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# Effects of Traditional Scheduling Versus Flexible Modular Scheduling on Academic Achievement

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# EFFECTS OF TRADITIONAL SCHEDULING VERSUS FLEXIBLE MODULAR SCHEDULING ON ACADEMIC ACHIEVEMENT

by

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Dissertation

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## ABSTRACT

by
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Title: Effects of Traditional Scheduling Versus Flexible Modular Scheduling on Academic Achievement (Under the direction of Dr. Kimberly Flowers)

The purpose of this dissertation was to determine the effects of gender and traditional or flexible modular scheduling participation on academic performance as measured by ACT Aspire Summative Assessment scores. Scores chosen for this study were from the 2018 10th-grade students in four Arkansas high schools. The samples were chosen from two schools participating in traditional scheduling and two schools participating in flexible modular scheduling. ACT Aspire Summative Assessment scores were used to provide the academic performance data for the dependent variable used in each hypothesis. During the spring semesters of 2018, the ACT Aspire Summative Assessment was administered to 10th-grade students across the state of Arkansas including students from the four selected high schools. For the four hypotheses, none displayed a significant interaction effect between schedule type and gender combined. Additionally, the main effect for gender type was not significant for the four hypotheses. Similarly, the main effect for schedule type was not significant for Hypothesis 3 and 4. However, the main effects of schedule type in Hypothesis 1 (Reading) and 2 (English) were significant, regardless of gender.

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# CHAPTER I

## INTRODUCTION

Administrators of school systems are continuously urged to review areas in their respective schools to improve student achievement. The National Commission on Excellence in Education (1983) released a report entitled *A Nation at Risk*. In this report, American schools were described as falling behind other nations academically, especially other modern industrialized countries. Officials at the National Commission on Excellence in Education suggested several recommendations for improving the quality of public schools in America. One area the commission studied was the actual use of time during the school day in American public schools. From this examination, the commission called for a more efficient configuration of the traditional school day, a lengthened school day, or an extended school year. The commission also recommended that the school day is adjusted to meet the needs of diversified learning styles of the student within the school system. The publication, *A Nation at Risk*, brought an awareness that American public schools needed to identify and implement changes in order to improve.

Despite the many variables school administrators cannot control, such as state standards, student motivation, and even parental support, how time is used during the school day falls under administrative control to some degree. Fisher and Berliner (1985) defined *instructional time* as that specific amount of necessary engagement and

processing needed to allow for the influence of the teacher and the effects of teaching. Fisher and Berliner discussed the idea of altering the school day and studying the effect of different time configurations. They observed how administrators divided the school day directly influenced teacher instruction and ultimately affected the outcome of student achievement. School administrators build students' class schedules to provide time for learning, and teachers subdivide this allotted time to provide instruction. The time that students need to take the information presented and transform the material into meaningful knowledge that can be retained and retrieved is an individual necessity.

One debate among school administrators is how to divide the school day to promote higher levels of academic performance. Whether the school day is divided into a few periods or many periods, time is standard. Even though the average school day nationwide includes the same number of hours and minutes, the length of the instructional periods varies by the type of class schedule from school to school. One reason for this variance is that some educators believe that the length of an instructional period can affect students' abilities to learn and teachers' abilities to teach (O'Neil, 1995). Therefore, how administrators divide instructional time on any given day by using a class-scheduling format has become a variable for many research studies. The amount of time for instruction is provided by class scheduling and is often provided in a generic amount in a traditional format, whereas the flexible modular schedule provides an individualized approach.

For many years, most schools provided their students with a traditional class-scheduling format that consisted of the school day being divided into 7 or 8 equal periods. However, several types of high school schedules have been designed to rival the

traditional class scheduling for the same designated time frame. Alternative types of scheduling, such as block scheduling that consists of A/B class scheduling and 4 x 4 block scheduling, are often called *needs-driven* because they address the restructuring of the time component in standard school organization (Hackmann & Schmitt, 1997). The A/B and 4 x 4 block schedules are two of the most commonly implemented types of scheduling.

An additional type of alternative schedule is the flexible modular schedule that is designed to use time designated for learning in a nontraditional way. Flexible modular scheduling was one of the first attempts to alter the traditional school day. The influence of J. Loyd Trump during the 1960s birthed the idea of flexible modular scheduling. In this type of scheduling, teacher instruction and student learning were increased by adjusting the class time structure to cater to more specified educational goals (Murray, 2008; Zepeda & Mayers, 2006). This scheduling required in-depth changes to the perceived roles of students, instructors, and administrators (Johnson, 1972). The idea of flexible modular scheduling is not new to high school class scheduling, but the flexibility of this scheduling format has provided administrators with a viable alternative for teaching and learning.

Flexible modular scheduling has supporters and critics. Proponents of flexible modular scheduling promote a design for supporting child-centered instruction. Previous studies that have compared the academic achievement of students in traditional schedules with flexible modular schedules favored the latter (Arhar & Irvin, 1995; Felner et al., 1997). Flexible modular scheduling may provide a more significant opportunity for the individualization of instruction along with the ability to develop a greater depth for

students and their personal needs. The added ability to invent class opportunities without a strict time limit in flexible modular scheduling may influence student achievement.

Subsequently, as schools investigate class scheduling to improve student achievement, some aspects of flexible modular scheduling may result in an undesirable effect on student learning. One component of inhibiting student learning is the misuse of unstructured time by students. Flexible modular scheduling allows students to manage their time more independently. The number of transition times between classes increases due to the number of modules offered, creating more opportunities for students to engage in inappropriate behavior (Festavan, 1996; Francka & Lindsey, 1995). Braddock (1967) noted that many students inadequately use their unstructured time during a school day, but administrators who created areas where students were supervised to complete their work reported increased student success. Havelock et al. (1974) concluded that students who developed the ability and could use this unscheduled time efficiently reported this practice to be a valuable maturity process in preparing them to be college-ready. No matter the type of class scheduling model used, administrators and teachers should set the expectations for the time provided to minimize the undesirable effects on student learning.

## Statement of the Problem

There were four purposes for this study. First, the purpose of this study was to determine the effects by gender between traditional period scheduling versus flexible modular scheduling on reading achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools. Second, the purpose of this study was to determine the effects by gender between

traditional period scheduling versus flexible modular scheduling on English achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools. Third, the purpose of this study was to determine the effects by gender between traditional period scheduling versus flexible modular scheduling on mathematics achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools. Fourth, the purpose of this study was to determine the effects by gender between traditional scheduling versus flexible modular scheduling on science achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools.

## Background

Schedules developed by school administrators have attempted to maximize student achievement through various forms of design and manipulation. The use of many models, with the same intentional goal of increasing student achievement, has been narrowed to two main models for this review: the traditional 7- or 8-period per day schedule and the flexible modular schedule. For traditional scheduling, the original Carnegie Unit has been used by high schools since the 1960s (Gruber & Onwuegbuzie, 2001). This review also examined the implementation of flexible modular scheduling, which became prominent in the late 1980s and early 1990s and was developed to meet the diverse needs of the students. This movement, led by J. Loyd Trump, was a result of the schools to challenge students through a variety of formats that would allow individual success (Gruber & Onwuegbuzie, 2001). This background presented an overview of traditional scheduling and forms of alternative scheduling, including A/B block, hybrid, 4

x 4 block scheduling, and flexible modular scheduling, along with the variables of gender and academic achievement.

**Theoretical Framework**

The time theory of instruction revolves around the flexible uses of instructional time. Flexible modular scheduling fills the desire for the development of a more suitable learning environment for students and allows instruction to be influenced by time in a creative, flexible way (Spear, 1992). Without the constraints of a rigid schedule, academic learning time can be viewed as quality instead of quantity. The start-and-stop approach of the traditional period schedule could inhibit teachers from teaching more creatively with longer class times, one that a flexible schedule may allow.

The time necessary for a student to be exposed to a new concept or information in order to foster understanding, and then transform this information into knowledge is an individual factor. The concept of time needed for learning was the basis for the acceptance of the Carnegie Unit as a standard unit of time needed for learning in an academic setting (Edwards, 1995). The industrialized concept also influenced the development of the Carnegie Unit that a certain amount of time spent working, in turn, yielded a certain amount of product (Kruse & Kruse, 1995). The Carnegie Unit is also the basis for the credit hour designation used by colleges and universities. Time is a common and binding factor in these situations.

Class schedules are based on time increments and have traditionally been locked into either 7 or 8 periods in a school day. Increased instructional time has been demonstrated to improve student achievement (Kubitschek et al., 2005). The idea is that more time exposed to concepts and teacher instruction leads to greater student

achievement. School administrators can control the time provided for instruction through the type of schedule the school implements.

To determine how much time is needed to learn, and therefore adjust the school schedule to provide the highest opportunity for learning, is significant if student academic achievement is sought. The concept of how much time is needed to learn is represented in the form of an equation: time spent in learning divided by the time needed for learning (Carroll, 1963). The concept of determining the amount of time needed is a unit that may be different for each student. Determining the amount of time necessary for learning before classroom engagement is challenging.

