthesis of the participants, a comprehensive list of the dependent variables, the dependent measures, and the data analysis used to statistically determine if the null hypothesis is rejected for each research question. Chapter 4 reports the research findings, including data analysis, tables, and inferential statistics. Chapter 5 draws conclusions from the findings and provides a discussion of the study findings.

CHAPTER TWO

Review of Literature

History

The National Commission on Excellence in Education (1983) published *A Nation at Risk* with a goal of attaining excellence in American schools. The report's intention was to make recommendations and show that "a society that has adopted these policies will then be prepared through education and skill of its people to respond to the challenges of a rapidly changing world" (National Commission on Excellence in Education, 1983, pg. 11). The report delivers findings on its research of American schools and identifies many problems that schools face, including the primary issue of time and how it is underutilized. This includes:

- Compared to other nations, American students spend much less time on school work.
- Time spent in the classroom and on homework is often used ineffectively.
- Schools are not doing enough to help students develop either the study skills required to use time well or the willingness to spend more time on school work. (1983, pg. 17)

Overwhelmingly, *A Nation at Risk* has molded educational reform unlike any other study in the last twenty-five years. From the time the report was introduced until today, schools have been modifying the way they do business in order to meet the needs of a changing society. One of the more prominent changes that schools are still modifying today is the way that instructional time is utilized in order to make the most out the school day.

"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" (National Education Commission on Time and Learning, 1994, pg. 5). Schools have taken this to heart and have changed the way time is allotted during the school day to maximize instruction. The traditional way is an assembly line method, a factory model of compartmentalization and specialization (Geismar & Pullease, 1996; Shortt & Thayer, 1997). At the same time, teaching in a more focused manner does not necessarily result in better learning (Gruber & Onwuegbuzie, 2001).

The field of education has long been viewed as one of many trends. Whatever trend is fashionable at one time may be obsolete at another. One thing that is apparent, however, is that trends typically come full circle. These beginnings are typically known as the grassroots. The grassroots of education are rural, one-room schoolhouses where those in the community dictate the curriculum. Although a return to these grassroots seems impossible, elements of the practice can still be accomplished today.

A growing trend in the American educational system, alternative scheduling, has become an issue because education professionals want to find the best way for children to learn. The crux of the issue is today's workplaces value and reward skills and behaviors that traditional schools typically ignore (Shortt & Thayer, 1997). The ultimate question then lies within the issue of time and how to maximize it. Numerous studies have been conducted over recent years to explain the significance of alternative scheduling practices compared to traditional scheduling and how time is utilized in both (Marchant & Paulson, 2001; Khazzaka, 1997; Deuel, 1999; Stokes & Wilson, 2000; Canady & Rettig, 1995; Knight, De Leon, & Smith, 1999; Dexter, Tai, & Sadler, 2006; Bottge, Gugerty, Serlin, & Moon, 2003). The research is in its infancy and no clear-cut conclusions have been discovered. What has been discovered is that schools are looking at the traditional practices of educational doctrine and change is happening. One avenue leading away from traditionalism is that of restructuring time that students are in class. Block scheduling accomplishes this and takes on various forms like the 4x4 block where students only take 4 classes a day for roughly 80-90 minutes and begin new classes twice a year (Zepeda & Mayers, 2006). A variation of the 4x4 block is the trimester model in which the school year is divided into three terms instead of two like the 4x4 block (Zepeda & Mayers, 2006). Finally, the A/B block method or the alternating block allows students to meet every other day throughout the school year and enroll in six to eight classes for roughly 70-90 minutes (Zepeda & Mayers, 2006). These are the main alternatives to the traditional model of scheduling. The research conducted thus far has focused primarily on scheduling models and the allowance for more in-depth study, support for effective achievement, improvement in student achievement, and improvement in attendance and discipline.

Traditional Scheduling

Most available research on scheduling models points towards various block scheduling models as a counter to the long-standing traditional models of six, seven, and eight period days. Most research that favors traditional scheduling models focus not on why the traditional model is better, but rather on the limited, if any, results of implementing a block schedule. Because traditional scheduling models are the norm, they are considered the measuring stick for all alternative scheduling models. Numerous studies try to explain the phenomenon by not showing why one scheduling model is better than another, but rather, how student achievement really doesn’t improve in a statistically significant matter by changing the way school time is organized (Dexter, Tai, & Sadler, 2006; Bottge, Gugerty, Serlin, & Moon, 2003).

There are traditionalists out there who are bucking the trend of block scheduling. Arnold is one of these researchers who feels that administrators have quickly rushed into the adoption of a block model based on its purported advantages, but without any real data on its benefits (2002). In a study of schools in Virginia using the Tests of Achievement and Proficiency (TAP), the data analysis revealed that although block-scheduled schools realized increases in mean scale scores during the implementation year of block scheduling, those increases diminished by the second year (Arnold, 2002). Arnold concludes that in order to make an appropriate comparison between block and traditional scheduled schools, factors other than standardized test score achievement should be examined more closely (2002).

Traditional Scheduling and Student Achievement

Though research is young in the field of scheduling models for high schools, the primary focus for these studies has been the effect of scheduling models on student achievement. The abundance of literature on the topic has been geared towards providing evidence that block scheduling increases levels of achievement compared to those schools on the traditional model. There are those researchers who feel that there is not enough conclusive evidence for a school to make a scheduling switch purely on the merits of student achievement (Lawrence & McPherson, 2000; Pliska, Harmston, & Hackmann, 2001; Gruber & Onwuegbuzie, 2001).

Lawrence and McPherson (2000) compared test scores for selected subject areas on the North Carolina End-of-Course tests and found that students on the traditional schedule scored significantly higher than their block counterparts on tests for Algebra 1, Biology, English I, and U.S. History. Results showed that block scheduling alone, may not be the most productive long-term solution to inadequate academic achievement for high school students (Lawrence & McPherson, 2000). In fact, the data collected from the study showed that the mean proficiency scores for traditional scheduled students were higher in all subject areas on the North Carolina End-of Course test (2000). Lawrence and McPherson advise educators to conduct research themselves to design better scheduling alternatives that more adequately meet the needs of students and teachers, since block scheduling does not meet all the desired outcomes (2000). This is consistent with the findings of Gruber and Onwuegbuzie (2001) who concluded that block scheduling does not have a positive impact on academic achievement and in fact, a moderate negative impact on academic performance appears in the areas of language arts, mathematics, social studies, and science (Lawrence & McPherson, 2000).

Continuing this research, Pliska, Harmston, and Hackmann (2001) compare students in Illinois and Iowa whose schools employ 4x4 block, eight-block alternating day, and traditional eight period schedules in one of the first studies to encompass such a large participant pool, spanning school boundaries and state lines. They contend that in order to effectively measure the merits of each schedule, a standardized test such as the ACT must be used in order to make meaningful comparisons across schools because the ACT is not prone to teacher subjectivity (2001). Early data results point to the fact that a block scheduling does not seem to result in short-term, dramatic improvements in ACT scores (2001).

Block Scheduling

In research conducted about the effectiveness of block scheduling, Canady and Rettig (1995), two of the foremost proponents of the block, claim that block scheduling is the most effective of scheduling methods because teachers do not have to plan classes around special program classes. They state, “Students traveling through a six, seven, or eight-period day encounter the same number of pieces of unconnected curriculum each day, with little opportunity for in-depth study” (Canady & Rettig, 1995, pg. 5). By using block scheduling, schools ensure that students will have an appropriate amount of time to connect and absorb the information that is given to them. Canady and Rettig suggest, “The assembly-line, traditional period schedule contributes to the depersonalizing nature of high schools (Canady & Rettig, 1995, pg. 5).” They contend that teachers who are responsible for over a hundred children daily are unable to build relationships with students. Conversely, they feel that students who have to answer to more than four teachers in a day, creates an environment where students don’t know who to turn to for guidance. This is a sentiment shared by Hughes (2004) who hypothesizes that students who have to focus on fewer subjects during each semester could apply themselves more and spend more time on each course and therefore get a greater understanding of the courses they are enrolled in. Further examination of the success of block scheduling was found in class sizes. Knight, De Leon, and Smith concluded that in most cases, block schedule classes were smaller than their traditional counterparts taught by the same teacher (1999). They came up with an alternate conclusion that smaller class size enables students in the block schedule to perform better academically (1999). By having fewer classes and fewer peers in those classes, it is presumed that students will be able to have more in-depth study and be more successful academically.

The research of Canady and Rettig, Hughes, as well as Knight, De Leon, and Smith is best exemplified in the findings of Marchant and Paulson (2001) who assessed the effect of block scheduling as compared to traditional scheduling. In general, Marchant and Paulson discovered that most students were supportive of block scheduling and the students commented:

1. The day goes faster.
2. You can cover a lot more.
3. It is good for labs, because you can complete the lab.
4. Allows for more in-depth conversation
5. There is less pressure since you have two days for homework. (Marchant & Paulson, 2001, pg. 16)

The research presented thus far offers a glimpse at how block scheduling provides an opportunity for smaller class sizes and a chance for more in-depth study for students. Although this research doesn't deal specifically with student achievement, it does show that schools choose a scheduling model because it provides support for improved student success and improved teaching strategies.

This brings to the forefront the idea that a scheduling model is a support mechanism for student achievement rather than the catalyst. Stokes and Wilson (2000) found that in the transition from year three to year four on the block model professional educators noted distinct instructional advantages of block scheduling as compared with traditional scheduling (2000). These areas include:

- The variety of instructional strategies used within a class increases.
- The development of an entire idea in one sitting often occurs.
- There is more student-teacher interaction.
- There is more on-task time.
- The quality and continuity of instruction improves.
- Alternative assessment use increases.
- Active learning increases.
- Learning is more enjoyable.
- There is more individualized instruction.
- There is more critical thinking in the curriculum.
- There is a positive impact on the percentage of students taking enrichment classes.

- The percentage of students doing homework increases. (Stokes & Wilson, 2000, pg. 97)

Zepeda and Mayers (2006) narrow the themes of Stokes and Wilson's research and break them down into five themes. They did an extensive search of research concerning block scheduling, constructed a matrix depicting the results of the search, and then analyzed the studies in the search. Focusing specifically on the research questions posed in the studies, Zepeda and Mayers were able to identify five categories in which the studies were clustered (2006). These clusters included:

- Teachers' instructional practices and perceptions of block scheduling
- Change and block scheduling
- Effects of implementing block scheduling
- Effects of block scheduling on student learning
- Students' perceptions of block scheduling

(2006, pg. 143)

After extensive research, Zepeda and Mayers conclude that analysis of block scheduling research is shallow at best (2006). They refer to the generalizations of block scheduling as problematic at best when unique characteristics of schools are factored in (2006). The two generalizations the authors find consistent among all literature on block scheduling is that teachers and students like block scheduling, but don't know why and student grades and grade point averages increase (2006). Although these generalizations become apparent through literature review, the lack of available empirical data on block scheduling hurts these generalizations.

Deuel (1999) presents results that are consistent with the themes generated by Stokes and Wilson (2000) and Zepeda and Mayers (2006) and shows that on no measures did non-block schools outperform block schools. In addition, Deuel found that perceptions among staff were in favor of block scheduling because of the ability to implement new teaching techniques, increase the number of learning activities, and experiment with different evaluation techniques (1999). Deuel noted that under block scheduling, students have been able to enroll in the classes they need to graduate on time (94%) and are able to pursue the electives that interest them (97%) (1999).

Many researchers warn educators that abandoning a traditional scheduling model in favor of block scheduling to maximize instructional time and student achievement, need to look hard at how the change is going to affect the school environment. Hamdy and Urich (1998) note that although the teachers they surveyed preferred block scheduling to traditional scheduling, some felt that the gaps between classes and semesters hindered the teaching of content material because many students forgot material and couldn’t bridge old and new material (Hamdy & Urich, 1998). They also noted students transitioning from the middle school to the high school were not prepared for longer class sessions and that because class sizes increased, classroom management took up a lot of instructional time (Hamdy & Urich, 1998). This thought is in opposition with most block scheduling proponents.

Block Scheduling and Student Achievement

Although the literature presented thus far looks at the advantages of alternative schedules as a catalyst for improved academic achievement rather than the direct cause there is research to support the notion that block scheduling does affect student achievement.

Khazzaka (1997) evaluates the merits of a seven-period school day or SPTS (Traditional Scheduling) and compared them to those in a four-period school day or FPBS (Block Scheduling) in a sample of six high schools in the same geographic area of the United States. The results of the study were overwhelmingly in favor of block scheduling. According to the findings, the block schedule was supported by students, teachers, administrators, and parents (1997). The study revealed that students participating in block scheduling completed 20% more classes than under the traditional schedule and 53% of the students improved their grades (Khazzaka, 1997). The study also revealed high ACT scores and an increased graduation rate among Native Americans. The most striking statistic was that, "While the percentage of A's earned by ninth graders rose from 14% to 26%, it went up from 32% to 44% in advanced placement classes" (Khazzaka, 1997, pg. 6).

Deuel's study confirmed the results of Khazzaka in the area of student achievement. Deuel notes that students at block scheduling schools achieved significantly more 'A' grades than their peers at non-block schools (1999). Conversely, although there were no statistically significant differences by scheduling type in the awarding of a "B" grade, significantly fewer C's, D's, and failing grades were assigned to students at schools with block scheduling (1999).

Knight et al. (1999) continued to look at the block scheduling model and looked at multiple data sources to investigate the processes and outcomes of 4x4 block schedule (1999). The results of the study indicated, students in block schedule classes performed better academically than their peers in traditional schedule classes on semester exams and grades (1999).

The findings of Knight et al. also shed some light on the effectiveness of the traditional schedule model. Although the study does show a higher percentage of students meeting achievement standards in a 4x4 block model, they did also find that more students in a traditional schedule attempt AP exams and perform better than their block counterparts (1999). The study found that students thought fewer people would take the AP exams because of the perception that they were not adequately prepared (1999).

If then, the school scheduling model is a support mechanism for student achievement, which scheduling model best prepares students for the real world and maximizes instructional time for the betterment of student achievement? Hackmann (2004) looks at the larger picture of education and sheds light on the difference between behaviorism versus constructivism. Hackmann feels that while behaviorism focuses primarily on the teacher as a transmitter of knowledge, constructivism emphasizes the student's role in the learning process (2004). He also notes that implementing a scheduling model in of itself is not enough to improve student achievement. With this in mind, what other factors need to be considered when looking at alternative scheduling models? Recently, new research has been geared towards the implementation of the best facets of all scheduling models to create hybrids.

Hybrid Scheduling

One such hybrid approach is the schedule within a schedule model (Childers & Ireland, 2005). The research on this model looks at a specific school that approached the scheduling issue by answering the following questions:

1. Which courses should be taught as block classes and which as traditional?
2. Will each student be able to have a complete schedule under this plan?
3. Will faculty and parents support it?
4. Will student performance on course work and end-of-course tests be negatively affected?
   (2005, pg. 44).

The answers to these questions provided the school with the opportunity to create the schedule they still utilize today. Through research, the district found that some classes need longer time periods while others do just fine on the traditional time frame (2005). This school district took the philosophical position that wholesale block and wholesale traditional scheduling best serve all students, teachers, and subjects (2005).