**Traditional Scheduling**

American high schools have structured learning opportunities around time rather than structuring time around learning. The Carnegie Unit from 1905 was implemented to standardize time for high school instruction (Carnegie Foundation for the Advancement of Teaching, 2018). The National Education Association was instrumental in developing a rigorous high school schedule where students would focus on five or six academic areas for 4 years of high school (Gorman, 1971). The traditional schedule, used by most high schools, remained relatively unchanged through the 1950s and 1960s (Carroll, 1990). Carnegie Units are units of time on which traditional schedules are based and where the time spent in an assigned class relates to the learning of the subject content (Edwards, 1995). The 40- to 60-minute periods were widely accepted as standard units of instruction. In the case of the Carnegie Units, credit hours earned for a specific amount of time spent learning a subject in high school corresponded with the same thinking of industrial production (Kruse & Kruse, 1995). This assigned time for educational

production correlated to the time when the developing standards of the American industry also used the idea that a specific amount of work time related to the amount of production.

High schools have remained grounded in the traditional schedule for many years. The development of the American high school and the past strategies for the development and organization of these public high schools can be found, according to Hammack (2004), as far back as the turn of the 20th century. The accepted ideology from school administrators was that all courses were taught the same way to every student within the same periods of time and content levels, no matter the background or past experiences the students possessed (Hammack, 2004). Regarding what is known now about human nature, however, the differences in the way students progress in their learning and the varied educational experiences of students bring to their learning might suggest that teaching all students the same way and for the same time periods would not be the ideal way to approach success for all students. Some students need more time in a subject and even more days of exposure to understand concepts, and other students might need less time.

Many of today's schools follow a specific school calendar composed of at least 178 student-contact days with a summer hiatus, excluding inclement weather days and scheduled holiday breaks. In the 1800s, schools developed calendars for attendance that were not as strict, especially in rural schools. Because children were needed to help with farming in the spring and fall, schools extended into the summer months, opposite of what a typical school year is currently (Huyvaert, 1998). Canady and Rettig (1995) noted high schools before the 1900s were more flexible in their schedules. They reported that

schools in rural settings often offered courses based on days of various length relevant to the content as opposed to meeting consistently for the same structured time over the full five days per week. The consideration of time adjustment revolved around the need for students to help their families with agricultural tasks.

**Nontraditional Block Scheduling**

Various block scheduling formats were developed to allow teachers flexibility by providing lengthier instructional periods during the school day and throughout the school year. Basic models of block scheduling include the A/B schedule, the hybrid schedule, the 4 x 4 schedule, and the flexible modular schedule. Students with an A/B schedule take 8 classes on a rotating basis (Canady & Rettig, 1995), and in the hybrid schedule, students can take a mixed number of classes (Boarman & Kirkpatrick, 1995). In the 4 x 4 block schedule, students take four classes per semester (Zepeda & Mayers, 2006). However, all schedules must meet the required minutes that are set by the Carnegie Unit for course credit. No matter which block schedule is implemented, any format offers additional time to incorporate teaching strategies during the school day. Therefore, the added time increases engagement and decreases the extra time taken for class changes.

Also known as the alternate day block schedule, the alternating block schedule or A/B block schedule allows teachers to convene classes with their students during their designated class time every other day instead of daily, like traditional scheduling. Classes may meet not only for an expanded amount of time but also may meet on a revolving arrangement at various times of the day. The A/B block schedule usually consists of up to 8 classes that meet for 80 to 90 minutes of instruction every other day (Canady & Rettig, 1995). The class meetings are alternating by days, with four classes meeting on one

school day and the other four classes meeting on the following school day for the entire academic school year. This design allows an equal number of class meetings for either day A or day B throughout the academic school year (Canady & Rettig, 1995). The alternating class schedule provides the double-block, which results in double the traditional time allowance for a class.

The most popular block scheduling arrangement is the 4 x 4 block schedule. Both teachers and students are responsible for a smaller number of classes during the semester with this schedule (Carroll, 1990). The 4 x 4 block schedule is structured for the student to complete four courses in the first semester and another four courses in the second semester, with a class duration of 90 minutes for each class meeting. Students have more opportunities for acceleration, but transfer students from schools on traditional schedules, along with absenteeism and make-up work, may prove problematic (Queen & Isenhour, 1998). The 4 x 4 block schedule is one way to offer students varying amounts of time for learning.

When schools blend various schedule models into different working versions, the hybrid schedule is formed. Schedules of this combined structure allow substantial freedom in meeting necessary individual student needs and programs but can cause stress to the school personnel who develop the schedule for students (Boarman & Kirkpatrick, 1995). Dependent upon the requirements of a class, students may enroll in one, two, or three blocks of time. The hybrid schedule in some schools entwines both traditional-length classes and block-length classes by allowing students to attend traditionally scheduled classes one day and block scheduled the next (Wronkovich, 1998). In the hybrid schedule, students meet for a shorter period for classes such as art, band, music,

physical education, and other electives, while using the longer block times for core classes.

**Flexible Modular Scheduling**

As the Carnegie Unit is the most common representation of the traditional schedule, the exemplification for the flexible modular schedule is the emphasis on the varied needs of the students. The flexible modular schedule was defined by Huyvaert (1998) as a schedule that changes as the needs of the student change and is based on what is required for instructional strategies that are used to present or demonstrate the content. With flexible modular scheduling, students are scheduled into multiple segments of learning, broken down into 10- to 20-minute modules. This type of scheduling results in students having more unstructured and often unsupervised time (Murray, 2008). Flexible modular scheduling provides more choices for students to enroll in required and elective classes. Although, unlike traditional scheduling, flexible modular scheduling allows time designated for classes to be adjustable and to provide independent learning.

The drive to change the traditional way American high schools have operated for over 150 years comes from the desire to provide more in-depth instruction resulting in higher student achievement. The implementation of the flexible modular scheduling concept was designed around the concept that by modifying the order and time of classes, learning and instruction could be maximized (Zepeda & Mayers, 2006). When evaluating schools, each school has the flexibility to set up the schedule independently if the district meets the required number of days outlined by the state. Advantages sought from the flexible modular schedule consist of improved time management skills, more in-depth development of relationships with teachers and peers, increased individualization of

learning and instruction, and added opportunities to take more classes (Murray, 2008). Teachers have the option, in the extended class periods, to implement a variety of planned teaching strategies and methods so that content can reach more student learners regardless of cultural backgrounds, socioeconomic status, or the physical or mental ability of the student learner (Vawter, 1999). Addressing individual learning needs for students with the delivery of instruction in a small group setting may lead to improved academic achievement.

The type of schedule implemented can also affect school climate. The effect of flexible modular scheduling on school climate has been studied and defined by Sergiovanni and Starret (1993) as "the enduring characteristics that describe the psychological character of a particular school, distinguish it from other schools, and influence behavior of the teachers and students" (p. 82). Flexible modular scheduling improves the school environment (Queen & Gaskey, 1997). For example, school districts have seen an increase in student attendance (Vawter, 1999). Further, as students and teachers work toward delivery and understanding of content in a more concentrated time, the climate of the classroom and school improved when students acknowledged that the scheduling was based upon their needs and desires (Hartzell, 1999). The increase in noted attendance may be associated with the novelty of the schedule type or may be a result of delivering the instruction in a platform that appeals to a student's learning style.

**Gender**

Although all students possess diverse learning styles, life experiences, and demographic differences, student coursework performance can also be influenced by gender. Males and females learn in different ways, and research indicates that testing

abilities between genders are also significantly different (Hanson, 1994). Klein et al. (1997) suggested that females score significantly higher on certain types of questions. With school administrators, concerns may arise about the cause of the differences in student performance regarding gender and whether school factors might play a part in these differences. Could different types of schedules during the school day help students of both genders? Evidence from previous studies suggested that academic success and less disciplinary referrals by females were related in a positive way to academic achievement. The compliance with behavior expectations by high school females resulted in increased academic success (Duckworth & Seligman, 2006). The number of office referrals between male and female students determined that female students had fewer referrals compared to male students. Scheduling that addresses the learning styles of males and females could improve academic achievement.

**Academic Achievement**

Scheduling classes, whether traditional or nontraditional, is completed with time for learning in mind. Novel and diverse methods of teaching provide teachers the opportunity to use the time allotted by these schedules to attempt to meet the academic needs of their students (Algozzine, Jenkins, & Queen, 2003). Student achievement is the goal of all educators. The time allocated for learning is fluid in some schedules.

Extended time is a variable that nontraditional scheduling offers teachers. The ability for teachers to engage students in activities and instruction that allow better content knowledge leads to an increased opportunity for academic success (Flocco, 2012). More significant periods of time where students are engaged in content reinforces

the learning goals of the subject. Time is a significant variable in learning that school schedules control.

## Hypotheses

After a review of the related literature, the researcher generated the following hypotheses:

1. No significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on reading achievement measured by the ACT Aspire Summative Exam for 10th-grade students' scores in two large and two small Arkansas schools.
2. No significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on English achievement measured by the ACT Aspire Summative Exam for 10th-grade students' scores in two large and two small Arkansas schools.
3. No significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on mathematics achievement measured by the ACT Aspire Summative Exam for 10th-grade students' scores in two large and two small Arkansas schools.
4. No significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on science achievement measured by the ACT Aspire Summative Exam for 10th-grade students' scores in two large and two small Arkansas schools.

## Description of Terms

**ACT Aspire Summative Assessment**. The ACT Aspire Summative Assessment system was adopted by the Arkansas Department of Education in 2015 and is aligned with the most commonly used college entrance exam, the ACT Test. The test can be used to predict ACT performance (ACT, 2018). The ACT Aspire Summative Assessment measures readiness in reading, English, mathematics, and science for Grades 3-10.

**Arkansas School Report Card**. Each year, the Arkansas Department of Education (2018) publishes a performance report of the state's schools. This online report provides information about each school and district, including test performance, teacher qualification, retention, discipline, and more.

**Carnegie unit**. The Carnegie Unit was developed in 1906 as a measure of the amount of time a student has studied a subject (Carnegie Foundation for the Advancement of Teaching, 2018).

**Every Student Succeeds Act.** The Every Student Succeeds Act was signed into law in December 2015 by President Barack Obama. This act reauthorized the 50-year-old Elementary and Secondary Education Act and replaced the No Child Left Behind Act of 2001 as the latest federal plan for education (Arkansas Department of Education, 2018).

**Flexible modular scheduling.** Flexible modular scheduling is a scheduling system where the school day is divided into a variety of time modules, period lengths, and the number of meetings per cycle for courses, students, teachers, and other staff personnel in a school curriculum (Valencia, 1969).

**Module.** A module is the smallest multiple unit of time in the school curriculum schedule. This time can be 15, 20, 25, 30, or any number of minutes selected as a minimum-time parameter for use in the school schedule (Sadowski, 2013).

**School size.** The definition of large and small high schools is based upon the classification system set forth by the Arkansas Activities Association. The Arkansas Activities Association (2018) distinguishes the size of Arkansas schools competing in athletics into six classifications based upon enrollment. For this study, small schools were defined as having a grade configuration of Grades 9-12, having less than 294 students, and having a 1A to 3A classification. Large schools were defined as having a grade configuration of Grades 9-12, having 294 or more students, and having a 4A to 7A classification (Arkansas Activities Association, 2018).

**Traditional schedule.** A traditional schedule is a daily schedule that allows students to participate in 7 or 8 classes per day for a duration between 40 and 60 minutes (Canady & Rettig, 1995).

## Significance

School administrators face tremendous pressure from the members of the communities in which they serve to create an environment in the public-school setting that fosters success. The publication, *A Nation at Risk: The Imperative for Educational Reform*, contained practical proposals for the improvement of education (National Commission on Excellence in Education, 1983). One suggestion concentrated on the time students in American high schools spent on core subjects and schoolwork. The time component of the flexible modular schedule allows for an adjustable offering of classes.

School districts use variable schedules in an attempt at school improvement. Schedule design is also used to incorporate change, to increase student achievement, and nurture a positive school climate. Research on scheduling types has resulted in a lack of support for one school schedule configuration over another (Zhang, 2001). Limitations may include an arrangement of the physical school building and the sharing of staff and facilities. Traditional scheduling, block scheduling, and flexible modular scheduling have benefits and limitations.

**Research Gaps**

Questions remain regarding the time of instruction and academic success. Many studies have concentrated on the effects of various school scheduling models and the effects on student achievement (Zepeda & Mayers, 2006). However, flexible modular scheduling, although not new, has few studies from which to draw information. More prevalent studies have reviewed the effects of block scheduling on student achievement, and although block scheduling is like flexible modular scheduling, enough of a difference exists to investigate the effects of the latter.

Females and males often have different concerns in high school, which could be a variable that influences academic achievement. One study reviewed the effects of school scheduling and gender with influences such as work and extracurricular activities as variables (Francis, 2000). Research that addresses the effects of traditional and flexible module scheduling on gender is limited.

**Possible Implications for Practice**

When deciding the type of class scheduling models that support student achievement, only the most informed administrators make these decisions with

confidence. Cosimano (2004) compared three Florida high schools; one had a nontraditional schedule, and two high schools employed a traditional class schedule. Research findings of Cosimano reinforced previous findings that the nontraditional scheduling improved academic success in reading, writing, and mathematics.

Interactive instructional strategies are more supported in extended class times, as opposed to traditionally structured schedules, allowing the learning acquisition to increase. More time spent on learning and less time on redirecting inappropriate student behavior have been determined to accompany nontraditional scheduling (Queen, 2003). In these extended blocks of learning, students experience more meaningful time in a learning environment with the teacher. Flexible modular scheduling allows for this extended time, unlike traditional schedules.

A significant time decrease for students to be in the hall in the transition from one class to another may decrease disciplinary issues. When the traditional schedule of a high school was changed to a nontraditional schedule, the number of times students transitioned from classes was reduced, resulting in a decreased amount of time in the hallways, decreased discipline concerns, and more time in the learning environment (Tan, Callahan, Hatch, Jordan, Eastmond, & Burnham, 2002). As the flexible modular schedule is implemented, the transition times between classes may be flexible, as well. These details must be considered when a nontraditional master schedule is created and implemented.

Key stakeholders must have the information necessary to make decisions regarding student achievement. The results of this study provide the appropriate school stakeholders with necessary research required for better-informed decisions regarding the

school scheduling design that benefits student achievement and success in Arkansas public schools. With the significance of Every Student Succeeds Act, the Arkansas Department of Education's school performance report card, and parents' perceptions of schools, every detail of a school must be examined. This inspection of how a school day is conducted, including the scheduling format, is an important aspect.

## Process to Accomplish

### Design

A quantitative, causal-comparative strategy was used in this study. For Hypotheses 1-4, the researcher used four 2 x 2 factorial between-groups designs. The independent variables were high school class scheduling type (traditional scheduling versus flexible modular scheduling) and gender (male versus female). The dependent variables for Hypotheses 1-4 included the student achievement from the ACT Aspire Summative Assessment in reading, English, mathematics, and science, respectively, for 10th-grade students in four Arkansas high schools.

### Sample

The sample in this study was the 2017-2018 ACT Aspire Summative Assessment scores from 10th-grade students in two large and two small Arkansas high schools. In this study, school size was used as a control variable for sampling purposes and not as an independent variable. The researcher selected two large schools and two small schools with similar student demographics, one large school and one small school using a traditional scheduling format and one large school and one small school using a flexible modular scheduling format. Next, the scores from the 10th graders in each school were stratified by gender. Then, all students who did not have a score in all four of the subject

areas were excluded from the sample. Finally, 25 males' and 25 females' scores were randomly selected from each school to make up the four groups for each hypothesis: 50 males using traditional scheduling, 50 females using traditional scheduling, 50 males using flexible modular scheduling, and 50 females using flexible modular scheduling. Therefore, each sample consisted of 200 scores from 10th-grade students in two large and two small Arkansas schools for each of the four subject areas, which made up the dependent variables in the study.

The schools used in the study were designated as School A, School B, School C, and School D. School A represented a small Arkansas school, and School B represented a large Arkansas school implementing traditional scheduling. School C represented a small Arkansas school, and School D represented a large Arkansas school implementing flexible modular scheduling. Schools C and D had implemented flexible modular scheduling for four years each.

School A's student population, designated as a small district with traditional class scheduling, consisted of Caucasian (88.8%), Hispanic-Latino (5.8%), African-American (0.5%), and Asian (0.4%) students. School B's student population, designated as a large district with traditional class scheduling, consisted of Caucasian (88.6%), Hispanic-Latino (5.8%), African-American (0.6%), and Asian (1.9%) students. School C's student population, designated as a small district with flexible modular scheduling, consisted of Caucasian (90.4%), Hispanic-Latino (4.4%), African-American (2.0%), and Asian (1.6%) students. School D's student population, designated as a large district with flexible modular scheduling, consisted of Caucasian (91.2%), Hispanic-Latino (6.8%), African-American (0.7%), and Asian American (0.02%) students. Socioeconomic status was

determined by lunch status with an average for School A of 43% and School B of 51% on free or reduced lunch for the traditional class scheduling schools. Socioeconomic status was determined by lunch status with an average for School C of 58% and School D of 47% on free or reduced lunch for flexible modular class scheduling schools. The four schools were similar in school demographics, including grade configuration (Grades 9-12) and size for the small schools (School A with 240 students and School C with 252 students) and the large school (School B with 516 students and School D with 468 students). In each school, the pupil-to-teacher ratio averaged between 16.8 to 1 and 17.3 to 1. The main difference in the schools was the type of class schedule. Two of the schools implemented traditional class scheduling, and two schools implemented flexible modular class scheduling. Teachers in both flexible modular scheduling schools received training in the scheduling model.

**Instrumentation**

In the spring of 2015, the Arkansas Department of Education adopted the ACT Aspire Summative Assessment as the standard for student achievement measurement. The system of assessment adopted by the Arkansas Department of Education is connected to the most commonly used college entrance exam, the ACT Test, and can be used to predict a future score on the ACT (ACT, 2018). The ACT Aspire Summative Assessment measures readiness in reading, English, mathematics, and science for Grades 3-10 (Arkansas Department of Education, 2018). The ACT Aspire Summative Assessment 10th-grade scores measured the four dependent variables of reading, English, mathematics, and science.

## Data Analysis

To address each of the four hypotheses, a 2 x 2 factorial analysis of variance (ANOVA) was conducted using a type of scheduling (traditional class scheduling versus flexible modular class scheduling) and gender (male versus female) as the independent variables. The dependent variables for the four hypotheses were student achievement measured by the 2017-2018 ACT Aspire Summative Assessment in reading, English, mathematics, and science, respectively.