Veldman (2002) confirms the findings of Childers and Ireland in his research of Coopersville High School in Michigan where the school district made a scheduling switch to reflect the best parts of traditional and block scheduling (2002). Coopersville discovered that teachers of physical education, math, music, and foreign language needed more repetition rather than more time (2002). This counters the argument of most proponents of block scheduling who feel that more in-depth study can only occur with more time in the classroom. Instead, Coopersville developed a composite schedule that met the following goals:

- Increased number of times each class meets
- Class periods of sufficient length to provide in-depth study
- Facilitation of teaming and team teaching
- Reduction in the amount of seminar time
- An easy-to-understand schedule for students, parents, and teachers (2002, pg. 37)

Although no evidence of improved student achievement is available, Coopersville has seen an increase in on-task learning, effective use of seminar time, and the ability to share staff members with other buildings (2002).

Showing similar results, Westfield High School in Indiana employed a 3x5 Trimester Plan where the academic year is divided into 12 week increments that follow the traditional seasons of fall, winter, and spring and students meet 5 periods a day for 70-minutes (Brower, 2000). The data collect suggests:

- Academic honor roll up 22 percent
- Failures down 12 percent
- Attendance up more than 1 full percentage point
- Exceeded all five areas of the expected performance proficiencies in high school for the state of Indiana, which include ISTEP batter, math scores, language arts scores, attendance rate, and graduation rate
- Graduation rate up over 9 percent
- Disciplinary referrals from teachers down 31 percent
- More students pursuing Academic Honors Diploma for the state
- More students pursuing the Core 40 state college course requirements
- More than 20 percent of students earning credit outside the walls of the building. This has increased 10 times since the trimester schedule implementation
- Articulation agreements were reached with three universities for the first time (Brower, 2000, pg. 30)

Other examples of hybrid schedules show how schools modify the way time has been traditionally used in an attempt to improve student achievement, school climate, and student discipline. Whether it be increasing the amount of time students get for lunch (Nye, 2000) or reducing the school week from five days to four with Friday being a day for students to take test-prep classes, repeat classes, participate in school-to-work seminars, participate in internships, or work on community service projects (Black, 2002), schools are experimenting with the time they have allotted to teach students in the most effective way possible.

Scheduling and Science Achievement

When looking at scheduling models and the effect on student achievement, it is sometimes beneficial to specify achievement to a particular discipline. Conventional wisdom says that courses such as science and other lab based courses would benefit from longer blocks of time to complete course specific work. Most research does show that longer class periods allow students to explore topics in depth, work in collaborative groups more often, use technology more, and work in more lab-based or problem solving environments (Shortt & Thayer, 1997; Hurley, 1997; Staunton, 1997), but does the scheduling model itself actually promote better student achievement?

According to Salvaterra, Lare, Gnall, & Adams (1999) teachers of science appear anxious about the retention of material due to the sequential nature of the course and the time gap that may exist between courses. In terms of how block scheduling prepared students for college course work, student responses tended to favor block scheduling because it allowed for more useful, productive labs (1999). Additionally, students felt that teachers in a block schedule used more group work and more hands-on activities, which in turn, put a heavier emphasis on research that aided students in post-secondary education (1999).

On the other hand, Dexter, Tai, & Sadler (2006) address two major questions regarding scheduling models and science achievement:

1. Do students who participated in a block science class report instructional practices at frequencies different from their counterparts in traditional classes?
2. Controlling for secondary science achievement and differences in backgrounds, is introductory college science performance associated with students' reported participation in high school scheduling plans? Are interactive associations between scheduling plans and instructional practice associated with introductory college science performance?
(2006, pg. 11)

The findings from over 8,178 surveys collected show that there is little, if any, difference between students prepared through a block, traditional, or modified block schedule (2006). In fact, they discovered that the slight variation in achievement that did exist suggests that students on a traditional schedule are predicted to earn higher grades than anyone else (2006).

With confounding results then, what scheduling model provides a better opportunity for higher achievement? Certainly, with fewer classes in a day and more instructional time spent delivering the curriculum, students would perform better in a block schedule? According to Staunton (1997), the answer is that block scheduling alone does not ensure meaningful change. Instead, the move to this type of scheduling must be accompanied by changes in instruction and curriculum delivery, for real achievement gains to be made (1997).

Issues Other than Student Achievement

In all of the research provided on alternative scheduling models thus far, questions arise regarding issues other than student achievement (Pliska, Harmston, & Hackman, 2001; Marchant & Paulson, 2001; Shortt & Thayer, 1998; Rikard & Banville, 2005; Eineder & Bishop, 1997; George, 1997). Proponents of block scheduling feel that scheduling reforms are interrelated with other components in a school system and that a schedule change is not enough by itself to improve student achievement (Pliska et al., 2001). Two of the most prominent themes that arise are that of student-teacher relationships and student discipline.

Numerous studies have been done that resemble the outcome of the Marchant and Paulson study where it was concluded that block scheduling increased student GPA, improved attendance, decreased discipline events, and also indicated that students, parents, and school administrators support the new scheduling model (2001). These studies focus on the perceptions of students, teachers, and parents and they show the positive correlation between block scheduling and a more relaxed environment for students and staff, decreased unsupervised movement in the school, a decrease in behavior referrals, decreased the number of fights in school, improved teacher morale, and had a positive impact on attendance (Shortt & Thayer, 1998; Rikard & Banville, 2005).

Eineder and Bishop (1997) and George (1997) focus how block scheduling has a positive impact on relationships between teachers and students and how student behavior improves when this type of scheduling model is implemented. They found that block scheduling allowed teachers to have smaller class sizes, which improved student-teacher relationships and students had increased opportunities to complete group activities in class under the supervision of the teacher (Eineder & Bishop, 1997). They found that 95% of teachers and 80% of students felt that student-teacher relationships improved (Eineder & Bishop, 1997). This research is echoed in the findings of George (1997). George's survey found that teachers achieved a positive rapport with their students quicker than what they would have accomplished under a traditional scheduling model (1997).

Eineder and Bishop (1997) also found that discipline improved at the school. The number of students involved in fights reduced by 40% and the longer instructional periods allowed teachers time to effectively handle discipline during class time (1997). George confirms this finding in his survey of teachers. He notes that teachers noticed less trouble in the hallways and between classes because students frequent them less in block schedule (George, 1997). Deuel (1999) also discovered one-third of teachers "observed improvements in student promptness (39%) and attendance (40%), with a reduction in student misconduct in their classrooms (39%) and schoolwide (40%)" (Deuel, 1999).

Summary

The literature discussed here poses interesting questions as to whether school organization in scheduling is important in student achievement. Due to the relative newness of the subject, the following study hopes to shed some light on the area of scheduling and offer suggestions on how schools can structure the way they do things so that students will receive the best possible benefits.

This study will focus specifically on traditional scheduling and 4x4 block scheduling because both represent opposite ends of the scheduling spectrum. More specifically, this study will analyze a school district in the Midwest that offers different scheduling options at all of its four high schools (traditional, 4x4 block, modified A/B block, and trimester). The district has a strong belief in providing choices for its students and promotes site based decision making. This allows the high schools to decide which scheduling model they want to implement in order to effectively educate their students.

CHAPTER THREE

Methodology

The purpose of this comparative efficacy study is to determine the impact of two scheduling models, seven-period traditional schedule (SPTS) and four-period block schedule (FPBS), on the science Essential Learner Outcome (ELO) strand scores, office referrals, and absence frequencies of 11th-grade students attending suburban schools with equivalent race, gender, socioeconomic status, and curriculum offerings.

Participants

Individuals participating in this study were enrolled in a school with a traditional scheduling model (Research School A) or block scheduling model (Research School B) for three consecutive years and also completed a beginning pretest 8th-grade science Essential Learner Outcome (ELO) assessment and an ending posttest 11th-grade science ELO. The samples were randomly selected.

Number of participants. Study participants (N = 60) consist of two randomly formed arms. The first study arm will be a randomly selected group of students who have been enrolled in a school with a traditional, seven-period scheduling model (n = 30). The second study arm will be a randomly selected group of students who have been enrolled in a school with a 4x4 block scheduling model (n = 30). Participants were in the 8th-grade during the 2005-2006 school year and 11th-grade in the 2008-2009 school year.

Inclusion criteria of participants. Participants selected for this study completed 8th through 11th-grade in the study school district and completed science ELOs in both 8th and 11th-grade. Students must have had consecutive enrollment in their high school from grades 9 through 11.

Description of Procedures

Sample. The random sample included 30 11th-grade grade students from two different high schools in the Research School District (*N* = 60). All students who attend the Research School District are required to take Essential Learner Outcomes (ELOs) in the areas of reading, math, writing, science, and social studies. More specifically, students take a science ELO in 8th-grade as a benchmark test and then again in the 11th-grade as a graduation requirement. Students who did not have both scores were excluded from the sample.

Research Design. This comparative efficacy study used a pretest-posttest repeated-measures group design presented in the following notation:

Group 1 X_1 O_1 Y_1 O_2

Group 2 X_1 O_1 Y_2 O_2

Group 1 = Study participants #1. A random sample of students who attend Research School A with a seven-period traditional schedule (*n = 30).*

Group #2 = Study participants #2. A random sample of students who attend Research School B with a four-period block schedule (*n = 30).*

X_1 = Study constant. All study participants completed 8th through 11th-grade in the Millard Public Schools and completed science ELO in both 8th and 11th-grade. Students must have been enrolled in their high school from grades 9 through 11.

Y_1 = Study independent variable scheduling model condition #1. A random sample of 11th-grade students who attend Research School A with traditional scheduling.

Y_2 = Study independent variable scheduling model condition #2. A random sample of 11th-grade students who attend Research School B 4x4 block scheduling.

O_1 = Study dependent measures #1. Pretest 8th-grade (a) science ELO proficiency levels (*i*) below proficient, (*ii*) barely proficient, (*iii*) proficient, and (*iv*) beyond proficient and (b) science ELO strands (*i*) earth science, (*ii*) life science, (*iii*) physical science, and (*iv*) scientific inquiry raw scores that are converted to standard scores. Dependent measures also include pretest 8th-grade behavior office referrals and absence frequency.

O_2 = Study dependent measures #1. Posttest 11th-grade (a) science ELO proficiency levels (*i*) below proficient, (*ii*) barely proficient, (*iii*) proficient, and (*iv*) beyond proficient and (b) science ELO strands (*i*) earth science, (*ii*) life science, (*iii*) physical science, and (*iv*) scientific inquiry raw scores that are converted to standard scores. Dependent measures also include posttest 11th-grade behavior office referrals and absence frequency.

Independent Variable Descriptions

The independent variables were 11th-grade students from two Millard High Schools (Research Schools A and B). The Research School A group was composed of 30 students and the Research School B group was composed of 30 students. Data collection times were held on two different occasions, in the students' 8th-grade and 11th-grade years.

Research School A employs 150 certified staff members, of which approximately 60% have Master Degrees or higher (Nebraska Department of Education, 2007). The student population of Millard North High School is approximately 2,500 students with the following breakdown: 1.) Freshman – 573 students, 2.) Sophomores – 641 students, 3.) Juniors – 651, and 4.) Seniors 653 students (Nebraska Department of Education, 2007). Research School A operates on a SPTS with an optional zero and eighth hour for extended learning opportunities.

Research School B opened in 1995. The school has an enrollment of 2,076 students with the following breakdown: 1.) Freshman – 555 students, 2.) Sophomores – 508 students, 3.) Juniors – 541 students, and 4.) Seniors – 472 students (NDE, 2007). The school employs 112 certified staff members, of which 65.55% have Master's degrees (NDE, 2007). Research School B operates on FPBS with each block being 90-minutes in length and classes lasting approximately 9-10 weeks.

Dependent Variables

There were five dependent variables for this study that fell into three specific themes: academic achievement, attendance, and behavior.

Academic achievement measures and instrumentation. Academic achievement was defined by pretest 8th-grade science ELO strand data scores compared to posttest 11th-grade scores (interval). These scores were converted to standard scores. The other measure of academic achievement was proficiency levels (below proficient, barely proficient, proficient, and beyond proficient) on the science ELO 8th-grade pretest compared to 11th-grade posttest (ordinal).

Attendance dependent measures and instrumentation. Absence frequency was a ratio level variable that referred to the number of days a student was absent from school.

Behavior dependent measures and instrumentation. Behavior office referral rate is a ratio level variable that indicates the number of behavior referrals a student received during a given year.

Research Questions, Sub-Questions, and Data Analysis

The following pretest-posttest research questions will be used to analyze academic achievement as measured by criterion-referenced Essential Learner Outcome (ELO) scores in science for students enrolled in a seven-period traditional schedule (SPTS) or for students enrolled in a four-period block schedule (FPBS).

Overarching Pretest-Posttest Criterion-Referenced Science ELO Achievement Research Question #1. Do students who participate in seven-period traditional schedule (SPTS) lose, maintain, or improve their beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) strand scores converted to standard scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry?

Sub-Question 1a. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO earth science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule?

Sub-Question 1b. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO life science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule?

Sub-Question 1c. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO physical science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule?

Sub-Question 1d. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO scientific inquiry strand scores converted to standard scores for students enrolled in a seven-period traditional schedule?

Analysis. Research Sub-Questions #1a, 1b, 1c, and 1d will be analyzed using dependent *t* tests to examine the significance of the difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome strand scores converted to standard scores for students enrolled in a seven-period traditional schedule. Because multiple statistical tests will be conducted, a two-tailed .05 alpha level will be employed to help control for Type 1 errors. Means and standard deviations will be displayed on tables.

Overarching Pretest-Posttest Criterion-Referenced Science ELO Achievement Research Question #2. Do students who participate in four-period block schedule (FPBS) lose, maintain, or improve their beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) strand scores converted to standard scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry?

Sub-Question 2a. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO earth science strand scores converted to standard scores for students enrolled in a four-period block schedule?

Sub-Question 2b. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science

ELO life science strand scores converted to standard scores for students enrolled in a four-period block schedule?

Sub-Question 2c. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO physical science strand scores converted to standard scores for students enrolled in a four-period block schedule?

Sub-Question 2d. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science ELO scientific inquiry strand scores converted to standard scores for students enrolled in a four-period block schedule?

Analysis. Research Sub-Questions #2a, 2b, 2c, and 2d will be analyzed using dependent *t* tests to examine the significance of the difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome strand scores converted to standard scores for students enrolled in a four-period block schedule. Because multiple statistical tests will be conducted, a two-tailed .05 alpha level will be employed to help control for Type 1 errors. Means and standard deviations will be displayed on tables.

Overarching Posttest-Posttest Criterion-Referenced Science ELO Achievement Research Question #3. Do students who participate in a seven-period traditional schedule (SPTS) compared to students who participate in a four-period block schedule (FPBS) have congruent or different posttest 11th-grade science Essential Learner Outcome (ELO) strand scores converted to standard scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry?

Sub-Question 3a. Is there a statistically significant different between posttest 11th-grade science Essential Learner Outcome scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule on the earth science strand score converted to a standard score?

Sub-Question 3b. Is there a statistically significant difference between posttest 11th-grade science Essential Learner Outcome scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule on the life science strand score converted to a standard score?

Sub-Question 3c. Is there a statistically significant difference between posttest 11th-grade science Essential Learner Outcome scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule on the physical science strand score converted to a standard score?

Sub-Question 3d. Is there a statistically significant difference between posttest 11th-grade science Essential Learner Outcome scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule on the scientific inquiry strand score converted to a standard score?

Analysis. Research Sub-Questions #3a, 3b, 3c, and 3d will be analyzed using independent *t* tests to examine the significance of the difference between students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule on posttest 11th-grade science Essential Learner Outcome strand scores converted to standard scores. Because multiple statistical tests will be conducted, a two-tailed .05 alpha level will be employed to help control for Type 1 errors. Means and standard deviations will be displayed on tables.

The following pretest-posttest research questions were used to analyze academic achievement as measured by criterion-referenced Essential Learner Outcome (ELO) scores in science for students who participate in a seven-period traditional schedule (SPTS) or for students who participate in a four-period block schedule (FPBS).

Overarching Pretest-Posttest Criterion-Referenced Science ELO Achievement Research Question #4. Is the number of students at each proficiency level congruent or different from beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) for students enrolled in a seven-period traditional schedule (SPTS)?

Analysis. Research Question #4 will be analyzed using a chi-square test for independence to examine the significance of the difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome proficiency level for students who participate in a seven-period traditional schedule. To control for Type 1 errors, a .05 alpha level will be employed. Means and standard deviations will be displayed on tables.

Overarching Pretest-Posttest Criterion-Referenced Science ELO Achievement Research Question #5. Is the number of students at each proficiency level congruent or different from beginning pretest 8th-grade compared to ending posttest

11th-grade science Essential Learner Outcome (ELO) for students enrolled in a four-period block schedule (FPBS)?

Analysis. Research Question #5 will be analyzed using a chi-square test for independence to examine the significance of the difference between students' beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome proficiency level for students who participate in a four-period block schedule (FPBS). To control for Type 1 errors, a .05 alpha level will be employed. Means and standard deviations will be displayed on tables.

Overarching Posttest-Posttest Criterion-Referenced Science ELO Achievement Research Question #6. Do students who participate in a seven-period traditional schedule (SPTS) compared to students who participate in a four-period block schedule (FPBS) have congruent or different posttest 11th-grade science Essential Learner Outcome (ELO) proficiency levels?

Analysis. Research Question #6 will be analyzed using a chi-square test for independence to examine the significance of the difference between students who participate in a seven-period traditional schedule and students who participate in a four-period block schedule on posttest 11th-grade science Essential Learner Outcome proficiency levels. To control for Type 1 errors, a .05 alpha level will be employed. Means and standard deviations will be displayed on tables.

The following pretest-posttest research questions were used to analyze behavior outcomes for science for students who participate in a seven-period traditional schedule (SPTS) or students who participate in a four-period block schedule (FPBS).

Overarching Pretest-Posttest Behavior Research Question #7. Do students who participate in a seven-period traditional schedule have congruent or different beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior outcomes for (a) behavior office referral frequencies and (b) absence frequencies?

Sub-Question 7a. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior office referral frequencies after participating in the seven-period traditional schedule?

Sub-Question 7b. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to their ending posttest 11th-grade absence frequencies after participating in the seven-period traditional schedule?

Analysis. Research Sub-Questions #7a and 7b will be analyzed using a chi-square test for independence to examine the significance of the difference between beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior outcomes for students who participate in a seven-period traditional schedule. Because multiple statistical tests will be conducted, a .05 alpha level will be employed to help control for Type 1 errors. Means and standard deviations will be displayed on tables.

Overarching Pretest-Posttest Behavior Research Question #8. Do students who participate in a four-period block schedule have congruent or different beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior outcomes for (a) behavior office referral frequencies and (b) absence frequencies?

Sub-Question 8a. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior office referral frequencies after participating in the four-period block schedule?

Sub-Question 8b. Is there a statistically significant difference between students' beginning pretest 8th-grade compared to their ending posttest 11th-grade absence frequencies after participating in four-period block schedule?

Analysis. Research Sub-Questions #8a and 8b will be analyzed using a chi-square test for independence to examine the significance of the difference between beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior outcomes for students who participate in a four-period block schedule. Because multiple statistical tests will be conducted, a .05 alpha level will be employed to help control for Type 1 errors. Means and standard deviations will be displayed on tables.

The following posttest-posttest research questions were used to analyze student participation in a seven-period traditional schedule compared to student participation in a four-period block schedule measuring behavior outcomes.

Overarching Posttest-Posttest Behavior Research Question #9. Do students who participate in a seven-period traditional schedule and students who participate in a four-period block schedule have congruent or different ending posttest 11th-grade behavior outcome data for (a) behavior office referral frequencies and (b) absence frequencies?

Sub-Question 9a. Are behavior outcome scores the same for students who participate in a seven-period traditional schedule and for students who participate in a four-period block schedule as measured by the ending posttest 11th-grade behavior office referral frequencies?

Sub-Question 9b. Are behavior outcome scores the same for students who participate in a seven-period traditional schedule and for students who participate in a four-period block schedule as measured by the ending posttest 11th-grade absence frequencies?

Analysis. Research Sub-Questions #9a and 9b will be analyzed using a chi-square test for independence to examine the significance of the difference between ending posttest 11th-grade behavior outcomes for students who participate in a seven-period traditional schedule and for students who participate in a four-period block schedule. Because multiple statistical tests will be conducted, a .05 alpha level will be employed to help control for Type 1 errors. Means and standard deviations will be displayed on tables.

Data Collection Procedures

All study data is retrospective and archival and is routinely collected by school employees with ethical access to student records. Students enrolled in Millard Public Schools take the science Essential Learner Outcome (ELO) in the fall of their 8th-grade year and again in the fall of their 11th-grade year. Students earn a scaled score which is comprised of strand scores in earth science, life science, physical science, and scientific inquiry. These strand scores were standardized so that comparisons could be made. A student’s total ELO scaled score also places them in a proficiency level (below proficient, barely proficient, proficient, and beyond proficient) which are based on cut scores which are established during a standard setting session.

All study data were de-identified. The study was approved first by the Director of Planning and Evaluation for Millard Public Schools and then the University of Nebraska Medical Center/University of Nebraska at Omaha Joint Institutional Review Board (IRB) for the Protection of Human Subjects.

Performance sites. The research will be conducted in the public school setting under normal educational practices. The study procedure will not interfere in any way with the normal educational practices in the public school setting and will not involve coercion or discomfort of any kind. Data will be stored on spreadsheets and computer flash drives for statistical analysis in the office of the primary researcher and the dissertation chair. Data and computer drives will be secured. No individual identifiers will be attached to the data.

Confidentiality. Non-coded numbers were used to display individual achievement. Individual data will de-identified by the appropriate university personnel after all information is linked and the data sets are complete.

Human Subjects Approval Category

The exemption categories for this study were provided under 45CFR.101(b) categories 1, 2, and 4. The research will be conducted using routinely collected archival data. A letter of support from the district was provided for the University of Nebraska Medical Center/University of Nebraska at Omaha Joint Institutional Review Board for the Protection of Human Subjects.

CHAPTER 4

Results

Purpose of the Study

The purpose of this study was to analyze academic achievement, behavior office referrals, and absence frequency for a random sample of 11th-grade students who participate in a traditional, seven-period schedule at Research School A and a four-period block schedule at Research School B to determine if one type of school scheduling model is more effective than another. All dependent variable study data was retrospective, archival, and routinely collected school information. Permission from the appropriate school research personnel was received before achievement, behavior, and attendance data were collected and analyzed. A randomly formed sample of 60 students was obtained to include achievement and behavior data. Non-coded numbers were used to display individual de-identified achievement data. Aggregated group data, descriptive statistics, and inferential statistical analysis were utilized and reported with means and standard deviations on tables.

There were five dependent variables for this study that fell into three specific themes: science academic achievement, behavior referral frequency, and attendance frequency. Academic achievement was defined by pretest 8th-grade science ELO strand data scores compared to posttest 11th-grade scores (interval). These scores were converted to standard scores. The other measure of academic achievement was proficiency levels (below proficient, barely proficient, proficient, and beyond proficient) on the science ELO 8th-grade pretest compared to 11th-grade posttest (ordinal). Absence frequency was a ratio level variable that referred to the number of days a student was absent from school. Behavior office referral rate is a ratio level variable that indicates the number of behavior referrals a student received during a given year.

Research Question #1

Do students who participate in seven-period traditional schedule (SPTS) lose, maintain, or improve their beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) strand scores converted to standard scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry?

Research Question #1a. Pretest-posttest Essential Learner Outcome (ELO) earth science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule are contained in Table 3. The analysis, comparing students beginning pretest 8th-grade scores to ending posttest 11th-grade ELO earth science strand scores is contained in Table 4. As seen in Table 4, the null hypothesis was rejected. The pretest ELO earth science strand scores (M = 116.55, SD = 6.76) were statistically significantly higher compared to the posttest science ELO earth science strand scores (M = 102.07, SD = 10.00), $t(28)$ = 7.64, $p < .005$ (two-tailed), d = 1.73.

Research Question #1b. Pretest-posttest Essential Learner Outcome (ELO) life science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule are contained in Table 5. The analysis, comparing students beginning pretest 8th-grade scores to ending posttest 11th-grade ELO life science strand scores is contained in Table 6. As seen in Table 6, the null hypothesis was rejected. The pretest ELO life science strand scores (M = 116.37, SD = 5.46) were statistically significantly higher compared to the posttest science ELO life science strand scores score (*M* = 110.30, *SD* = 6.15), *t*(28) = 5.12, $p < .005$ (two-tailed), *d* = 1.05.

Research Question #1c. Pretest-posttest Essential Learner Outcome (ELO) physical science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule are contained in Table 7. The analysis, comparing students beginning pretest 8th-grade scores to ending posttest 11th-grade ELO physical science strand scores is contained in Table 8. As seen in Table 8, the null hypothesis was rejected. The pretest ELO physical science strand scores (*M* = 112.53, *SD* = 9.73) were statistically significantly higher compared to the posttest science ELO physical science strand scores score (*M* = 102.79, *SD* = 8.27), *t*(28) = 4.93, $p < .005$ (two-tailed), *d* = 1.08.

Research Question #1d. Pretest-posttest Essential Learner Outcome (ELO) scientific inquiry strand scores converted to standard scores for students enrolled in a seven-period traditional schedule are contained in Table 9. The analysis, comparing students beginning pretest 8th-grade scores to ending posttest 11th-grade ELO scientific inquiry strand scores is contained in Table 10. As seen in Table 10, the null hypothesis was rejected. The pretest ELO scientific inquiry strand scores (*M* = 121.37, *SD* = 3.52) were statistically significantly higher compared to the posttest science ELO scientific inquiry strand scores score (*M* = 115.29, *SD* = 4.22), *t*(28) = 6.34, $p < .005$ (two-tailed), *d* = 1.57.

Research Question #2

Do students who participate in four-period block schedule (FPBS) lose, maintain, or improve their beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) strand scores converted to standard scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry?

Research Question #2a. Pretest-posttest Essential Learner Outcome (ELO) earth science strand scores converted to standard scores for students enrolled in a four-period block schedule are contained in Table 11. The analysis, comparing students beginning pretest 8th-grade scores to ending posttest 11th-grade ELO earth science strand scores is contained in Table 12. As seen in Table 12, the null hypothesis was rejected. The pretest ELO earth science strand scores (M = 118.25, SD = 8.28) were statistically significantly higher compared to the posttest science ELO earth science strand scores (M = 98.17, SD = 21.39), $t(28) = 6.19$, $p < .005$ (two-tailed), d = 1.35.

Research Question #2b. Pretest-posttest Essential Learner Outcome (ELO) life science strand scores converted to standard scores for students enrolled in a four-period block schedule are contained in Table 13. The analysis, comparing students beginning pretest 8th-grade scores to ending posttest 11th-grade ELO life science strand scores is contained in Table 14. As seen in Table 14, the null hypothesis was rejected. The pretest ELO life science strand scores (M = 114.70, SD = 6.51) were statistically significantly higher compared to the posttest science ELO life science strand scores (M = 110.42, SD = 7.63), $t(28) = 3.60$, $p = .001$ (two-tailed), d = .61.

Research Question #2c. Pretest-posttest Essential Learner Outcome (ELO) physical science strand scores converted to standard scores for students enrolled in a four-period block schedule are contained in Table 15. The analysis, comparing students beginning pretest 8th-grade scores to ending posttest 11th-grade ELO physical science strand scores is contained in Table 16. As seen in Table 16, the null hypothesis was rejected. The pretest ELO physical science strand scores (*M* = 111.84, *SD* = 7.60) were statistically significantly higher compared to the posttest science ELO physical science strand scores (*M* = 102.99, *SD* = 6.95), $t(28) = 5.24$, $p < .005$ (two-tailed), $d = 1.22$.

Research Question #2d. Pretest-posttest Essential Learner Outcome (ELO) scientific inquiry strand scores converted to standard scores for students enrolled in a four-period block schedule are contained in Table 17. The analysis, comparing students beginning pretest 8th-grade scores to ending posttest 11th-grade ELO scientific inquiry strand scores is contained in Table 18. As seen in Table 18, the null hypothesis was rejected. The pretest ELO scientific inquiry strand scores (*M* = 120.83, *SD* = 3.00) were statistically significantly higher compared to the posttest science ELO scientific inquiry strand scores (*M* = 115.29, *SD* = 4.71), $t(28) = 5.46$, $p < .005$ (two-tailed), $d = 1.43$.

Research Question #3

Do students who participate in a seven-period traditional schedule (SPTS) compared to students who participate in a four-period block schedule (FPBS) have congruent or different posttest 11th-grade science Essential Learner Outcome (ELO) strand scores converted to standard scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry?

Research Question #3a. Posttest-posttest Essential Learner Outcome (ELO) earth science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule are contained in Table 19. The analysis, comparing SPTS students ending posttest 11th-grade ELO earth science strand scores to FPBS students ending posttest 11th-grade ELO earth science strand scores is contained in Table 20. As seen in Table 20, the null hypothesis was not rejected. The SPTS posttest ELO earth science strand scores (*M* = 102.50, *SD* = 10.11) were not statistically significantly higher compared to the FPBS posttest science ELO earth science strand scores (*M* = 98.17, *SD* = 21.39), *t*(58) = -1.00, *p* = .32 (two-tailed), *d* = -.28.

Research Question #3b. Posttest-posttest Essential Learner Outcome (ELO) life science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule are contained in Table 21. The analysis, comparing SPTS students ending posttest 11th-grade ELO life science strand scores to FPBS students ending posttest 11th-grade ELO life science strand scores is contained in Table 22. As seen in Table 22, the null hypothesis was not rejected. The FPBS posttest ELO life science strand scores (*M* = 110.42, *SD* = 7.63) were not statistically significantly higher compared to the SPTS posttest science ELO life science strand scores (*M* = 110.30, *SD* = 6.15), *t*(58) = .06, *p* = .95 (two-tailed), *d* = .02.