# CHAPTER II

## REVIEW OF RELATED LITERATURE

The federal Public Law 114-95, better known as Every Student Succeeds Act of 2015, has tasked school districts and states to be accountable to close the student achievement gap. The Every Student Succeeds Act replaced the No Child Left Behind Act of 2001. Both were reintroductions of the Elementary and Secondary Education Act of 1965, which was the foundation of the federal government's increased involvement in public education (Vaughn, 2018). Although the Every Student Succeeds Act required different accountability measures compared to No Child Left Behind Act of 2001, state-mandated testing of students was still a requirement by law for students in the Grades 3-8. The use of standardized testing was one of the quantitative factors that allowed progress to be monitored.

A review of the literature for this study gathered information from a variety of resources. During the search, key descriptors included "flexible modular vs. traditional scheduling," "flex-mod scheduling," "high school scheduling alternatives," "student achievement and traditional scheduling," and "student achievement and flexible modular scheduling." The primary research material for this literature review originated from doctoral dissertations, educational journals, and books accessed through the digital medium.

By examining the Carnegie unit and the class time required to earn credit for an academic course, the various attempts at school restructuring were evident. The restructuring that began with the publication*, A Nation at Risk: The Imperative of Educational Reform* in the 1980s referenced academic achievement and the limiting factor of time. No matter whether the component of time was from a student, teacher, or administrator perspective, time was the standard variable. This restructuring of time has sought higher student academic achievement and, in some instances, the education of the whole child.

The various schedule types used throughout American schools have been a result of administrative choice or a trend settled on in hopes of positively influencing student success by considering the individual needs of the whole child. The review of empirical research on school scheduling types covered areas within the scope of traditional, nontraditional, and flexible modular scheduling, gender, and academic achievement. Ultimately, all the factors previously mentioned influence academic performance, whether positively or negatively.

## Theoretical Framework

This study contributed to the understanding of time-on-task learning theories. Carroll (1963) identified five elements that influenced learning. Those factors included the aptitude of the student, the ability to understand instruction, the quality of instruction, the opportunity for learning, and the time spent in learning. Though his model changed slightly over the next 45 years, early research into the influence of time on task and academic achievement identified time as a significant factor. From child to child, the necessary amount of time to learn a concept varies. The ability of school administrators

to schedule the length of the school year and, more specifically, the school day, are the only variables that a school can control regarding time on task. Research indicated that more instructional time contributed to higher achievement (Kubitschek, Hallinan, Arnett, & Galipeau, 2005). However, the lone factor of time was not enough for learning to occur. Time was identified as a variable towards the minimum requirement for learning by establishing limits for students' opportunities to learn and because time sets limits on the teachers' opportunities to deliver instruction.

As school administrators contemplate methods to increase student achievement, the ability to adjust schedule types for better use of time for instructional purposes was considered. In 1994, the National Education Commission on Time and Learning released the report *Prisoners of Time*, which sparked debate surrounding the very issue of time and learning (Metzker, 2003). Because of this publication, the National Education Commission on Time and Learning suggested that the school day be revamped to decrease the time related to noninstructional activities and increase the time of instruction in core academic areas. Others argued that noncore areas had educational value as well and should not have time reduced for subjects such as music, drama, sports, and physical education (Metzker, 2003). The desire for success, as this relates to the whole-child, can only be addressed through exposure to content and activities other than core academics.

## Historical Background

During the 1800s, the school calendar was flexible for many rural schools. Rural schools were open during the summer months, opposite of how the school year is typically defined today (Huyaert, 1998). Because of inclement weather, poor road conditions, and the need for students to help during the planting and harvesting seasons,

schools had to offer instruction when students could attend. After this time, the school year and flexibility shifted to a more rigid academic schedule.

Educators worked to schedule classes during the times that families were able to send their students to school in rural areas near the turn of the century. Along with flexible scheduling of the school year, flexibility in course offerings was available in American schools and Latin grammar schools with courses offered in a variety of daily schedule combinations (Canady & Rettig, 1995). These daily schedules allowed flexibility in time and learning so that students experienced an individualized learning environment. Two developments contributed to the demise of flexible scheduling. The first was the National Education Association Committee of Ten Report (1892), which suggested that students focus on five or six academic courses per high school year (Canady & Rettig, 1995). The report narrowed the focus of secondary education from a broad set of offerings to a focused core of subjects. The second was the Carnegie Standard Unit, which emerged in the early 1900s to provide uniformity across school settings (Kruse & Kruse, 1995). The development of this unit led to secondary education units, as well as higher education college credits. The creation of these units with a narrower set of course offerings aligned with the desires of educational providers but not with those promoting an individualized learning environment for students.

Traditional scheduling, established in the early 1900s, continued to frame the school day in many high schools. No matter which subject content was delivered, classes were held 5 days each week. Class duration for content delivery ranged from 35 to 60 minutes each, depending upon if the school day was divided into 7- or 8-periods per day. The seat time, which corresponded with the time in which effort was demonstrated to

achieve knowledge, was measured in Carnegie Units and was the basis of credit for the course (National Education Commission on Time and Learning, 1994). Time-bound class meetings resulted in the delivery of content instruction primarily by lecture and reinforcement to many students through homework (Carroll, 1990). The distribution of educational information in this way was not individualized education. High school schedules varied in design, so a more individualized educational delivery format could be implemented.

Individualized education has been the desire of many devoted educators in order to meet the specific needs of each student. Over time, attempts have been made to move away from the traditionally accepted class schedule (Pisapia & Westfall, 1997). Some of these nontraditional schedules include 4 x 4 block and A/B block scheduling, as well as flexible modular scheduling. While the introduction of flexible modular scheduling was done to appeal to the individual student's needs, the foundation of flexible modular scheduling was based on three fundamental beliefs. The beliefs included that not all subjects required the same instructional approach by the teacher, the same amount of class time to complete, or a specific number of students to justify the class offering (Fletcher, 1997). The offering of flexible modular scheduling permitted varying amounts of time for classes, optional formats, and the flexibility of class size that allowed for small or large group instruction (O'Neil, 1995). However, barriers to the success of flexible modular scheduling existed. Canady and Rettig (1995) proposed that the attempt to provide for individuality was the reason this type of scheduling failed. Students experienced unscheduled time, which had been allotted to allow independent study time but often became an avenue that resulted in disciplinary issues. Teachers also had

objections because they had difficulty planning for variable amounts of instructional time. Schools that implemented flexible modular scheduling also had to contend with administrative problems (Pisapia & Westfall, 1997). Students and teachers had to be instructed in expectations and the desired outcomes of the new, flexible module system, but issues of student discipline and teacher preparation arose.

**Traditional Scheduling**

The most common form of course scheduling for American high schools has been the 7- or 8-period daily schedule. Through the 1970s, the typical high school schedule contained 6- or 7-periods (Kruse & Kruse, 1995); and in the 1980s, the 8-period course schedule became popular. The Back to Basics Reform Movement led to this occurrence (DeBoer, 1991). During this time, education became conservative, changing into a push for more subjects to be required, an extended school year, more homework, and better results on standardized tests (Cuban, 1990). Requirements for graduation were raised in the core curriculum areas of language arts, mathematics, science, and social studies. To accommodate the required academic courses and electives, an increase in the number of class periods was necessary (Queen & Isenhour, 1998). The increase in the number of periods resulted in shortened time for each class period and forced schools to increase the number of periods of the school day. The influence of the Carnegie unit and seat time is present.

A traditional high school schedule contains classes that are held 5 days per week from 35- to 60-minutes each. The amount of time used for each period depends upon how the typical 420-minute school day is divided (National Education Commission on Time and Learning, 1994). The division of this time is different for students and teachers.

During this designated time for the school day, students have 7- or 8-class periods and a lunch period. For teachers, schedules are comprised of one preparation period each day and teaching assignments during the other periods of the day (Carroll, 1990), with a total student enrollment of 125 to 180 students per teacher (Canady & Rettig, 1995). From state to state, these limitations vary in specific numbers and requirements. Just as duties and time commitments of instructors differ from one school district to the next, the time needed to deliver instruction in specific content areas also differ.

**Nontraditional Scheduling**

Business owners and political leaders have pressured public schools to change how education has been delivered. Those that promote themselves as school reformers have attempted for decades to find a way to improve student achievement, and recently, the most considered approach has been the structure of time in a school day (McCreary & Hausman, 2001). At the secondary level particularly, time has become the most identified variable that has been modified to address the decline of academic achievement (Needham, Crosnoe, & Muller, 2004). By changing the way time was used during the school day, a better-educated student will enter the future workforce. The act of scheduling the student's instructional time for more time of exposure to content is essential.

Block scheduling is the practice of organizing the school day in different divisions compared to a traditional scheduled school day. Courses in block scheduling are 90 minutes in length for 5 days per week for one semester (Queen, 2003). The amount of time allotted for content instruction is condensed into a semester rather than the

traditional year-long course expectation, although nontraditional, the instruction is still fundamentally delivered based upon the Carnegie unit.