Research Question #3c. Posttest-posttest Essential Learner Outcome (ELO) physical science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule are contained in Table 23. The analysis, comparing SPTS students ending posttest 11th-grade ELO physical science strand scores to FPBS students ending posttest 11th-grade ELO physical science strand scores is contained in Table 24. As seen in Table 24, the null hypothesis was not rejected. The FPBS posttest ELO physical science strand scores (*M* = 102.99, *SD* = 6.95) were not statistically significantly higher compared to the SPTS posttest science ELO physical science strand scores (*M* = 102.79, *SD* = 8.27), *t*(58) = .10, *p* = .92 (two-tailed), *d* = .03.

Research Question #3d. Posttest-posttest Essential Learner Outcome (ELO) scientific inquiry strand scores converted to standard scores for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule are contained in Table 25. The analysis, comparing SPTS students ending posttest 11th-grade ELO scientific inquiry strand scores to FPBS students ending posttest 11th-grade ELO scientific inquiry strand scores is contained in Table 26. As seen in Table 26, the null hypothesis was not rejected. The FPBS posttest ELO scientific inquiry strand scores (*M* = 115.29, *SD* = 4.71) were not statistically significantly higher compared to the SPTS posttest science ELO scientific inquiry strand scores (*M* = 115.20, *SD* = 4.27), *t*(58) = .08, *p* = .94 (two-tailed), *d* = .02.

Research Question #4

Is the number of students at each proficiency level congruent or different from beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) for students enrolled in a seven-period traditional schedule (SPTS)?

Research Question #4a. Pretest-posttest Essential Learner Outcome (ELO) proficiency levels for students enrolled in a seven-period traditional schedule are contained in Table 27. The chi-square analysis, comparing students beginning pretest 8th-grade proficiency levels to ending posttest 11th-grade ELO proficiency levels is contained in Table 28. As seen in Table 28, the null hypothesis was not rejected. Results of the Chi-Square Test of Independence indicated that there was no statistically significant relationship between beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) for students enrolled in a seven-period traditional schedule (SPTS) (χ^2 (3, N = 30) = 4.29, p = .231). Inspecting the frequency and percent findings in Table 28, we find that the number of students scoring beyond proficient in the pretest (16, 26.7%) was greater than the number of students scoring beyond proficient in the posttest (9, 15.0%). The number of students scoring proficient in the posttest (15, 25.0%, was greater than the number of students scoring proficient in the pretest (9, 15.0%). The number of students scoring barely proficient in the pretest (3, 5.0%) was less than the number of students scoring barely proficient on the posttest (5, 8.3%). The number of students scoring below proficient on the posttest (1, 1.7%) was less than the number of students scoring below proficient on the pretest (2, 3.3%).

Research Question #5

Is the number of students at each proficiency level congruent or different from beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) for students enrolled in a four-period block schedule (FPBS)?

Research Question #5a. Pretest-posttest Essential Learner Outcome (ELO) proficiency levels for students enrolled in a four-period block schedule are contained in Table 29. The chi-square analysis, comparing students beginning pretest 8th-grade proficiency levels to ending posttest 11th-grade ELO proficiency levels is contained in Table 30. As seen in Table 30, the null hypothesis was not rejected. Results of the Chi-Square Test of Independence indicated that there was no statistically significant relationship between beginning pretest 8th-grade compared to ending posttest 11th-grade science Essential Learner Outcome (ELO) for students enrolled in a four-period block schedule (FPBS) (χ^2 (3, N = 30) = 1.86, p = .602). Inspecting the frequency and percent findings in Table 30, we find that the number of students scoring beyond proficient in the pretest (12, 20.0%) was greater than the number of students scoring beyond proficient in the posttest (9, 15.0%). The number of students scoring proficient in the posttest (12, 20.0%, was greater than the number of students scoring proficient in the pretest (10, 16.7%). The number of students scoring barely proficient in the pretest (7, 11.7%) was less than the number of students scoring barely proficient on the posttest (9, 15.0%). The number of students scoring below proficient on the posttest (0, 0.0%) was less than the number of students scoring below proficient on the pretest (1, 1.7%).

Research Question #6

Do students who participate in a seven-period traditional schedule (SPTS) compared to students who participate in a four-period block schedule (FPBS) have congruent or different posttest 11th-grade science Essential Learner Outcome (ELO) proficiency levels?

Research Question #6a. Posttest-posttest Essential Learner Outcome (ELO) proficiency levels for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule are contained in Table 31. The chi-square analysis, comparing students beginning pretest 8th-grade proficiency levels to ending posttest 11th-grade ELO proficiency levels is contained in Table 32. As seen in Table 32, the null hypothesis was not rejected. Results of the Chi-Square Test of Independence indicated that there was no statistically significant relationship between ending posttest 11th-grade proficiency levels for students enrolled in a seven-period traditional schedule compared to ending posttest 11th-grade proficiency levels for students enrolled in a four-period block schedule (χ^2 (3, N = 60) = 2.48, *p* = .480). Inspecting the frequency and percent findings in Table 32, we find that the number of students scoring beyond proficient on the posttest in both Research Schools were the same (9, 15.0%). The number of students scoring proficient on the posttest in Research School A (SPTS) (15, 25.0%) was greater than the number of students scoring proficient on the posttest in Research School B (FPBS) (12, 20.0%). The number of students scoring barely proficient on the posttest in Research School A (SPTS) (5, 8.3%) was less than the number of students scoring barely proficient on the posttest in Research School B (FPBS) (9, 15.0%). The number of students scoring below proficient on the posttest in Research School A (SPTS) (1, 1.7%) was greater than the number of students scoring below proficient on the posttest in Research School B (FPBS) (0, 0.0%).

Research Question #7

Do students who participate in a seven-period traditional schedule have congruent or different beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior outcomes for (a) behavior office referral frequencies and (b) absence frequencies?

Research Question #7a. Pretest-posttest behavior office referral frequencies for students enrolled in a seven-period traditional schedule are contained in Table 33. The chi-square analysis, comparing students beginning pretest 8th-grade behavior office referral frequencies to ending posttest 11th-grade behavior office referral frequencies is contained in Table 34. As seen in Table 34, the null hypothesis was not rejected. Results of the Chi-Square Test of Independence indicated that there was no statistically significant relationship between beginning pretest 8th-grade compared to ending posttest 11th-grade behavior office referral frequencies for students enrolled in a seven-period traditional schedule ($\chi^2(2) = 0.35$, $p = .838$).

Research Question #7b. Pretest-posttest absence frequencies for students enrolled in a seven-period traditional schedule are contained in Table 35. The chi-square analysis, comparing students beginning pretest 8th-grade absence frequencies to ending posttest 11th-grade absence frequencies is contained in Table 36. As seen in Table 36, the null hypothesis was not rejected. Results of the Chi-Square Test of Independence indicated that there was no statistically significant relationship between beginning pretest 8th-grade compared to ending posttest 11th-grade absence frequencies for students enrolled in a seven-period traditional schedule ($\chi^2(2) = 3.20$, $p = .202$).

Research Question #8.

Do students who participate in a four-period block schedule have congruent or different beginning pretest 8th-grade compared to their ending posttest 11th-grade behavior outcomes for (a) behavior office referral frequencies and (b) absence frequencies?

Research Question #8a. Pretest-posttest behavior office referral frequencies for students enrolled in a four-period block schedule are contained in Table 37. The chi-square analysis, comparing students beginning pretest 8th-grade behavior office referral frequencies to ending posttest 11th-grade behavior office referral frequencies is contained in Table 38. As seen in Table 38, the null hypothesis was not rejected. Results of the Chi-Square Test of Independence indicated that there was no statistically significant relationship between beginning pretest 8th-grade compared to ending posttest 11th-grade behavior office referral frequencies for students enrolled in a four-period block schedule ($\chi^2(2) = 1.18$, $p = .555$).

Research Question #8b. Pretest-posttest absence frequencies for students enrolled in a four-period block schedule are contained in Table 39. The chi-square analysis, comparing students beginning pretest 8th-grade absence frequencies to ending posttest 11th-grade absence frequencies is contained in Table 40. As seen in Table 40, the null hypothesis was not rejected. Results of the Chi-Square Test of Independence indicated that there was no statistically significant relationship between beginning pretest 8th-grade compared to ending posttest 11th-grade absence frequencies for students enrolled in a four-period block schedule ($\chi^2(2) = 4.27$, $p = .118$).

Research Question #9

Do students who participate in a seven-period traditional schedule and students who participate in a four-period block schedule have congruent or different ending posttest 11th-grade behavior outcome data for (a) behavior office referral frequencies and (b) absence frequencies?

Research Question #9a. Posttest-posttest behavior office referral frequencies for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule are contained in Table 41. The chi-square analysis, comparing students ending posttest 11th-grade behavior office referral frequencies for students enrolled in a seven-period traditional schedule to ending posttest 11th-grade behavior office referral frequencies for students enrolled in a four-period block schedule is contained in Table 42. As seen in Table 42, the null hypothesis was not rejected. Results of the Chi-Square Test of Independence indicated that there was no statistically significant relationship between ending posttest 11th-grade behavior office referral frequencies for students enrolled in a seven-period traditional schedule compared to ending posttest 11th-grade behavior office referral frequencies for students enrolled in a four-period block schedule ($\chi^2(2) = 0.16$, $p = .992$).

Research Question #9b. Posttest-posttest absence frequencies for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule are contained in Table 43. The chi-square analysis, comparing students ending posttest 11th-grade absence frequencies for students enrolled in a seven-period traditional schedule to ending posttest 11th-grade absence frequencies for students enrolled in a four-period block schedule is contained in Table 44. As seen in Table 44, the null hypothesis was not rejected. Results of the Chi-Square Test of Independence indicated that there was no statistically significant relationship between ending posttest 11th-grade absence frequencies for students enrolled in a seven-period traditional schedule compared to ending posttest 11th-grade absence frequencies for students enrolled in a four-period block schedule ($\chi^2(2) = 0.73$, $p = .693$).

Table 1

Demographic information of students enrolled in a seven-period traditional schedule

Student Number	Gender	Ethnicity
1	Female	Caucasian
2	Female	Caucasian
3	Female	Caucasian
4	Female	Caucasian
5	Male	Caucasian
6	Female	Caucasian
7	Male	Caucasian
8	Male	Caucasian
9	Male	Caucasian
10	Male	Caucasian
11	Male	Caucasian
12	Male	Caucasian
13	Male	Caucasian
14	Male	Caucasian
15	Male	Caucasian
16	Male	Caucasian
17	Male	Caucasian
18	Female	Caucasian
19	Male	Caucasian
20	Female	Caucasian
21	Male	Caucasian
22	Male	Caucasian
23	Female	Caucasian
24	Male	Caucasian
25	Male	Caucasian
26	Male	Caucasian
27	Male	Caucasian
28	Male	Caucasian
29	Female	Caucasian
30	Male	Caucasian

Note: All students were in attendance in Research School A 9th-grade through 11th-grade.

Table 2

Demographic information of students enrolled in a four-period block schedule

Student Number	Gender	Ethnicity
1	Female	Caucasian
2	Male	Caucasian
3	Male	Caucasian
4	Male	Caucasian
5	Female	Caucasian
6	Female	Caucasian
7	Female	Caucasian
8	Female	Caucasian
9	Male	Caucasian
10	Female	Caucasian
11	Male	Caucasian
12	Female	Caucasian
13	Male	Caucasian
14	Male	Caucasian
15	Male	Caucasian
16	Female	Caucasian
17	Female	Caucasian
18	Male	Caucasian
19	Male	Caucasian
20	Female	Caucasian
21	Female	Caucasian
22	Female	Caucasian
23	Male	Caucasian
24	Male	Caucasian
25	Male	Caucasian
26	Male	Caucasian
27	Male	Caucasian
28	Male	Caucasian
29	Male	Caucasian
30	Female	Asian/Pacific Islander

Note: All students were in attendance in Research School B 9th-grade through 11th-grade.

Table 3

Pretest-posttest ELO earth science strand scores converted standard scores for students enrolled in a seven-period traditional schedule

	Earth Science Pretest		Earth Science Posttest	
Student Number	Scale Score	Standard Score	Scale Score	Standard Score
1	6.0	115.0	5.0	108.0
2	6.0	115.0	6.0	115.0
3	4.0	100.0	2.0	85.0
4	7.0	123.0	5.0	108.0
5	7.0	123.0	4.0	100.0
6	6.0	115.0	5.0	108.0
7	6.0	115.0	4.0	100.0
8	7.0	123.0	5.0	108.0
9	6.0	115.0	5.0	108.0
10	7.0	123.0	5.0	108.0
11	7.0	123.0	3.0	93.0
12	5.0	108.0	6.0	115.0
13	7.0	123.0	4.0	100.0
14	7.0	123.0	6.0	115.0
15	7.0	123.0	6.0	115.0
16	7.0	123.0	4.0	100.0
17	5.0	108.0	1.0	78.0
18	5.0	108.0	4.0	100.0
19	6.0	115.0	6.0	115.0
20	6.0	115.0	5.0	108.0
21	7.0	123.0	3.0	93.0
22	5.0	108.0	3.0	93.0
23	7.0	123.0	5.0	108.0
24	7.0	123.0	3.0	93.0
25	7.0	123.0	4.0	100.0
26	5.0	108.0	3.0	93.0
27	6.0	115.0	2.0	85.0
28	5.0	108.0	5.0	108.0
29	7.0	123.0	5.0	108.0
30	7.0	123.0	6.0	115.0

Note: Student numbers correspond with Table 1**.**

Table 4

Beginning pretest 8th-grade compared to ending posttest 11th-grade ELO earth science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule

Pretest-Posttest Comparison

	Pretest (SPTS)		Posttest (SPTS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Earth Science Strand Score	116.55	6.76	102.07	10.00	1.73	7.64	<.005

Table 5

Pretest-posttest ELO life science strand scores converted standard scores for students enrolled in a seven-period traditional schedule

Student Number	Life Science Pretest		Life Science Posttest	
	Scale Score	Standard Score	Scale Score	Standard Score
1	18.0	108.0	11.0	110.0
2	25.0	121.0	11.0	110.0
3	22.0	115.0	11.0	110.0
4	24.0	119.0	13.0	117.0
5	24.0	119.0	9.0	103.0
6	21.0	113.0	12.0	114.0
7	21.0	113.0	11.0	110.0
8	22.0	115.0	8.0	100.0
9	23.0	117.0	10.0	107.0
10	26.0	123.0	12.0	114.0
11	24.0	119.0	10.0	107.0
12	20.0	112.0	13.0	117.0
13	23.0	117.0	12.0	114.0
14	26.0	123.0	13.0	117.0
15	22.0	115.0	13.0	117.0
16	25.0	121.0	12.0	114.0
17	18.0	108.0	7.0	97.0
18	25.0	121.0	9.0	103.0
19	20.0	112.0	8.0	100.0
20	23.0	117.0	13.0	117.0
21	24.0	119.0	9.0	103.0
22	23.0	117.0	13.0	117.0
23	23.0	117.0	11.0	110.0
24	18.0	108.0	9.0	103.0
25	27.0	125.0	13.0	117.0
26	14.0	100.0	10.0	107.0
27	22.0	115.0	10.0	107.0
28	25.0	121.0	11.0	110.0
29	24.0	119.0	13.0	117.0
30	23.0	117.0	12.0	114.0

Note: Student numbers correspond with Table 1**.**

Table 6

Beginning pretest 8th-grade compared to ending posttest 11th-grade ELO life science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule

Pretest-Posttest Comparison

	Pretest (SPTS)		Posttest (SPTS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Life Science Strand Score	116.37	5.46	110.30	6.15	1.05	5.12	<.005

Table 7

Pretest-posttest ELO physical science strand scores converted standard scores for students enrolled in a seven-period traditional schedule

Student Number	Physical Science Pretest		Physical Science Posttest	
	Scale Score	Standard Score	Scale Score	Standard Score
1	7.0	108.0	7.0	93.0
2	8.0	113.0	10.0	101.0
3	7.0	108.0	8.0	96.0
4	6.0	103.0	14.0	113.0
5	10.0	124.0	5.0	87.0
6	6.0	103.0	11.0	104.0
7	7.0	108.0	6.0	90.0
8	8.0	113.0	12.0	107.0
9	9.0	118.0	14.0	113.0
10	6.0	103.0	8.0	96.0
11	8.0	113.0	9.0	99.0
12	8.0	113.0	13.0	110.0
13	9.0	118.0	14.0	113.0
14	10.0	124.0	14.0	113.0
15	9.0	118.0	9.0	99.0
16	10.0	124.0	10.0	101.0
17	4.0	92.0	6.0	90.0
18	8.0	113.0	8.0	96.0
19	9.0	118.0	15.0	116.0
20	10.0	124.0	10.0	101.0
21	3.0	87.0	10.0	101.0
22	9.0	118.0	15.0	116.0
23	10.0	124.0	14.0	113.0
24	6.0	103.0	9.0	99.0
25	10.0	124.0	11.0	104.0
26	5.0	97.0	12.0	107.0
27	9.0	118.0	11.0	104.0
28	8.0	113.0	7.0	93.0
29	9.0	118.0	12.0	107.0
30	9.0	118.0	10.0	101.0

Note: Student numbers correspond with Table 1.

Table 8

Beginning pretest 8th-grade compared to ending posttest 11th-grade ELO physical science strand scores converted to standard scores for students enrolled in a seven-period traditional schedule

Pretest-Posttest Comparison							
	Pretest (SPTS)		Posttest (SPTS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Physical Science Strand Score	112.53	9.73	102.79	8.27	1.08	4.93	<.005

Table 9

Pretest-posttest ELO scientific inquiry strand scores converted standard scores for students enrolled in a seven-period traditional schedule

	Scientific Inquiry Pretest		Scientific Inquiry Posttest	
Student Number	Scale Score	Standard Score	Scale Score	Standard Score
1	16.0	124.0	14.0	118.0
2	15.0	121.0	14.0	118.0
3	16.0	124.0	10.0	105.0
4	16.0	124.0	14.0	118.0
5	14.0	118.0	13.0	115.0
6	16.0	124.0	14.0	118.0
7	15.0	121.0	14.0	118.0
8	14.0	118.0	14.0	118.0
9	14.0	118.0	12.0	111.0
10	15.0	121.0	11.0	108.0
11	16.0	124.0	13.0	115.0
12	15.0	121.0	13.0	115.0
13	15.0	121.0	14.0	118.0
14	16.0	124.0	14.0	118.0
15	16.0	124.0	15.0	121.0
16	15.0	121.0	11.0	108.0
17	12.0	111.0	11.0	108.0
18	15.0	121.0	13.0	115.0
19	16.0	124.0	15.0	121.0
20	15.0	121.0	13.0	115.0
21	16.0	124.0	12.0	111.0
22	15.0	121.0	15.0	121.0
23	16.0	124.0	13.0	115.0
24	15.0	121.0	12.0	111.0
25	16.0	124.0	13.0	115.0
26	12.0	111.0	15.0	121.0
27	15.0	121.0	13.0	115.0
28	14.0	118.0	14.0	118.0
29	15.0	121.0	13.0	115.0
30	16.0	124.0	14.0	118.0

Note: Student numbers correspond with Table 1**.**

Table 10

Beginning pretest 8th-grade compared to ending posttest 11th-grade ELO scientific inquiry strand scores converted to standard scores for students enrolled in a seven-period traditional schedule

Pretest-Posttest Comparison

	Pretest (SPTS)		Posttest (SPTS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Scientific Inquiry Strand Score	121.37	3.52	115.29	4.22	1.57	6.34	<.005

Table 11

Pretest-posttest ELO earth science strand scores converted standard scores for students enrolled in a four-period block schedule

Student Number	Earth Science Pretest		Earth Science Posttest	
	Scale Score	Standard Score	Scale Score	Standard Score
1	3.0	93.0	0.0	0.0
2	5.0	108.0	4.0	100.0
3	6.0	115.0	5.0	108.0
4	7.0	123.0	4.0	100.0
5	7.0	123.0	5.0	108.0
6	7.0	123.0	1.0	78.0
7	7.0	123.0	5.0	108.0
8	7.0	123.0	5.0	108.0
9	3.0	93.0	3.0	93.0
10	7.0	123.0	5.0	108.0
11	6.0	115.0	4.0	100.0
12	7.0	123.0	2.0	85.0
13	7.0	123.0	5.0	108.0
14	7.0	123.0	5.0	108.0
15	7.0	123.0	5.0	108.0
16	6.0	115.0	2.0	85.0
17	7.0	123.0	5.0	108.0
18	7.0	123.0	4.0	100.0
19	7.0	123.0	6.0	115.0
20	7.0	123.0	5.0	108.0
21	5.0	108.0	3.0	93.0
22	7.0	123.0	2.0	85.0
23	7.0	123.0	2.0	85.0
24	7.0	123.0	6.0	115.0
25	7.0	123.0	6.0	115.0
26	7.0	123.0	5.0	108.0
27	7.0	123.0	6.0	115.0
28	6.0	115.0	5.0	108.0
29	7.0	123.0	2.0	85.0
30	6.0	115.0	5.0	108.0

Note: Student numbers correspond with Table 2**.**

Table 12

Beginning pretest 8th-grade compared to ending posttest 11th-grade ELO earth science strand scores converted to standard scores for students enrolled in a four-period block schedule

Pretest-Posttest Comparison

	Pretest (FPBS)		Posttest (FPBS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Earth Science Strand Score	118.25	8.28	98.17	21.39	1.35	6.19	<.005

Table 13

Pretest-posttest ELO life science strand scores converted standard scores for students enrolled in a four-period block schedule

Student Number	Life Science Pretest		Life Science Posttest	
	Scale Score	Standard Score	Scale Score	Standard Score
1	14.0	100.0	8.0	100.0
2	23.0	117.0	10.0	107.0
3	20.0	112.0	9.0	103.0
4	21.0	113.0	9.0	103.0
5	21.0	113.0	11.0	110.0
6	21.0	113.0	7.0	97.0
7	19.0	110.0	12.0	114.0
8	25.0	121.0	11.0	110.0
9	19.0	110.0	11.0	110.0
10	26.0	123.0	13.0	117.0
11	17.0	106.0	8.0	100.0
12	23.0	117.0	12.0	114.0
13	24.0	119.0	14.0	121.0
14	26.0	123.0	14.0	121.0
15	23.0	117.0	11.0	110.0
16	20.0	112.0	8.0	100.0
17	23.0	117.0	14.0	121.0
18	24.0	119.0	9.0	103.0
19	26.0	123.0	15.0	124.0
20	15.0	102.0	10.0	107.0
21	20.0	112.0	10.0	107.0
22	21.0	113.0	12.0	114.0
23	20.0	112.0	8.0	100.0
24	25.0	121.0	12.0	114.0
25	25.0	121.0	13.0	117.0
26	25.0	121.0	15.0	124.0
27	27.0	125.0	11.0	110.0
28	20.0	112.0	11.0	110.0
29	19.0	110.0	10.0	107.0
30	17.0	106.0	12.0	114.0

Note: Student numbers correspond with Table 2**.**

Table 14

Beginning pretest 8th-grade compared to ending posttest 11th-grade ELO life science strand scores converted to standard scores for students enrolled in a four-period block schedule

Pretest-Posttest Comparison							
	Pretest (FPBS)		Posttest (FPBS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Life Science Strand Score	114.70	6.51	110.42	7.63	.61	3.60	.001

Table 15

Pretest-posttest ELO physical science strand scores converted standard scores for students enrolled in a four-period block schedule

Student Number	Physical Science Pretest		Physical Science Posttest	
	Scale Score	Standard Score	Scale Score	Standard Score
1	4.0	92.0	10.0	101.0
2	7.0	108.0	8.0	96.0
3	7.0	108.0	8.0	96.0
4	7.0	108.0	9.0	99.0
5	8.0	113.0	10.0	101.0
6	6.0	103.0	11.0	104.0
7	8.0	113.0	12.0	107.0
8	9.0	118.0	10.0	101.0
9	10.0	124.0	4.0	84.0
10	8.0	113.0	12.0	107.0
11	7.0	108.0	8.0	96.0
12	6.0	103.0	10.0	101.0
13	7.0	108.0	14.0	113.0
14	9.0	118.0	14.0	113.0
15	9.0	118.0	13.0	110.0
16	5.0	97.0	8.0	96.0
17	9.0	118.0	11.0	104.0
18	9.0	118.0	12.0	107.0
19	9.0	118.0	15.0	116.0
20	8.0	113.0	11.0	104.0
21	9.0	118.0	9.0	99.0
22	7.0	108.0	9.0	99.0
23	8.0	113.0	10.0	101.0
24	7.0	108.0	12.0	107.0
25	10.0	124.0	11.0	104.0
26	8.0	113.0	14.0	113.0
27	10.0	124.0	13.0	110.0
28	6.0	103.0	10.0	101.0
29	8.0	113.0	7.0	93.0
30	8.0	113.0	11.0	104.0

Note: Student numbers correspond with Table 2**.**

Table 16

Beginning pretest 8th-grade compared to ending posttest 11th-grade ELO physical science strand scores converted to standard scores for students enrolled in a four-period block schedule

Pretest-Posttest Comparison							
	Pretest (FPBS)		Posttest (FPBS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Physical Science Strand Score	111.84	7.60	102.99	6.95	1.22	5.24	<.005

Table 17

Pretest-posttest ELO scientific inquiry strand scores converted standard scores for students enrolled in a four-period block schedule

	Scientific Inquiry Pretest		Scientific Inquiry Posttest	
Student Number	Scale Score	Standard Score	Scale Score	Standard Score
1	14.0	118.0	13.0	115.0
2	14.0	118.0	11.0	108.0
3	14.0	118.0	15.0	121.0
4	14.0	118.0	13.0	115.0
5	14.0	118.0	13.0	115.0
6	16.0	124.0	14.0	118.0
7	14.0	118.0	14.0	118.0
8	14.0	118.0	14.0	118.0
9	16.0	124.0	14.0	118.0
10	16.0	124.0	14.0	118.0
11	14.0	118.0	15.0	121.0
12	14.0	118.0	14.0	118.0
13	16.0	124.0	13.0	115.0
14	16.0	124.0	15.0	121.0
15	15.0	121.0	13.0	115.0
16	15.0	121.0	15.0	121.0
17	15.0	121.0	11.0	108.0
18	16.0	124.0	13.0	115.0
19	15.0	121.0	14.0	118.0
20	13.0	115.0	14.0	118.0
21	16.0	124.0	12.0	111.0
22	15.0	121.0	11.0	108.0
23	14.0	118.0	12.0	111.0
24	15.0	121.0	13.0	115.0
25	16.0	124.0	12.0	111.0
26	16.0	124.0	14.0	118.0
27	16.0	124.0	14.0	118.0
28	14.0	118.0	12.0	111.0
29	15.0	121.0	9.0	102.0
30	15.0	121.0	15.0	121.0

Note: Student numbers correspond with Table 2.

Table 18

Beginning pretest 8th-grade compared to ending posttest 11th-grade ELO scientific inquiry strand scores converted to standard scores for students enrolled in a four-period block schedule

Pretest-Posttest Comparison

	Pretest (FPBS)		Posttest (FPBS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Scientific Inquiry Strand Score	120.83	3.00	115.29	4.71	1.43	5.46	<.005

Table 19

Posttest-posttest ELO earth science strand scores converted standard scores for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule

	Earth Science Standard Score	
Student Number	SPTS Posttest	FPBS Posttest
1	108.0	0.0
2	115.0	100.0
3	85.0	108.0
4	108.0	100.0
5	100.0	108.0
6	108.0	78.0
7	100.0	108.0
8	108.0	108.0
9	108.0	93.0
10	108.0	108.0
11	93.0	100.0
12	115.0	85.0
13	100.0	108.0
14	115.0	108.0
15	115.0	108.0
16	100.0	85.0
17	78.0	108.0
18	100.0	100.0
19	115.0	115.0
20	108.0	108.0
21	93.0	93.0
22	93.0	85.0
23	108.0	85.0
24	93.0	115.0
25	100.0	115.0
26	93.0	108.0
27	85.0	115.0
28	108.0	108.0
29	108.0	85.0
30	115.0	108.0

Note: Student numbers correspond with Table 1 and Table 2**.**

Table 20

Ending posttest 11th-grade science ELO earth science strand scores converted to standard scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule

Posttest-Posttest Comparison

	Research School A (SPTS)		Research School B (FPBS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Earth Science Strand Score	102.50	10.11	98.17	21.39	-.28	-1.00	.32

Table 21

Posttest-posttest ELO life science strand scores converted standard scores for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule

	Life Science Standard Score	
Student Number	SPTS Posttest	FPBS Posttest
1	110.0	100.0
2	110.0	107.0
3	110.0	103.0
4	117.0	103.0
5	103.0	110.0
6	114.0	97.0
7	110.0	114.0
8	100.0	110.0
9	107.0	110.0
10	114.0	117.0
11	107.0	100.0
12	117.0	114.0
13	114.0	121.0
14	117.0	121.0
15	117.0	110.0
16	114.0	100.0
17	97.0	121.0
18	103.0	103.0
19	100.0	124.0
20	117.0	107.0
21	103.0	107.0
22	117.0	114.0
23	110.0	100.0
24	103.0	114.0
25	117.0	117.0
26	107.0	124.0
27	107.0	110.0
28	110.0	110.0
29	117.0	107.0
30	114.0	114.0

Note: Student numbers correspond with Table 1 and Table 2**.**

Table 22

Ending posttest 11th-grade science ELO life science strand scores converted to standard scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule

Posttest-Posttest Comparison

	Research School A (SPTS)		Research School B (FPBS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Life Science Strand Score	110.30	6.15	110.42	7.63	.02	.06	.95