The block schedule also has a modified version known as the 4 x 4 block schedule. This schedule, which delivers instruction in four classes in a semester, was not efficient in the time needed for instruction nor as flexible (Edwards, 1995). The 4 x 4 block has also been referred to as an accelerated block. Alternative day or A/B Block schedules was yet another modification of the block schedule. With this type of schedule, a student takes four classes one day with a different four the next day. The pattern in which the student attends class continues to alternate (Lybbert, 1998). This type of class configuration allows students to obtain the necessary credits toward graduation, along with gaining work-related experiences. Forms of block scheduling have been developed and implemented with the desire to increase student achievement by offering the delivery of instruction in diverse forms of time periods.

**Flexible Modular Scheduling**

Attempts have been made to adjust the timeframes designated for the delivery of secondary education throughout the 20th Century. Most of these attempts have failed. The Dalton Plan of 1921 and the Tremestie Plan of 1946 were based upon Montessori educational principles and attempted to lengthen class periods, thereby increasing the instructional time and day (King, 1996). In most of these attempts, the inability for proper supervision during the extended periods led to increased discipline and behavior problems. The schools' leaders eventually decided to return to traditional scheduling (King, 1996). These decisions were based on administration input and not necessarily student failure.

Various types of schedules have been attempted. In the late 1950s, J. Lloyd Trump developed and implemented a modular scheduling approach (Hackmann, 1999). The Western States Small School Project had defined modular scheduling as a schedule that divided the time designated for a school day into units of time that were shorter than the traditional 45- to 60- minute class periods. These smaller units were called *modules* and organized in multiple configurations to address specific requests. These requests came from students and teachers regarding the use and division of time, space, and grouping (Jesser & Stutz, 1966). In modular scheduling, the four basic types of instructional models are implemented by assigning one- or several-time modules: activities, independent study, individualized study, and small and large group instruction. Educators assign and combine various modules to accommodate their specific content instruction (Bush & Allen, 1964). The amount of time determined to master the intended learning was used to decide the number of modules to be assigned.

In modular scheduling, students in an academic course may receive instruction through a large group class meeting and then break into smaller modules for small group learning reinforcement and discussion. The following day, the instruction may include several small modules for reinforcement activities; for example, in science, a laboratory experiment might be planned. Several small modules allow students to have time set aside for individualized assistance, small group reflection, or independent academic work. Many public and private schools began using this new scheduling model by the early 1970s (Swaab, 1974). Because of the need for both large group and small group instruction, facilities for secondary education were designed for the implementation of modular scheduling.

**Schedule Restructuring**

The measurement that connects learning to seat time, the Carnegie Unit, evolved into the foundation for traditional school scheduling. This unit, believed to be a type of measurement for learning, also affected teacher and student behavior (Owens, 1995). Sizer (1994) discovered that traditional class scheduling in secondary schools interfered with the education process. The National Association of Secondary School Principals (1996) released the report, entitled *Breaking Ranks*. An educational committee contended, "How a high school organizes itself and how the school uses time to create a framework affects almost everything about teaching and learning in the school" (p. 44). One type of influence for a high school organization is the specific type of class scheduling selected.

In the late 1980s and early 1990s, educational restructuring efforts revolved around the reallocation of time in the realm of public education. *A Nation at Risk*, a report by the National Education Commission on Excellence in Education (1983), disclosed the problems in American schools and pushed for a decrease in or removal of time limitations. The Task Force on Education and Economic Growth (1983) in *Action for Excellence* reiterated the commission's efforts to increase student-learning time while attempting to de-emphasize seat time. Educators would be able to focus on efficient time management as a feasible method for improving the quality of learning. The National Education Commission on Time and Learning was established in 1991 by the Education Council Act, which released the report *Prisoners of Time* (National Education Commission on Time and Learning, 1994). This report identified several criticisms in support of changing the format of traditional schools' schedules:

- the foundational defect of an established clock and calendar restructuring,
- the academic time lost to provide a multitude of nonacademic offerings,
- the school schedules altered to coincide with daily events that take place outside the scheduled school day,
- the educators not able to teach in the current time constraints, and
- learning specific standards requiring all students to spend more time.

They believed that the diversified configuration of a school day might increase individualized student achievement.

The complete infrastructure of school would have to be redeveloped to begin this type of comprehensive school reform successfully. Carroll (1994) contended, "While it is possible to change without improving, it is impossible to improve without changing" (p. 108). School structure change would not be about scheduling only but would affect the format of education and all stakeholders. *Breaking Ranks* served as a blueprint for high school reforms and suggested actions for implementation (National Association of Secondary School Principals, 1996). The implementation process would take a substantial amount of time, and the publication listed one of the priorities for renewal that asked for "restructuring space and time for a more flexible education" (p. 45). The authors of the report proposed at least four suggestions for success by restructuring time usage in the secondary school structure.

- Schools should not hold teachers strictly accountable for large group instructional time to give more time for instructing students on an individual basis.

- Schools should develop flexible scheduling to meet core course requirements through various time models.
- Schools should no longer use seat time as a measurement of learning.
- Schools should redefine or replace the Carnegie Unit.

These suggestions seemed easily implemented, but the financial cost of reducing class sizes was not feasible, and the responsibility of individualized learning was an overwhelming proposition for untrained teachers. The complete restructuring of the educational system would be the only way to achieve this massive undertaking.

## Time Management

### Teacher Time

In studies conducted previously, no accurate and widely accepted definition of time management was provided. The process of identifying needs, setting goals to achieve these identified needs, and ranking and planning the necessary actions required to achieve the determined goals had been supported by researchers (Lakein, 1973). Other definitions or inferences to the meaning of time management were used according to the literary context. Several aspects identified to be descriptors of time management included referring to this as a method for controlling time (Macan, 1994), as a way for efficient use of time to complete tasks (Woolfolk & Woolfolk, 1986), and an exercise to augment cognitive output (Britton & Tesser, 1991). All the previously listed descriptors were correct, depending upon contextual usage. To accurately use the term *time management* was complicated since this infers observing and manipulating time.

The definition of time management used by most researchers involved a product. One of the most straightforward definitions of time management was the supervision or

handling of time for the most beneficial outcome or result. Time management was associated with actions that individuals completed to gain the best results of their time spent and referred to the way that individuals make mindful and sensible decisions about the activities that engross their time (Allen, 2001). Individuals must decide how they want to spend the time that they must use. Time management may be perceived as consciously scheduled actions that result in desired productivity within the desired time limit.

Individuals struggle in an attempt to control the time that they are provided for varied tasks and commitments. The perceptions by an individual relating to the control of time, satisfaction with the occupation, and well-being were negatively related to stress (Suleman, Hussain, Shehzad, Syed, & Raja, 2018). However, the behaviors of efficient time managers were related to stress positively (Schneiderman, Ironson, & Siegal, 2005). Teachers enhanced their time management abilities, but this improvement did not correlate to better performance directly (Claessens, Eerde, Rutte, & Roe, 2007). When teachers became better time managers, the efficiency in which they delivered instruction was increased. However, the quality of instruction was still dependent upon other variables. Teachers must research and work toward perfecting their time management skills, often through self-education and reflection rather than learning through professional development. The more confidence a teacher has regarding knowledge of content, classroom management, and most importantly, time management of their classes, the possibility for student engagement and success is increased.

Several articles and books discussed the idea of time management and the results for those that use these principles. Covey (2004) suggested that the numerous time

management approaches were categorized into the following classifications. First generation time management referred to prompts that can be used to indicate a time when an undertaking is completed. These prompts were based on the use of watches or clocks. Second generation time management consisted of organization and development involving establishing objectives. This organization process often included the use of calendars and meeting or appointment books. Third generation time management focused on specific functions such as organizing, arranging, and ranking daily activities. This type of organization involved individual attention such as a personal organizer, computer, or another object that allows the clarification of worth and priorities. Fourth generation time management centered on being productive and possessing a driven action plan based upon objectives and the ability to identify the importance of the time necessary. Consistent attempts have been made to apply time management approaches to the educational arena.

Understanding and comprehension are the results of the curriculum effectively taught by teachers at each grade level. Teachers must spend time planning content but also consider the procedure, consistency, time usage, and evaluation if they teach the subject matter correctly and skillfully (Lay & Schouwenburg, 1993). The ability to complete the task is dependent upon the implementation of time management principles by teachers during the school day and outside the designated instructional time. A teacher not only delivers content but also must demonstrate the characteristics of an efficient time manager.

**Student Time**

Actions that result in the unsuitable apportionment of time or the last-minute study binges have often been identified as one of the primary roots of poor academic achievement. Because of inadequacy in the skills of time management, procrastination and furor of completion are practices students demonstrate when overcome with feelings that they do not have enough time to finish an assignment or task. In the students' academic environments, time management alludes to how they manage their time for academic success (Campbell, Svenson, & Jarvis, 1992). The ability for students to identify and prioritize tasks, which can be considered an essential aspect of time management, is crucial. In identifying time management tasks, Gloe (1999) stated that this method of time management was the best way to manage academic content well. Other methods included large group dialogue and sharing ideas and thoughts on valuable topics, which in turn helps students increase their academic performance. Students must learn time management skills to have an increased opportunity for academic achievement.