Table 23

Posttest-posttest ELO physical science strand scores converted standard scores for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule

	Physical Science Standard Score	
Student Number	SPTS Posttest	FPBS Posttest
1	93.0	101.0
2	101.0	96.0
3	96.0	96.0
4	113.0	99.0
5	87.0	101.0
6	104.0	104.0
7	90.0	107.0
8	107.0	101.0
9	113.0	84.0
10	96.0	107.0
11	99.0	96.0
12	110.0	101.0
13	113.0	113.0
14	113.0	113.0
15	99.0	110.0
16	101.0	96.0
17	90.0	104.0
18	96.0	107.0
19	116.0	116.0
20	101.0	104.0
21	101.0	99.0
22	116.0	99.0
23	113.0	101.0
24	99.0	107.0
25	104.0	104.0
26	107.0	113.0
27	104.0	110.0
28	93.0	101.0
29	107.0	93.0
30	93.0	104.0

Note: Student numbers correspond with Table 1 and Table 2**.**

Table 24

Ending posttest 11th-grade science ELO physical science strand scores converted to standard scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule

Posttest-Posttest Comparison

	Research School A (SPTS)		Research School B (FPBS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Physical Science Strand Score	102.79	8.27	102.99	6.95	.03	.10	.92

Table 25

Posttest-posttest ELO scientific inquiry strand scores converted standard scores for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule

	Scientific Inquiry Standard Score	
Student Number	SPTS Posttest	FPBS Posttest
1	118.0	115.0
2	118.0	108.0
3	105.0	121.0
4	118.0	115.0
5	115.0	115.0
6	118.0	118.0
7	118.0	118.0
8	118.0	118.0
9	111.0	118.0
10	108.0	118.0
11	115.0	121.0
12	115.0	118.0
13	118.0	115.0
14	118.0	121.0
15	121.0	115.0
16	108.0	121.0
17	108.0	108.0
18	115.0	115.0
19	121.0	118.0
20	115.0	118.0
21	111.0	111.0
22	121.0	108.0
23	115.0	111.0
24	111.0	115.0
25	115.0	111.0
26	121.0	118.0
27	115.0	118.0
28	118.0	111.0
29	115.0	102.0
30	118.0	121.0

Note: Student numbers correspond with Table 1 and Table 2**.**

Table 26

Ending posttest 11th-grade science ELO scientific inquiry strand scores converted to standard scores for students who participate in a seven-period traditional schedule compared to students who participate in a four-period block schedule

Posttest-Posttest Comparison

	Research School A (SPTS)		Research School B (FPBS)				
Source	*M*	*SD*	*M*	*SD*	*d*	*t*	*p*
Scientific Inquiry Strand Score	115.20	4.27	115.29	4.71	.02	.08	.94

Table 27

Pretest-posttest science ELO proficiency levels for students enrolled in a seven-period traditional schedule

	Proficiency Levels	
Student Number	Pretest	Posttest
1	2	3
2	4	3
3	3	2
4	4	4
5	4	2
6	3	3
7	3	3
8	3	3
9	3	3
10	4	3
11	4	3
12	2	4
13	4	4
14	4	4
15	4	4
16	4	3
17	1	1
18	4	2
19	3	4
20	4	3
21	3	2
22	3	4
23	4	4
24	2	2
25	4	3
26	1	3
27	4	3
28	3	3
29	4	4
30	4	3

Note: Student numbers correspond with Table 1**.**

Table 28

Beginning pretest 8th-grade compared to ending posttest 11th-grade ELO proficiency levels for students enrolled in a seven-period traditional schedule

Proficiency Level	Below Proficient	Barely Proficient	Proficient	Beyond Proficient	Total	χ^2 (a)
Pretest	2 (3.3%)	3 (5.0%)	9 (15.0%)	16 (26.7%)	30 (50.0%)	
Posttest	1 (1.7%)	5 (8.3%)	15 (25.0%)	9 (15.0%)	30 (50.0%)	
Total	3 (5.0%)	8 (13.3%)	24 (40.0%)	25 (41.7%)	60 (100%)	4.29

(a) χ^2 not significant for Observed verses Expected cell frequencies with *df* = 3 and tabled value = 7.81 for alpha level of .05.

Table 29

Pretest-posttest science ELO proficiency levels for students enrolled in a four-period block schedule

	Proficiency Levels	
Student Number	Pretest	Posttest
1	1	2
2	3	2
3	3	3
4	3	3
5	3	3
6	3	2
7	2	4
8	4	3
9	2	2
10	4	4
11	2	3
12	3	3
13	4	4
14	4	4
15	4	3
16	2	2
17	4	3
18	4	3
19	4	4
20	2	3
21	3	2
22	3	2
23	3	2
24	4	4
25	4	3
26	4	4
27	4	4
28	2	3
29	3	2
30	2	4

Note: Student numbers correspond with Table 2**.**

Table 30

Beginning pretest 8th-grade compared to ending posttest 11th-grade ELO proficiency levels for students enrolled in a four-period block schedule

Proficiency Level	Below Proficient	Barely Proficient	Proficient	Beyond Proficient	Total	χ^2 (a)
Pretest	1 (1.7%)	7 (11.7%)	10 (16.7%)	12 (20.0%)	30 (50.0%)	
Posttest	0 (0.0%)	9 (15.0%)	12 (20.0%)	9 (15.0%)	30 (50.0%)	
Total	1 (1.7%)	16 (26.7%)	22 (36.7%)	21 (35.0%)	60 (100%)	1.86

(a) χ^2 not significant for Observed verses Expected cell frequencies with *df* = 3 and tabled value = 7.81 for alpha level of .05.

Table 31

Posttest-posttest science ELO proficiency levels for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule

	Proficiency Levels	
Student Number	SPTS Posttest	FPBS Posttest
1	3	2
2	3	2
3	2	3
4	4	3
5	2	3
6	3	2
7	3	4
8	3	3
9	3	2
10	3	4
11	3	3
12	4	3
13	4	4
14	4	4
15	4	3
16	3	2
17	1	3
18	2	3
19	4	4
20	3	3
21	2	2
22	4	2
23	4	2
24	2	4
25	3	3
26	3	4
27	3	4
28	3	3
29	4	2
30	3	4

Note: Student numbers correspond with Table 1 and Table 2**.**

Table 32

Ending posttest 11th-grade science ELO proficiency levels for students enrolled in a seven-period traditional schedule compared to students who participate in a four-period block schedule

Proficiency Level	Below Proficient	Barely Proficient	Proficient	Beyond Proficient	Total	χ^2 (a)
Research School A	1 (1.7%)	5 (8.3%)	15 (25.0%)	9 (15.0%)	30 (50.0%)	
Research School B	0 (0.0%)	9 (15.0%)	12 (20.0%)	9 (15.0%)	30 (50.0%)	
Total	1 (1.7%)	14 (23.3%)	27 (45.0%)	18 (30.0%)	60 (100%)	2.48

(a) χ^2 not significant for Observed verses Expected cell frequencies with *df* = 3 and tabled value = 7.81 for alpha level of .05.

Table 33

Pretest-posttest behavior office referral frequencies for students enrolled in a seven-period traditional schedule

	Behavior Office Referral Frequencies	
Student Number	Pretest	Posttest
1	0	0
2	0	0
3	1	5
4	0	0
5	0	0
6	0	0
7	0	0
8	4	5
9	0	0
10	0	0
11	1	1
12	1	0
13	0	0
14	13	4
15	0	0
16	1	0
17	0	0
18	1	0
19	1	0
20	0	18
21	6	2
22	2	20
23	0	0
24	0	0
25	3	0
26	2	0
27	0	0
28	1	1
29	1	0
30	0	1

Note: Student numbers correspond with Table 1.

Table 34

Pretest-posttest behavior office referral frequencies for students enrolled in a seven-period traditional schedule

Behavior Office Referral Frequency	Less than 3 behavior office referrals	3-6 behavior office referrals	Greater than 6 behavior office referrals	Total	χ^2 (a)
Pretest	26 (43.3%)	3 (5.0%)	1 (1.7%)	30 (50.0%)	
Posttest	25 (41.7%)	3 (5.0%)	2 (3.3%)	30 (50.0%)	
Total	51 (85.0%)	6 (10.0%)	3 (5.0%)	60 (100.0%)	0.35

(a) χ^2 not significant for Observed verses Expected cell frequencies with *df* = 2 and tabled value = 5.99 for alpha level of .05.

Table 35

Pretest-posttest absence frequencies for students enrolled in a seven-period tradition schedule

	Absence Frequencies	
Student Number	Pretest	Posttest
1	1.0	11.0
2	4.0	9.5
3	5.0	7.5
4	19.5	9.0
5	5.5	6.5
6	12.0	7.5
7	12.0	14.0
8	4.5	17.5
9	15.5	22.0
10	5.5	11.0
11	19.0	4.5
12	2.0	1.0
13	2.0	8.5
14	8.0	3.0
15	2.5	7.5
16	3.0	7.5
17	17.0	32.0
18	18.5	12.5
19	6.0	5.5
20	11.0	11.5
21	14.5	17.5
22	13.0	12.5
23	16.5	13.0
24	12.0	11.0
25	11.0	6.5
26	6.0	4.0
27	4.5	12.0
28	5.0	56.5
29	5.0	5.5
30	6.5	8.0

Note: Student numbers correspond with Table 1.

Table 36

Pretest-posttest absence frequencies for students enrolled in a seven-period traditional schedule

Absence Frequency	Less than 10 Absences	10-20 Absences	Greater than 20 Absences	Total	χ^2 (a)
Pretest	17 (28.3%)	13 (21.7%)	0 (0.0%)	30 (50.0%)	
Posttest	16 (26.7%)	11 (18.3%)	3 (5.0%)	30 (50.0%)	
Total	33 (55.0%)	24 (40.0%)	3 (5.0%)	60 (100.0%)	3.20

(a) χ^2 not significant for Observed verses Expected cell frequencies with *df* = 2 and tabled value = 5.99 for alpha level of .05.

Table 37

Pretest-posttest behavior office referral frequencies for students enrolled in a four-period block schedule

	Behavior Office Referral Frequencies	
Student Number	Pretest	Posttest
1	0	0
2	4	2
3	1	0
4	0	0
5	0	0
6	0	1
7	2	1
8	0	0
9	19	8
10	0	0
11	0	1
12	0	0
13	0	0
14	0	0
15	0	0
16	0	3
17	0	0
18	0	0
19	0	0
20	1	0
21	0	1
22	1	0
23	0	3
24	0	1
25	0	3
26	0	0
27	0	0
28	0	3
29	3	7
30	0	0

Note: Student numbers correspond with Table 2**.**

Table 38

Pretest-posttest behavior office referral frequencies for students enrolled in a four-period block schedule

Behavior Office Referral Frequency	Less than 3 behavior office referrals	3-6 behavior office referrals	Greater than 6 behavior office referrals	Total	χ^2 (a)
Pretest	27 (45.0%)	2 (3.3%)	1 (1.7%)	30 (50.0%)	
Posttest	24 (40.0%)	4 (6.7%)	2 (3.3%)	30 (50.0%)	
Total	51 (85.0%)	6 (10.0%)	3 (5.0%)	60 (100.0%)	1.18

(a) χ^2 not significant for Observed verses Expected cell frequencies with *df* = 2 and tabled value = 5.99 for alpha level of .05.

Table 39

Pretest-posttest absence frequencies for students enrolled in a four-period block schedule

	Absence Frequencies	
Student Number	Pretest	Posttest
1	3.5	15.0
2	8.0	14.0
3	20.5	19.0
4	5.0	5.0
5	1.5	0.0
6	8.5	6.5
7	4.0	22.5
8	8.0	4.0
9	12.5	22.0
10	0.0	1.0
11	4.0	10.5
12	13.0	19.0
13	5.5	3.0
14	2.5	8.0
15	1.0	3.5
16	5.0	7.0
17	8.0	20.5
18	0.0	3.5
19	1.0	4.5
20	11.5	9.5
21	2.0	8.5
22	11.0	9.5
23	4.5	11.5
24	2.0	4.5
25	1.5	10.0
26	4.5	3.0
27	0.0	1.0
28	2.0	11.5
29	8.0	40.0
30	3.0	1.5

Note: Student numbers correspond with Table 2**.**

Table 40

Pretest-posttest absence frequencies for students enrolled in a four-period block schedule

Absence Frequency	Less than 10 Absences	10-20 Absences	Greater than 20 Absences	Total	χ^2 (a)
Pretest	25 (41.7%)	4 (6.7%)	1 (1.7%)	30 (50.0%)	
Posttest	18 (30.0%)	8 (13.3%)	4 (6.7%)	30 (50.0%)	
Total	43 (71.7%)	12 (20.0%)	5 (8.3%)	60 (100.0%)	4.27

(a) χ^2 not significant for Observed verses Expected cell frequencies with *df* = 2 and tabled value = 5.99 for alpha level of .05.

Table 41

Posttest-posttest behavior office referral frequencies for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule

	Behavior Office Referral Frequencies	
Student Number	SPTS Posttest	FPBS Posttest
1	0	0
2	0	2
3	5	0
4	0	0
5	0	0
6	0	1
7	0	1
8	5	0
9	0	8
10	0	0
11	1	1
12	0	0
13	0	0
14	4	0
15	0	0
16	0	3
17	0	0
18	0	0
19	0	0
20	18	0
21	2	1
22	20	0
23	0	3
24	0	1
25	0	3
26	0	0
27	0	0
28	1	3
29	0	7
30	1	0

Note: Student numbers correspond with Table 1 and Table 2**.**

Table 42

Posttest-posttest behavior office referral frequencies for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule

Behavior Office Referral Frequency	Less than 3 behavior office referrals	3-6 behavior office referrals	Greater than 6 behavior office referrals	Total	χ^2 (a)
Research School A (SPTS) Posttest	25 (41.7%)	3 (5.0%)	2 (3.3%)	30 (50.0%)	
Research School B (FPBS) Posttest	24 (40.0%)	4 (6.7%)	2 (3.3%)	30 (50.0%)	
Total	49 (81.7%)	7 (11.7%)	4 (6.7%)	60 (100.0%)	0.16

(a) χ^2 not significant for Observed verses Expected cell frequencies with *df* = 2 and tabled value = 5.99 for alpha level of .05.

Table 43

Posttest-posttest absence frequencies for students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule

	Absence Frequencies	
Student Number	SPTS Posttest	FPBS Posttest
1	11.0	15.0
2	9.5	14.0
3	7.5	19.0
4	9.0	5.0
5	6.5	0.0
6	7.5	6.5
7	14.0	22.5
8	17.5	4.0
9	22.0	22.0
10	11.0	1.0
11	4.5	10.5
12	1.0	19.0
13	8.5	3.0
14	3.0	8.0
15	7.5	3.5
16	7.5	7.0
17	32.0	20.5
18	12.5	3.5
19	5.5	4.5
20	11.5	9.5
21	17.5	8.5
22	12.5	9.5
23	13.0	11.5
24	11.0	4.5
25	6.5	10.0
26	4.0	3.0
27	12.0	1.0
28	56.5	11.5
29	5.5	40.0
30	8.0	1.5

Note: Student numbers correspond with Table 1 and Table 2**.**

Table 44

Posttest-posttest absence frequencies students enrolled in a seven-period traditional schedule compared to students enrolled in a four-period block schedule

Absence Frequency	Less than 10 Absences	10-20 Absences	Greater than 20 Absences	Total	χ^2 (a)
Research School A (SPTS) Posttest	16 (26.7%)	11 (18.3%)	3 (5.0%)	30 (50.0%)	
Research School B (FPBS) Posttest	18 (30.0%)	8 (13.3%)	4 (6.7%)	30 (50.0%)	
Total	34 (56.7%)	18 (31.7%)	7 (11.7%)	60 (100.0%)	0.73

(a) χ^2 not significant for Observed verses Expected cell frequencies with *df* = 2 and tabled value = 5.99 for alpha level of .05.

Chapter Five

Conclusions and Discussions

The purpose of this comparative efficacy study was to determine the impact of two scheduling models, seven-period traditional schedule (SPTS) and four-period block schedule (FPBS), on the science Essential Learner Outcome (ELO) strand scores, proficiency levels, office referrals, and absence frequencies of 11th-grade students attending suburban schools with equivalent race, gender, socioeconomic status, and curriculum offerings.

There were five dependent variables for this study that fall into three specific themes: academic achievement, attendance, and behavior. The first of these, academic achievement, was analyzed using the following dependent measures (a) science Essential Learner Outcome (ELO) strand scores converted to standard scores (*i*) earth science, (*ii*) life science, (*iii*) physical science, and (*iv*) scientific inquiry and (b) proficiency levels (*i*) below proficient, (*ii*) barely proficient, (*iii*) proficient, and (*iv*) beyond proficient. The second theme, attendance, was collected retrospectively from participating students' 8th and 11th grade school years. Finally, the third theme, behavior, was collected retrospectively from participating students' 8th and 11th-grade school years. All dependent variable data was collected using the Research School District's student information system Infinite Campus. All study achievement, attendance, and behavior data related to each of the dependent variables were retrospective, archival, and routinely collected school information. Permission from the appropriate school research personnel was obtained before data were collected and analyzed.

Conclusions

The following conclusions may be drawn from the study for each of the nine research questions.

Research Question #1

Overall, pretest-posttest results indicated beginning 8th-grade pretest compared to ending 11th-grade posttest science Essential Learner Outcome (ELO) strand scores converted to standardized scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry for students enrolled in Research School A with a seven-period traditional schedule were statistically significantly different in the direction of higher pretest mean achievement in all science ELO strands. Comparing students' pretest and posttest earth science strand scores converted to standard scores puts their performance in perspective. A pretest earth science strand score mean of 116.55 is congruent with a Percentile Rank of 86, a Stanine Score of 7 (the lower stanine of the above average range), and an achievement qualitative description of above average. Conversely, a posttest earth science strand score mean of 102.07 is congruent with a Percentile Rank of 55, a Stanine Score of 5 (the middle stanine of the average range), and an achievement qualitative description of average. Comparing students' pretest and posttest life science strand scores converted to standard scores puts their performance in perspective. A pretest life science strand score mean of 116.37 is congruent with a Percentile Rank of 86, a Stanine Score of 7 (the lower stanine of the above average range), and an achievement qualitative description of above average. Conversely, a posttest life science strand score mean of 110.30 is congruent with a Percentile Rank of 75, a Stanine Score of 6 (the higher stanine of the average range), and an achievement qualitative description of average. Comparing students' pretest and posttest physical science strand scores converted to standard scores puts their performance in perspective. a pretest physical science strand score mean of 112.53 is congruent with a Percentile Rank of 79, a Stanine Score of 6 (the higher stanine of the average range), and an achievement qualitative description of average. Conversely, a posttest physical science strand score mean of 102.79 is congruent with a Percentile Rank of 55, a Stanine Score of 5 (the middle stanine of the average range), and an achievement qualitative description of average. Comparing students' pretest and posttest scientific inquiry strand scores converted to standard scores puts their performance in perspective. A pretest scientific inquiry strand score mean of 121.37 is congruent with a Percentile Rank of 92, a Stanine Score of 8 (the middle stanine of the above average range), and an achievement qualitative description of above average. Conversely, a posttest scientific inquiry strand score mean of 115.29 is congruent with a Percentile Rank of 84, a Stanine Score of 7 (the lower stanine of the average range), and an achievement qualitative description of above average.

Research Question #2

Overall, the pretest-posttest results indicated beginning 8th-grade pretest compared to ending 11th-grade posttest science Essential Learner Outcome (ELO) strand scores converted to standardized scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry for students enrolled in Research School B with a four-period block schedule were statistically significantly different in the direction of higher pretest mean achievement in all ELO strands.

Comparing students' pretest and posttest earth science strand scores converted to standard scores puts their performance in perspective. A pretest earth science strand score mean of 118.25 is congruent with a Percentile Rank of 88, a Stanine Score of 7 (the lower stanine of the above average range), and an achievement qualitative description of above average. Conversely, a posttest earth science strand score mean of 98.17 is congruent with a Percentile Rank of 45, a Stanine Score of 4 (the lower stanine of the average range), and an achievement qualitative description of average. Comparing students' pretest and posttest life science strand scores converted to standard scores puts their performance in perspective. A pretest life science strand score mean of 114.70 is congruent with a Percentile Rank of 82, a Stanine Score of 6 (the higher stanine of the average range), and an achievement qualitative description of average. Conversely, a posttest life science strand score mean of 110.42 is congruent with a Percentile Rank of 75, a Stanine Score of 6 (the higher stanine of the average range), and an achievement qualitative description of average. Comparing students' pretest and posttest physical science strand scores converted to standard scores puts their performance in perspective. A pretest physical science strand score mean of 111.84 is congruent with a Percentile Rank of 77, a Stanine Score of 6 (the higher stanine of the average range), and an achievement qualitative description of average. Conversely, a posttest physical science strand score mean of 102.99 is congruent with a Percentile Rank of 55, a Stanine Score of 5 (the middle stanine of the average range), and an achievement qualitative description of average.

Comparing students' pretest and posttest scientific inquiry strand scores converted to standard scores puts their performance in perspective. A pretest scientific inquiry strand score mean of 120.83 is congruent with a Percentile Rank of 91, a Stanine Score of 8 (the middle stanine of the above average range), and an achievement qualitative description of above average. Conversely, a posttest scientific inquiry strand score mean of 115.29 is congruent with a Percentile Rank of 84, a Stanine Score of 7 (the lower stanine of the above average range), and an achievement qualitative description of above average.

Research Question #3

Overall, the posttest-posttest results indicated ending 11th-grade posttest science Essential Learner Outcome (ELO) strand scores converted to standardized scores for (a) earth science, (b) life science, (c) physical science, and (d) scientific inquiry for students enrolled in Research School A with a seven-period tradition schedule compared to Research School B with a four-period block schedule were not statistically significantly different. Comparing students' posttest earth science strand scores converted to standard scores puts their performance in perspective. A posttest earth science strand score mean of 102.50 in Research School A with a seven-period traditional schedule is congruent with a Percentile Rank of 55, a Stanine Score of 5 (the middle stanine of the average range), and an achievement qualitative description of average. Conversely, a posttest earth science strand score mean of 98.17 in Research School B with a four-period block schedule is congruent with a Percentile Rank of 45, a Stanine Score of 4 (the lower stanine of the average range), and an achievement qualitative description of average.

Comparing students' posttest earth science strand scores converted to standard scores puts their performance in perspective. A posttest earth science strand score mean of 102.50 in Research School A with a seven-period traditional schedule is congruent with a Percentile Rank of 55, a Stanine Score of 5 (the middle stanine of the average range), and an achievement qualitative description of average. Conversely, a posttest earth science strand score mean of 98.17 in Research School B with a four-period block schedule is congruent with a Percentile Rank of 45, a Stanine Score of 4 (the lower stanine of the average range), and an achievement qualitative description of average. Comparing students' posttest life science strand scores converted to standard scores puts their performance in perspective. A posttest life science strand score mean of 110.30 in Research School A with a seven-period traditional schedule is congruent with a Percentile Rank of 75, a Stanine Score of 6 (the higher stanine of the average range), and an achievement qualitative description of average. Conversely, a posttest life science strand score mean of 110.42 in Research School B with a four-period block schedule is congruent with a Percentile Rank of 75, a Stanine Score of 6 (the higher stanine of the average range), and an achievement qualitative description of average. Comparing students' posttest physical science strand scores converted to standard scores puts their performance in perspective. A posttest physical science strand score mean of 102.79 in Research School A with a seven-period traditional schedule is congruent with a Percentile Rank of 55, a Stanine Score of 5 (the middle stanine of the average range), and an achievement qualitative description of average. Conversely, a posttest physical science strand score mean of 102.99 in Research School B with a four-period block schedule is congruent with a Percentile Rank of 55, a Stanine Score of 5 (the middle stanine of the average range), and an achievement qualitative description of average. Comparing students' posttest scientific inquiry strand scores converted to standard scores puts their performance in perspective. A posttest scientific inquiry strand score mean of 115.20 in Research School A with a seven-period traditional schedule is congruent with a Percentile Rank of 84, a Stanine Score of 7 (the lower stanine of the above average range), and an achievement qualitative description of above average. Conversely, a posttest scientific inquiry strand score mean of 115.29 in Research School B with a four-period block schedule is congruent with a Percentile Rank of 84, a Stanine Score of 7 (the lower stanine of the above average range), and an achievement qualitative description of above average.

Students' mean posttest scores in earth science were higher in Research School A with a seven-period traditional schedule compared to students in Research School B with a four-period block schedule. The earth science strand demonstrated the largest difference in mean scores and it favored the traditional schedule model. However, in the other strands of life science, physical science, and scientific inquiry, students' mean scores were higher in the four-period block schedule compared to the seven-period traditional schedule. In these particular strands, the difference in means was only in the tenths of a point.

Research Question #4

Overall, science Essential Learner Outcome pretest-posttest proficiency frequencies category indicated a 7 student decline in the beyond proficient category from the pretest 8th-grade science ELO. That is to say that 7 students' posttest science Essential Learner Outcome scale scores converted to standard scores were not strong enough to keep them in the highest proficiency category. Of equal importance, there was a 1 student decline in the below proficient category, a 2 student increase in the barely proficient category, and a 6 student increase in the proficient category on the posttest science ELO. The increase in the number of students at posttest in the barely proficient and proficient category may represent increased movement into these categories by students with both increasing (from below proficient) and decreasing (from beyond proficient) science skills. Given that movement among proficiency levels from pretest to posttest, it is inconclusive whether the seven-period traditional scheduling model has an impact on science academic achievement.

Research Question #5

Overall, science Essential Learner Outcome (ELO) pretest-posttest proficiency frequencies category indicated a 3 student decline in the beyond proficient category from the pretest 8th-grade science ELO. That is to say that 3 students’ posttest science Essential Learner Outcome scale scores converted to standard scores were not strong enough to keep them in the highest proficiency category. Of equal importance, there was a 1 student decline in the below proficient category, a 2 student increase in the barely proficient category, and a 2 student increase in the proficient category on the posttest science ELO. The increase in the number of students at posttest in the barely proficient and proficient category may represent increased movement into these categories by students with both increasing (from below proficient) and decreasing (from beyond proficient) science skills. Given that movement among proficiency levels from pretest to posttest, it is inconclusive whether the four-period block scheduling model has an impact on science academic achievement.

Research Question #6

Overall, science Essential Learner Outcome (ELO) posttest-posttest proficiency frequencies category indicated that both Research School A (SPTS) and Research School B (FPBS) both had 9 students in the beyond proficient category, which is the highest proficiency level possible. Research school A (SPTS) had 3 more students in the proficient category and 4 fewer students in the barely proficient category compared to Research School B (FPBS). Conversely, Research School B (FPBS) had no students fall in the below proficient category, while Research School A (SPTS) had 1 student who scored in this lowest level of proficiency. Given the findings of this posttest-posttest comparison students in Research School A (SPTS) appear to score at higher levels of proficiency compared to students in Research School B (FPBS) although not at a statistically significant level.

Research Question #7

Overall, pretest-posttest results indicated beginning 8th-grade pretest compared to ending 11th-grade posttest behavior office referral frequencies and attendance frequencies for students enrolled in Research School A with a seven-period traditional schedule were not statistically significantly different in the direction of beginning 8th-grade pretest observed frequencies to ending 11th-grade posttest observed frequencies.

The pretest-posttest behavior office referral frequencies category indicated a 1 student decrease in the number of students who accumulated less than three behavior office referrals from 8th-grade to 11th-grade. There was no difference in pretest-posttest comparisons for students who accumulated three to six behavior office referrals. Finally, there was a 1 student increase in the number of students who accumulated greater than six behavior office referrals from 8th-grade to 11th-grade. Given these results, behavior office referrals frequency was consistent from 8th-grade to 11th-grade.

The pretest-posttest absence frequencies category indicated a 1 student decrease in the number of students who accumulated less than ten absences from 8th-grade to 11th-grade. There was a 2 student decrease in the number of students who accumulated ten to twenty absences. Finally, there was a 3 student increase in the number of students who accumulated greater than twenty absences from 8th-grade to 11th-grade. Given these results, it is apparent that there were a few students who moved from the less than ten absences category and ten to twenty absences category into excessive absences greater than twenty from 8th-grade to 11th-grade.

Research Question #8

Overall, pretest-posttest results indicated beginning 8th-grade pretest compared to ending 11th-grade posttest behavior office referral frequencies and attendance frequencies for students enrolled in Research School B with a four-period block schedule were not statistically significantly different in the direction of beginning 8th-grade pretest observed frequencies to ending 11th-grade posttest observed frequencies.

The pretest-posttest behavior office referral frequencies category indicated a 3 student decrease in the number of students who accumulated less than three behavior office referrals from 8th-grade to 11th-grade. There was a 2 student increase in the pretest-posttest comparisons for students who accumulated three to six behavior office referrals from 8th-grade to 11th-grade. Finally, there was a 1 student increase in the number of students who accumulated greater than six behavior office referrals from 8th-grade to 11th-grade. Given these results, behavior office referrals frequencies showed that 3 students moved from the lowest category of behavior office referrals in to the categories of three to six behavior office referrals and the category of greater than six behavior office referrals.

The pretest-posttest absence frequencies category indicated a 7 student decrease in the number of students who accumulated less than ten absences from 8th-grade to 11th-grade. There was a 4 student increase in the number of students who accumulated ten to twenty absences from 8th-grade to 11th-grade. Finally, there was a 3 student increase in the number of students who accumulated greater than twenty absences from 8th-grade to 11th-grade. Given these results, it is apparent that 7 students moved from the lowest category of absences in to the upper two categories from 8th-grade to 11th-grade.

Research Question #9

Overall, results of ending 11th-grade posttest behavior office referral frequencies and attendance frequencies for students enrolled in Research School A with a seven-period traditional schedule compared to ending 11th-grade posttest behavior office referral frequencies and attendance frequencies for students enrolled in Research School B with a four-period block schedule were not statistically significantly different.