The ability to manage time by an individual in an efficient manner while completing assignments is demonstrated by a stable approach to time usage and the ability to schedule and prioritize present and upcoming tasks. Kaushar (2013) noted that a student's ability to manage time was correlated to his academic achievement and that the inability to demonstrate time management skills appeared to be an obstacle to improved academic achievement. The deliberate acts of time management by a student are crucial to academic success. The ability to avoid engaging in activities that are less influential or important to academic achievement is one of the first ways to begin prioritizing academic

actions (Sansgiry, Bhosle, & Sail, 2006). The act of being able to begin or finish specific activities at a previously determined time, developing and following a list of needed actions, and the ability to stay focused on the tasks listed allows students to control their available time to complete their academic work. The students' ability to efficiently manage time results in a benefit as they enter higher education or the workforce.

Time management by students at all levels of education is significant. Several crucial factors related to time management include developing successful ways to study, critically analyzing given problems, identifying and using powerful memorization strategies, and most importantly, avoiding episodes of procrastination (Rowe & Fitness, 2018). Britton and Tesser (1991) tested their hypothesis that time management practices could predict grade point averages. They discovered that two components of time management affected cumulative student grade point averages directly: planning and the perception by the students of how their time on the task needed to be used. Students that planned and focused on their actions during scheduled segments felt more in control of their time to learn.

Studies have questioned the factors and variables that affect a student's academic achievement associated with time management. Al-Zoubi (2016) designed a study to determine a student's perspective regarding the development of time segments and the influence on academic performance. The results of the research indicated that the action of planning demonstrated a strong influence on student academic achievement. Planning action was also determined to have a positive, statistical significance on a student's academic achievement in other studies (MacNeil, Prater, & Busch, 2009). The ability of students to assess their assignments and then develop an appropriate way to complete

those assignments is necessary. Teaching students to plan for academic success is essential.

**Scheduling and Teacher Professional Development**

When switching from one type of high school scheduling format to another, including training and preparation of all staff members to influence the success of such a change is crucial. A lack of focused teacher professional development regarding teaching strategies was cited as a reason for adverse outcomes when switching scheduling types (Soares, 1998). Veteran teachers need ideas to better deliver the required content within the newly adjusted class schedule. For schedule changes to be successful, professional development must be based on real-life experiences, "If we are to go beyond the university's traditional hold on the theories and practices of teacher training, then we must search for solutions in actual practices of teachers" (Soares, 1998, p. 217). When proper training of teachers takes place, they can recognize the way they deliver instruction and reflect and adjust the presentation of their content. Teachers are no different from other professionals, and they recognize that with any new challenge, development and practice are essential.

When the traditional 7- or 8-period day is changed to a flexible modular schedule, students are asked to learn through the application of 21st-century skills. The fact that teachers are also being asked to teach these same 21st-century skills, which they have never been exposed to themselves, to students is significant and should not be disregarded (Taylor & Parsons, 2011). These skills include methods and strategies for delivering instruction that is more than lectures and student note-taking (Taylor & Parsons, 2011). Veteran teachers often continue to hold onto methods that they have

previously used, which results in the traditional form of delivery of instructional content (Keiler, 2018). Differentiated methods of instruction are more likely associated with nontraditional and flexible modular scheduling. It is the teacher's responsibility to look for what student needs exist and modify their content delivery.

## Time for Learning

### Allocated Learning Time

Studies completed on the proportioning of educational time and academic achievement have considered the relationship regarding the length of instructional time and the level of academic performance in core content areas. Wiley and Harnischfeger (1974) asserted that the level of student achievement could be predicted by the allocated time set aside to deliver academic instruction. The model that they developed regarding the educational process depended on the belief that the amount of knowledge (total units of time for learning) dictated the amount of learning. Wiley and Harnischfeger determined, "In schools where students receive 24% more schooling, they will increase their average gain in reading scores by two-thirds and their gains in mathematics and verbal skills by more than one-third" (p. 9). Fredrick and Walberg (1980) discovered a weak positive relationship between total time allocated (school years, days, and measured time in class, coupled with time spent studying) and overall achievement. Time, pre-determined and set aside for learning or the amount of content delivery, remains a critical time element influencing mastery.

### Spent Learning Time

The amount of time reserved for learning in most classrooms, or a core content area, is frequently different from the amount of time that students spend learning subject

content. For example, different teachers may be allotted the same amount of time for mathematics instruction, but the amount of time students are engaged in learning may vary between the classes and among learners. Andersen, Humlum, and Nandrup (2016) emphasized that time engaged in the education process was a more beneficial measurement of time spent learning and a better predictor of student academic achievement than the time allocated to instructors to deliver content. The idea of Academic Learning Time represents one way of considering the time spent by a student in learning. Academic engaged time refers to "the time which a student spends engaged in the academically relevant material which is of a moderate level of difficulty" (Fisher, Marliave, & Filby, 1979, p. 52). A crucial measure of achievement is the amount of Academic Learning Time. However, allocated time and the rate of engagement varies among each classroom throughout each educational setting.

Research conducted regarding time designated for learning and the amount of time spent engaged in learning confirms that both are critical factors of school learning. Allocated time and time engaged have the substantial potential to supplement instructional effectiveness (Berliner, 1979). On average, the degree of knowledge will be low if adequate learning time is not provided. Also, learning will not be complete unless students are engaged in a sufficient quantity of time learning the content (Berliner, 1979). Interventions developed to increase the time allocated or engaged should be impactful in raising the level and amount of learning. An important variable in determining the value of time allocated for learning, time spent engaged in learning, and the relation to achievement is the amount of time needed for learning (Gettinger, 1985). The outcome of increased instructional time is often not the same for all students. The variable that

influences the result is the individual differences that are present among students in the amount of time needed for comprehension.

**Necessary Learning Time**

Studies have been conducted to establish a reference for educational learning, which examined the amount of time needed for learning to take place by setting fixed achievement goals. These set goals have been accomplished through recognizing a specific criterion-based level of performance on an assessment tool and then measuring the differences in the amount of time needed for students to achieve mastery (Gettinger, 1984). Several indicators of learning time have been reported. One example is that time has been measured as the number of minutes a student was exposed to a learning exercise (Arlin & Webster, 1983). Time on task has been interpreted as engaged time (Anderson, 1976), usually defined behaviorally as students focusing their eyes on the teacher or the specific task assigned. However, one minute of observed time of engagement may not be interpreted as an equal learning time for all students. Since cognitive development and learning style for each student is not the same, the degree of engagement by students is difficult to determine.

Several negative factors exist that influence the amount of time for a teacher to instruct, students to engage, and learning to occur. The social, cognitive, and behavioral areas of a child's development are influenced through the experiences of attending school and particularly the interactions encountered in a classroom setting (Hurst, Wallace, & Nixon, 2013). Certain types of interactions, mainly negative, diminish the amount of time in which learning can take place. Classrooms that are boisterous and loud reduce the teacher's ability to manage the learning environments of their classrooms and student

behaviors (Bradshaw, Mitchell, & Leaf, 2010). One of the variables associated with school is classroom management, which can include student-teacher relations and its influence on school climate. Knowing these variables is significant in determining necessary interventions to reduce disruptive behavior. This knowledge has important implications for school administrators as they work to positively change the climate and help teachers with the management of their classrooms, which in turn has a substantial influence on students' actions and academic success (Weist, Lever, Bradshaw, & Owens, 2014). The climate that teachers have developed for their classrooms and the way that they managed the class have significant effects, not only on the academic success of their students but also on the students' perceptions of the teacher, class, subject, and school. Administrators should realize the importance of advising and supervising teachers in the aspect of classroom management.

The time it takes for a teacher to acquire information about students individually and as a group regarding student problems that lead to negative behavior issues is time well spent. Students in need of support services are often identified by reports regarding time-on-task made by teachers (Dwyer, Nicholson, & Battistutta, 2006). Teachers' reports of students' problem behaviors, such as horseplay, nonengagement, and insubordination, are often actions requiring a discipline referral to the office. Student behaviors that require an office referral are disruptive to the instructional learning time of the student who is acting out as well as classroom peers but, with information regarding students, teachers may be able to redirect students that are not engaged.

One component of flexible modular scheduling is unstructured time as opposed to the traditional scheduling, which had a designated time limit. Throughout a school week,

a student's unstructured time could be as much as 30% to 40% of their overall time on campus (Zepeda & Mayers, 2006). During the unstructured time, when used wisely and efficiently, students experienced valuable time to complete tasks and activities and for collaboration with fellow students (Chang & Brickman, 2018). School administrators then must design and implement areas where students who struggled with efficient management of large portions of unstructured time could be supervised and receive sustained advisement. This unstructured time can be used as each student decides.

The focus of most office referrals is behavior-based; however, information gathered from teachers regarding students' problems concentrating, lack of prosocial behaviors, and low academic functioning is essential in the development of programs designed for behavioral intervention. Interest has increased in research concentrating on expanding students' prosocial behaviors to increase academic performance and reduce at-risk behaviors (Gilman, Huebner, & Furlong, 2009). The results of these studies contribute to decisions made regarding classroom management. Students that are described by their classmates and teachers as being well-liked or popular are also the students that display more prosocial behavior (Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo, 2000). Teachers excel in instructional strategies in these types of classrooms. Positive relationships between classmates and between students and teachers have been associated with less disruption in the classroom and higher academic engagement (Spinard & Eisenberg, 2009). Classrooms that have these characteristics not only have teachers who feel successful in delivering instruction but also have high academic achievement present. The ability for a student to remain on task and complete assignments successfully can predict academic capability and classroom behavior

(Thomas & Bierman, 2006). Focusing on the tasks in the classroom is one of the most crucial actions students may learn. Student focus and engagement and their influence on positive academic achievement have been a focus of professional training for teachers from the beginning of their career and throughout their veteran years.

Past investigations have been conducted on the characteristics that teachers observe regarding a negative influence on the learning time and the relation to student achievement. Teachers often rate males as acting more aggressive in classroom settings (Craig & Pepler, 2003). However, if the number of students of either gender is large, the dynamic of the classroom may be affected (Craig & Pepler, 2003). The climate of the classroom and teaching strategies may change because of these numbers. Large group instruction and small group instruction may have different dynamics influenced by the content delivered.

Teachers continually evaluate the way they deliver instruction. Whether this self-evaluation is day-to-day or lesson-to-lesson, the search for successful delivery is noticeable in teachers that are conscientious of their tasks. Teachers tend to implement techniques such as cooperative learning more frequently when students display positive interactions with their classmates (Shim, Kiefer, & Wang, 2013). Students sometimes develop negative behaviors in classrooms; for this reason, investigations that look at the perceptions that teachers have of student behavior in order to negate the teachers' biases toward particular students is important. As teachers are asked to reflect on content delivery, reflection upon classroom management and student bias should also be emphasized.

How teachers conduct their classrooms and set boundaries are primary for academic performance. A recent examination found that after having developed and posted classroom rules and expectations, positive praise used by teachers related to students' self-efficacy along with classroom management (Reinke, Herman, & Stormont, 2013). The positive reinforcements of student behavior by teachers can establish an environment of success. The environment in the classroom depends on not only the teacher but the students, as well.

Time is an essential factor in determining the perceived school climate. In the public-school setting, school climate is based upon the perception of achievement and discipline referrals (Emmer & Stough, 2001). Often, the school climate consists of the perceptions of the quality and character of the school environment by the students, parents, and school personnel. The culture in the educational setting also includes the norms, beliefs, organizational factors, and teaching practices that involve all stakeholders. School climate is influenced in several ways, including the interactions between teachers and students, social and educational values, and the overall relationships in individual classrooms that often permeates the school (Thapa, Cohen, Guffey, & Higgins-D'Alessandro, 2013). The expectations and performance that happen in the educational setting of the classroom can spread throughout the entire school and can result in either a positive or negative school climate. School climate has been connected to misconduct, aggression, and behavioral issues demonstrated by students (Wilson, 2004). Some researchers have established a relationship between school climate and academic achievement (Battistich, Solomon, Kim, Watson, & Schaps, 1995). Research has been predominantly focused on how students perceive the school climate. However, staff

perception is also an essential factor in the school climate. The perception of how the school climate influences the time for instruction either negatively or positively is an important variable.

## Academic Achievement

### Traditional

Academic achievement for students in nontraditional schedules has increased over time, perhaps as teachers adjust instructional practices. However, academic gains for students in traditional schedules are still more significant, especially in particular content areas. Student academic performances indicate that student achievement is significantly higher on standardized assessments for mathematics and reading for students enrolled in secondary schools that have traditional class schedules instead of nontraditional class schedules (Wright, 2010). Student achievement reports do not report other areas or indicators of student success. Teachers acknowledge that not all students succeed in the same areas or the same way and often adjust their instruction based upon the time the schedule allows.

Whether schools have traditional or nontraditional class schedules, the desire by administrators for academic achievement exists. Wild (1998) suggested that about one-half of high schools in the United States are implementing some form of nontraditional scheduling, and dependent upon the state, the number of schools could have been more than 50%. Many school administrators are charged with developing the necessary schedules that foster student achievement. Unfortunately, no conclusive information has been reported as to which form of nontraditional scheduling is best.

The focus of a study in British Columbia investigated the influence of variable time schedules on science achievement. The science achievement scores of over 30,000 Canadian 10th-grade students were compared (Bateson, 1990). The science achievement scores of those students enrolled in a traditional yearlong science course were notably more significant than the nontraditional scheduled students. The act of retention of content exposure is one variable that could have contributed to this outcome. Freshmen at one high school in Indiana were assigned either to a traditional or nontraditional schedule at the beginning of the year. These students were tested in the areas of reading, language, and mathematics, with 327 students participating (Veal & Schreiber, 1999). When the state assigned achievement test results were received, no significance could be determined in the areas of reading and language in student performance between traditional and nontraditional scheduled students. However, student academic performance scores of those that had followed the traditional schedule for classes scored significantly higher in the area of mathematics.

**Nontraditional**

Nontraditional schedules are not expected by school administrators to gain time for instructional delivery but may lend to achievement gains. To observe how nontraditional scheduling affected students in academic performance, an investigation focused on the academic performance of college students but also took into consideration the type of schedule that the students were assigned in high school—traditional schedule participation and nonparticipation (Dexter, Tai, & Sadler, 2006). The researchers suggested that the high school students who did not participate in traditional scheduling did not appear to possess an advantage in their success in college science classes. The

results of the Virginian State Assessment program specified that an increase in student performance scores in the areas of reading and mathematics was present (Shortt & Thayer, 1999). The analysis of student scores indicated that not only was there an increase in achievement by students in a nontraditional class, but there was also a significant increase in the number of students in a nontraditional class schedule opposed to a traditional class schedule type existed. When comparing the number of nontraditional class schedule students to those students that attend a traditional class schedule, there is a difference in these numbers from state to state.

**Assumptions**

Certain assumptions were present that one schedule would be more beneficial compared to the other. The debate upon the effectiveness and influence of either scheduling choice remains. The assumption that schedule changes would result in benefits for the participating students was the driving force for such changes. Numerous favorable results, such as increased student academic performance and increased student engagement, were observed from students in nontraditional scheduled classes (Veal, 2000). A distinct, inconclusive confirmation of the merit or lack of merit for nontraditional high school schedules remains. The review of the literature revealed some dissimilarities in attitudes of students enrolled in high schools using traditional or nontraditional scheduling systems.

Specific subjects seem to be more advantageous for nontraditional scheduling. However, when the content of the subject is not considered as paramount, the attitude of the student and staff may have an influence. In one study, students and school administrators were surveyed, and the information gathered indicated that nontraditional

scheduling was endorsed by both groups with the belief that school climate was improved along with academic achievement in some subjects (Stader, 1999). The influence of *something different* as a factor that affected motivation, and ultimately, academic improvement was not easily determined. Students that have been exposed to and are accustomed to the different time segments that are known to define a nontraditional class schedule are a better representation of the actual influence of such a schedule.

## Gender

### Academic Differences

Researchers continue to explore gender-based academic differences. Academic achievement and behavior by females are related in a positive way to school achievement (Wentzel & Caldwell, 1997). In secondary students, Duckworth and Seligman (2006) determined that females' higher academic achievement was related in part to their compliance with behavior expectations. When comparing the number of office referrals for students by gender, male students had a more significant number of referrals than did female students (Kaufman et al., 2010). Other variables may exist that influence academic achievement by gender. Almost all high schools have both students that are male and female, with very few that are solely separated by gender.

Previously conducted research suggested that females were more successful than males in school. Males perceived females to be superior academically because of developed gender stereotypes, according to Hartley and Sutton (2013). Mathematics is one content area that female achievement has surpassed male achievement (Kenny-Benson, Pomerantz, Ryan, & Patrick, 2006). Male perception of female superiority in the academic realm included the areas of motivation, capability, accomplishment, and

behavior but was not consistent in all subjects (Hartley & Sutton, 2013). More males than females held the perception that females experienced more academic success than males.

The question of gender influence on academic achievement has been considered. Large-scale studies previously carried out in extracurricular settings demonstrated higher academic achievement by females in comparison to males (Bätz, Wittler, & Wilde, 2010). However, Machin and Pekkarinen (2008) insisted that although evidence for school achievement by gender differences existed, findings were inconsistent. No definitive results could support or deny the claims of one gender being superior in academic performance compared to the other. Almost three decades ago, Hyde (1990) determined no noteworthy differences by gender on students' intellectual ability were evident. The belief in an inherently gender-based cognitive advantage is not accepted. Even though intellectual abilities were not notable and conclusively related to academic achievement, other types of variables could explain gender differences in student academic performance (Spinath, Freudenthaler, & Neubauer, 2010). Therefore, the presence of nonintellectual variables must be considered to explain student academic performance by gender. The character and motivation of the male and female students must be considered in achievement differences in gender.

Stereotypes, whether positive or negative, are significant influences on academic achievement. Perceptions such as the belief that female students want to satisfy the expectations of adults to a greater extent than male students would explain the result of higher grades in school for females (Pomerantz, Altermatt, & Saxon, 2002). The concept that females are more likely to perform academically for adult approval can be related to behavior. Intrinsic desire to comply with expected behavior was displayed more

frequently by females than males (Wingfield, Good, & Woodzicka, 2010). When the enthusiasm for high performance on academic achievement exams is promoted and if females are more driven to perform at a high level due to the wish to comply with expected behavior, test results could provide such evidence. Males may not display the same drive and desire to comply with expected behavior.

A biological basis may exist that reflects what researchers have consistently determined concerning male and female academic performance. Males performed better on the visual-spatial challenges than females (Willingham & Cole, 1997). Females were less likely to use imagery to solve problems that involved moving objects than did males (Richardson, 1991). Males, however, lagged behind females in the ability to use memory (Halpern, 2000). Regardless of research that has introduced these neurologically-based variances in processing abilities, more females are experiencing success in the advanced courses in science and mathematics. The literature reviewed addressed gender differences which have been investigated previously in both the elementary and secondary educational settings.