The posttest-posttest behavior office referral frequencies category indicated a 1 student difference in the number of students who accumulated less than three behavior office referrals from 8th-grade to 11th-grade with Research School A having an additional student in this category. There was a 1 student difference in the category of three-six behavior office referrals with Research School B having one additional student in this category. Finally, there was no difference in the number of students who accumulated greater than six behavior office referrals in either Research School.

The posttest-posttest absence frequencies category indicated that Research School B had 2 more students than Research School A with less than ten absences. Research School A had 4 more students than Research School B in the category of ten to twenty absences. Finally, Research School B had 1 more student than Research School B in the category of greater than twenty absences.

Discussion

The results of this study supported the use of different scheduling models at the high school level. Because posttest-posttest comparisons between Research School A (SPTS) and Research School B (FPBS) were not statistically significantly different, the question of which scheduling model provides for better academic achievement becomes a moot point. In fact, more needs to be done within each high school to identify ways to improve student achievement on ELO assessments from pretest to posttest considering this is where the statistical significant difference lies.

Implications for practice. With education evolving in a more high-stakes culture with increased accountability, schools must continue to explore new teaching methods, emerging technologies, and alternate scheduling models to improve the teaching and learning process (Zepeda & Mayers, 2006). The reality is, that changing the school scheduling vehicle in and of itself doesn’t have a direct impact on student achievement according to the results of this study. Both the traditional and block scheduling model are successful in the delivery of curriculum and good teachers and instructional strategies are effective in any type of schedule (Veldman, 2002). Real achievement results occur when the culture of a school, building leadership, and the teaching staff all come together and support the scheduling model and how it impacts student learning. There are many variables beyond the schedule, including the school, home, and community that can influence student achievement (Trenta & Newman, 2002). It is also important to note that equally important to the school scheduling model is the preparation or in-service of the teachers and teaching methodologies (Trenta & Newman, 2002). Attrition of staff in high schools is commonplace and without proper staff development for teachers, a scheduling model is nothing more than a set amount of time that students sit in a classroom. As Arnold demonstrates in his findings, it is evident that block-scheduled schools may realize increased student achievement in the implementation year of the scheduling model, but most of that increase is diminished by the second year of block scheduling (2002).

The overall implications for practice require that schools understand why they are considering a schedule change and understand that variables other than student achievement must be considered in order to successfully implement the schedule. To be high performing, schools must look beyond scheduling models and have short and long term goals. This involves a strategy where, in the short run, school leaders can directly affect the quantity of learning by looking at bell-to-bell instruction and the instructional delivery model (Riddile, 2010). In the long run though, leaders need to work on improving the quality of instruction by building the capacity of teachers to meet the learning needs of individual students (Riddile, 2010). In addition, resources must continually be provided in the form of appropriate staff development that focuses on research based instructional best practices in order for a scheduling model to be viable and worth the change. Also, a school must look strongly at whether the culture and climate of the students, parents, and staff support a switch to a different scheduling model. As Veldman points out, the schedule can be an issue that creates anxiety with all stakeholders and it is crucial to keep the focus on student learning and teaching regardless of the schedule that is implemented in the school (2002). Schools need to understand that there is no perfect schedule that fits every high school and it is imperative to collect and monitor building data when matching scheduling needs and oftentimes conflicting research (Veldman, 2002).

Implications for policy. Local control, in the form of school boards, is a hallmark of American government. Locally elected citizens making policies regarding educational practices of school districts is, at its core, is essential to the democratic process. One of the fundamental expectations of American education is that all students will have an equal opportunity to learn and the purpose of educational reform is to improve the conditions for learning (Strom, Strom, & Wing, 2008). While these conditions for learning may look different in various parts of the country, the overarching goal remains the same. With approximately 14,000 school districts in the United States, local control is accepted because each district has site-specific purposes, demographic characteristics, history, identity, unique resources, and challenges (Strom et al., 2008). With this in mind, it is critical for school boards to implement policies that address these issues and remain true to educational reform that improve the conditions for learning.

School boards are at the forefront of educational reform because the policies they set, guide individual schools that make up a district. According to Usdan (2010), school reform should be characterized by systemic schoolwide improvement strategies that encompass the entire range of school activities from management and professional development to curriculum and instruction. On the other side of the coin, however, school boards need to strike a delicate balance between promoting educational reform and micromanaging. In large urban and suburban districts that span multiple square miles, there may be different perspectives or thoughts about how schools should be run. Having policy in place to allow for site-based decision making will allow individual schools an opportunity to decide what is best for their stakeholders. Many districts lack the capacity to set objectives and prioritize their efforts and because of this, aggressive targets are not met and educators end up focusing on issues sequentially, addressing one important, but limited area of improvement at a time (Cahill, 2009). By having specific objectives in place at the policy level, individual schools can prioritize their needs and meet these objectives in the order of their importance.

Change in schools can look different depending on the focus what schools are trying to accomplish. It is important to note however, that responsible change always leads directly to the classroom because this is where teaching and learning takes place (Riddile, 2010). Because of this, it is important for school districts to look closely at their policies regarding site based decision making and determine if this includes making decisions regarding school scheduling models. Policy must be clear regarding whether individual schools should have the autonomy to make decisions regarding how time is organized during the school day or if that decision should be left to the district office. Although school districts general have control of the purse strings and provide monetary resources to implement change projects, money cannot buy the teacher-student relationship, which is the single most important factor contributing to student achievement (Riddile, 2010). Because research has shown that scheduling models by themselves do not directly impact student achievement, policy can be strengthened by allowing individual schools to determine the method of delivering instruction and the school system can set the professional standards by which teachers must operate. The system can do this by implementing policy that requires procedures and processes as well as continual, ongoing, and connected professional development that is focused on improving teacher skills in the classroom (Riddile, 2010). Professional development looms as paramount for reforming teacher practice and one of the greatest challenges for district leadership is a "one size fits all" professional development approach that may not meet the needs of teachers who teach in different scheduling models (Biesinger, Crippen, & Muis, 2008).

Implications for further research. The results of this study point to the need for further research in a few key areas. A great deal can be learned about effective instructional practices in the classroom that will enable students to perform better on ELO assessments. Using the same type of instructional methods in two different and unique scheduling models fits hand-in-hand with the one-size-fits-all approach that schools need to break away from. Instructional differentiation needs to take place to allow students to have a more in-depth understanding of science in order to improve achievement scores from pretest to posttest.

Another key area to explore is the sequence of science courses at the high school level. The Research School District should look at how students progress from one level of science to another. In most cases, students at the 8th-grade level take the same generic science course that every other student receives. This changes at the high school level when students are asked to choose the appropriate level of science to take based on their current skill level. This a la carte method of science courses may cause students to miss out on key concepts assessed on the ELO assessments.

Finally, more research needs to be done on the reason why different scheduling models may benefit a certain type of student. Allowing students and parents a choice in how they are going to learn may prove to be an effective practice. By having schools in a school district that offer multiple ways of learning, more children have an opportunity for higher levels of academic achievement. The Research School District in this study should sustain the scheduling models they have in place in their Research High Schools because they appear to provide different types of students an opportunity to be successful. Overall, the results of this study suggest continued use of different scheduling models at the high school level.

References

Arnold, D. E. (2002). Block schedule and traditional schedule achievement: A comparison. *NASSP Bulletin*, 86, 42-53.

Biesinger, K. D., Crippen, K. J., & Muis, K.R. (2008). The impact of block scheduling on student motivation and classroom practice in mathematics. *NASSP Bulletin*, 92(3), 191-208.

Black, K. J. (2002). Changing time: The 4+1 school week. *Catalyst for Change*, 32(1), 8-9.

Bottge, B. A., Gugerty, J. J., Serlin, R., & Moon, K. (2003). Block and traditional schedules: Effects on students with and without disabilities in high school. *NASSP Bulletin*, 87, 2-14.

Brower, R. E. (2000). The 3x5 trimester schedule: time to improve teaching & learning. *High School Magazine*, 7(9), 28-31.

Cahill, M. (2009). Smart, bold reform for powerful schools. *Education Digest*, 75(4), 14-16.

Canady, R. L., & Rettig, M. D. (1995). The power of innovative scheduling. *Educational Leadership,* 53(3), 4-10.

Childers, G. L., & Ireland, R. W. (2005). Mixing block and traditional scheduling. *Education Digest: Essential Readings Condensed for Quick Review,* 71(3), 43-49.

Deuel, L. S. (1999). Block scheduling in large, urban high schools: Effects on academic achievement, student behavior, and staff perceptions. *The High School Journal,* 83(1), 14-25.

Dexter, K. M., Tai, R. H., & Sadler, P. M. (2006). Traditional and block scheduling for college science preparation: A comparison of college science success of students who report different high school scheduling plans. *The High School Journal,* 89(4), 22-33.

Eineder, D. V., & Bishop, H. L. (1997). Block scheduling the high school: The effects on achievement, behavior, and student-teacher... (cover story). *NASSP Bulletin,* 81(589), 45.

Geismar, T. J., & Pullease, B. G. (1996). The trimester: A competency based model of block scheduling. research brief. *NASSP Bulletin*, 80(581), 95-105.

George, M. A. (1997). I'd never go back: teachers talk about block scheduling. *American Secondary Education,* 25, 23-31.

Gruber, C. D., & Onwuegbuzie, A. J. (2001). Effects of block scheduling on academic achievement among high school students. *The High School Journal*, 84(4), 32-42.

Gullatt, D. E., (2006). Block scheduling: the effects on curriculum and student productivity. *NASSP Bulletin*, 90(3), 250-266.

Hackmann, D. G. (2004). Constructivism and block scheduling: Making the connection. *Phi Delta Kappan,* 85(9), 697-702.

Hamdy, M., & Urich, T. (1998). Perceptions of teachers in south Florida toward block scheduling. *NASSP Bulletin*, 82(596), 79-82.

Hurley, C. (1997). The 4 x 4 block scheduling model: what do students have to say about it? *NASSP Bulletin*, 81, 64-72.

Hughes, W. W. (2004). Blocking student performance in high school? *Economics of Education Review*, 23(6), 663-667.

Irmsher, K. (1996). Block Scheduling (Report No. EDO-EA-96-4). Eugene, OR: ERIC Clearinghouse on Educational Management. (ERIC Document Reproduction Service No. ED393156).

Khazzaka, J. (1997). Comparing the merits of a seven-period school day to those of a four-period school day. *High School Journal*, 81, 87-98.

Knight, S. L., De Leon, N. J., & Smith, R. G. (1999). Using multiple data sources to evaluate an alternative scheduling model. *The High School Journal*, 83(1), 1-13.

Lawrence, W. W., & McPherson, D. D. (2000). A comparative study of block scheduling and traditional scheduling on academic achievement. *Journal of Instructional Psychology*, 27(3), 178-182.

Lee, J. (2001). Gaining high school achievement in agriscience. *The Agricultural Education Magazine*, 74(3), 11-13.

Marchant, G. J., & Paulson, S. E. (2001). Differential school functioning in a block schedule: A comparison of academic profiles. *The High School Journal*, 84(4), 12-20.

Millard Public Schools. (2008a). *History of District*. Retrieved April 10, 2008, from Millard Public School: http://www.mpsomaha.org

Millard Public Schools. (2008b). *Online Publications.* Retrieved April 10, 2008, from Millard Public Schools: http://www.mpsomaha.org

Millard Public Schools. (2008c). *Assessment Program.* Retrieved June 23, 2009, from Millard Public Schools: http://www.mpsomaha.org

National Commission on Excellence in Education. (1983). *A nation at risk: the imperative for educational reform.* Washington, D.C.: U.S. Department of Education.

National Education Commission on Time and Learning. (1994). *Prisoners of time: report of the national education commission on time and learning.* Washington, D.C.: U.S. Government Printing Office.

Nebraska Department of Education. (2007). *State of the schools report*. Retrieved September 14, 2008, from Nebraska Department of Education: http://www.nde.state.ne.us/

No Child Left Behind Act of 2001, Pub. L. No. 107-110, 115 Stat. 1425 (2002).

Nye, K. P. (2000). A crazy idea that worked. *Principal Leadership (Middle School Edition),* 1(4), 66-69.

Pallas, A., Natriello, G., & Riehl, C. (1999). Rites and wrongs; institutional explanations for the student course-scheduling process in urban hgih schools. *American Journal of Education , 107,* 116-154.

Pliska, A., Harmston, M. T., & Hackmann, D. G. (2001). The relationship between secondary school scheduling models and ACT assessment scores. *NASSP Bulletin*, 85, 42-55.

Randler, C., Kranich, K., & Eisele, M. (2007). Block scheduled versus traditional biology teaching--an educational experiment using the water lily. *Instructional Science*, 36(1), 17-25.

Riddile, M. (2010). The best things may be free. *Principal Leadership*, 10(5), 64-66.

Rikard, G. L., & Banville, D. (2005). High school physical education teacher perceptions of block scheduling. *High School Journal*, 88(3), 26-35.

Salvaterra, M., Lare, D., Gnall, J., & Adams, D. (1999). Block scheduling: students' perceptions of readiness for college math, science, and foreign language. *American Secondary Education*, 27(4), 13-21.

Schroth, G. (2008). *Education Encyclopedia*. Retrieved September 14, 2008, from StateUniversity.com: http://education.stateuniversity.com/pages/2385/Scheduling.html

Shortt, T. L., & Thayer, Y. V. (1998). Block scheduling can enhance school climate. *Educational Leadership*, 56(4), 76-81.

Shortt, T. L., & Thayer, Y. V. (1997). A vision for block scheduling: where are we now? Where are we going? *NASSP Bulletin*, 81(1), 1-15.

Staunton, J. (1997). A study of teacher beliefs on the efficacy of block scheduling. *NASSP Bulletin*, 81, 73-80.

Stokes, L. C., & Wilson, J. W. (2000). A longitudinal study of teachers' perceptions of the effectiveness of block versus traditional scheduling. *NASSP Bulletin*, 84(619), 90-99.

Strom, P., Strom, R., & Wing, C. (2008). Polling students about conditions of learning. *NASSP Bulletin*, 92(4), 292-304.

Traverso, H. (1996). *New Directions in Scheduling the Secondary School.* Reston, VA: NASSP.

Trenta, L., & Newman, I. (2002). Effects of a high school block scheduling program on students: a four-year longitudinal study of the effects of block scheduling on student outcome variables. *American Secondary Education*, 31(1), 54-71.

Usdan, M. (2010). School boards: a neglected institution in an era of school reform. *Phi Delta Kappan*, 91(6), 8-10.

Veldman, R. (2002). The best of both schedules. *Principal Leadership (High School Ed.)*, 3(3), 36-38.

Weiss, C. (2001). Difficult starts: turbulence in the school year and its impact on urban students' achievement. *American Journal of Education* , *109*, 196-227.

Zepeda, S. J., & Mayers, R. S. (2006). An analysis of research on block scheduling. *Review of Educational Research*, 76(1), 137-170.

Zitlow, C. (2003). Teaching and learning with a block schedule. *The English Journal* , *92*, 89-90.