**Academic Performance**

Multiple measures, such as intelligence test scores and academic achievement results, have been compared by gender. Efforts have been made to remove gender bias from assessments of intelligence, which should negate any average overall difference between the sexes (Brody, 1992). Academic achievement is generally associated with criterion-referenced assessments and grades; however, compounding factors, other than cognitive ability, may be gender-associated (Adelman 1991; Willingham & Cole, 1997). Significant differences do not appear to exist in intelligence relative to gender (Mandell

& Pherwani, 2003). However, cognitive ability differences consistently are influenced by gender. To remember that these implications are generalized for females and males and do not pertain to all females and males individually is crucial (Halpern, 2000). Individuals are influenced by factors that are both intrinsic and extrinsic. These factors are difficult to identify if a gender-based factor exists.

The reasons females earn higher grades than males may include biological and environmental factors. Males were identified as learning disabled by a ratio of 2:1 over females, and at 4 times the rate of females, males were classified as emotionally disturbed (Henning-Stout & Close-Conoley, 1992). Starkweather (1997) estimated that males were 10 times more likely to exhibit a language problem identified as stuttering. Males were also identified as dyslexic 4 to 5 times more than females (Stein, 1994). When adverse social actions are considered, males exhibited substantially more episodes than females, which is believed to influence academic achievement (Downey & Vogt-Yuan, 2005). When analyzing the results reported, not to think that males have more of an academic challenge than females in many aspects is difficult. No matter which class schedule type was implemented in a school, females seemed to have an advantage in academic performance.

In school, social acceptance for all students revolves around compliance and defiance. Boys more often challenge and test accepted social conventions as an assertion of manliness (Fine, 1987), and males were more willing to take risks and less likely to accept compliant behavior. For many males, the desire and pursuit of good grades, often associated with female academic achievement, challenged their manliness (Downey & Vogt-Yuan, 2005). Male students may not realize that their compliance with school rules

may be associated with how teachers perceive them. Acceptance by other students is also often related to their behaviors.

Comprehensive differences by gender in quantitative abilities have not been noted on subtests. In those subtests, males did not score as well as females on mathematical reasoning, and males recorded higher scores than females in probability and statistics, as well as geometry (Halpern, 2000). Females' dominance in verbal strategies and males' supremacy in visual-spatial strategies may contribute to the lack of a significant difference in comprehension scores in the field of mathematics (Pezaris & Casey, 1991). Since subtests were not definitive in proving either gender were dominant in quantitative abilities, the investigation of more general tests would only be relevant if a significant difference exists.

One male stereotype is that cognitive abilities appear to be more unpredictable than that of females. Males were inclined to score higher on multiple-choice exams than females (Hedges & Nowell, 1995). Although in Halpern's (2000) study, females scored higher than males in academic performance, and an essential factor was to identify the content and specific subject matter that was tested. By identifying the content, gender success may be able to be predicted.

**Administrative Concerns**

School officials must address several issues when making a change from traditional scheduling to flexible modular scheduling. First, the effect of students' academic retention, the type of the curriculum, and the delivery of instruction are all concerns that arise when going from traditional schedules to flexible modular scheduling (Hartzell, 1999). Second, transfer students arriving at a school using flexible modular

scheduling from a traditional scheduled high school may be at a disadvantage (Canady & Rettig, 1995). Transfer students might have less training in dealing with the additional freedom in their schedule over that of a traditional schedule and may not have been taught to organize their time adequately; their academic performance could suffer because of the new scheduling structure (Cole, 2007). The transfer students also may have difficulty adjusting to a longer time in each class. In addition, the scope and sequence and the variety of course offerings could magnify the problem. Changes in the class schedule type must consider several influences to be successful.

## Conclusion

This literature review outlined the development of the different scheduling options historically implemented in American high schools. Schedule development began with independent calendars set by each school, especially in rural areas. The Carnegie Unit was applied to standardize the time for instruction in high schools. With the reform movement of the late 1960s and early 1970s, the design of an anchored and established time schedule was challenged. To distinguish the need for 8-period days to provide for more offerings was the driving force of some schools as they developed class schedules.

The literature supported the idea that nontraditional scheduling boosted the climate of schools with a reduction of discipline issues, an increase in teacher preparation, a higher number of opportunities for students to receive instruction, and an increased number of choices for individual learning. Achievement, as measured by standardized assessments, may not be positively affected, even though students may be more empowered. Flexible modular class scheduling enables the development of a classroom that has constructivist type characteristics. Students in a constructivist

classroom learn from the activities presented that are based on real-world applications. They may leave high school better equipped with soft skills and practical experiences that make for success in the workplace—something not measured by state assessments. The students' knowledge is gained from their own experiences, which are the basis of their learning.

# CHAPTER III

# METHODOLOGY

A review of the literature demonstrated that school scheduling could be manipulated to help school leaders discover the best practice in time management for the school day. Traditional scheduling has been the benchmark for daily school scheduling for many years. However, flexible modular scheduling has been increasingly implemented in the past two decades, with estimates that 40% or more of American high schools have explored this format (Canady & Rettig, 1995). Despite the attempts to manage the school day by implementing flexible modular scheduling to increase achievement, flexible modular scheduling remains a less studied topic in educational literature.

This research project examined two different forms of high school class scheduling (traditional and flexible modular scheduling formats) and gender on reading, English, science, and mathematics achievement measured by the ACT Aspire Summative Exam for a sample of 10th-grade students in Arkansas. The hypotheses used in this study were as follows:

1. No significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on reading achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools.

2. No significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on English achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools.
3. No significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on mathematics achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools.
4. No significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on science achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools.

This chapter discussed the research design, the process of obtaining a sample, and the description of the sample population. The instrument used to measure student achievement was discussed, and the data collections and statistical analysis processes were detailed. Finally, limitations of the study were discussed.

## Research Design

A quantitative, causal-comparative strategy was used for this study. The researcher used a 2 x 2 factorial between-groups design to analyze each hypothesis. This design was deemed appropriate due to the lack of control to manipulate or alter the variables and the comparison of the relationship between the independent and dependent variables (Leech, Barrett, & Morgan, 2011). For Hypothesis 1, the independent variables were participation in class scheduling type (traditional versus flexible modular) and

gender (males versus female). The dependent variable for Hypothesis 1 was student achievement from the 2017-2018 ACT Aspire Summative Assessment in reading. For Hypothesis 2, the independent variables were participation in class scheduling type (traditional versus flexible modular) and gender (male versus female). The dependent variable for Hypothesis 2 was student achievement from the 2017-2018 ACT Aspire Summative Assessment in English. For Hypothesis 3, the independent variables were participation in class scheduling type (traditional versus flexible modular) and gender (male versus female). The dependent variable for Hypotheses 3 was student achievement from the 2017-2018 ACT Aspire Summative Assessment in mathematics. For Hypothesis 4, the independent variables were participation in class scheduling type (traditional versus flexible modular) and gender (male versus female). The dependent variable for Hypothesis 4 was student achievement from the 2017-2018 ACT Aspire Summative Assessment in science.

## Sample

The sample in this study consisted of 200 Grade 10 students' scores from the 2017-2018 ACT Aspire Summative Assessment in reading, English, mathematics, and science in four Arkansas schools. The four schools selected for this research were chosen based on their student population size and their type of class scheduling. To control for school size in the sampling process, one small school and one large school, based upon student populations according to the Arkansas Activities Association classifications, were chosen to make up each accessible population. For the first two accessible populations, the two schools were using a traditional class scheduling format. For the other two accessible populations, the two schools were using a flexible modular class scheduling

format. Each of the two schools in this study that used the flexible modular class scheduling had implemented this scheduling type for 4 years before the sample data collection.

All the schools from the samples shared similar demographic characteristics. These demographics included ethnicity, socioeconomic status, student-to-teacher ratio, and student enrollment. Table 1 displays the socioeconomic status, the student/teacher ratio, the 10th-grade student size, the high school student enrollment, the school student population K-12, and the Arkansas Activities Association designation for each school.

Table 1

*School Demographics from the Accessible Population*

| School | SES (%) | Student/ Teacher Ratio | 10th-Grade Student Size | High School Student Enrollment | School Student Population K-12 | Arkansas Activities Association Status | Schedule Type |
|---|---|---|---|---|---|---|---|
| A | 63.5 | 17.29 | 64 | 240 | 818 | 2A | Trad |
| B | 68.6 | 16.93 | 129 | 516 | 1,687 | 4A | Trad |
| C | 70.1 | 16.38 | 63 | 251 | 873 | 2A | Flex |
| D | 59.8 | 17.31 | 184 | 555 | 1,953 | 4A | Flex |

*Note.* Trad = traditional scheduling format; Flex = flexible modular scheduling format.

A stratified random sampling technique was used for this study. First, the four schools were stratified by scheduling type, two schools using traditional scheduling and two schools using flexible modular scheduling. Second, the 10th-grade scores were stratified by gender. Finally, 25 males' and 25 females' scores were randomly selected

from each school to make up the four groups for each hypothesis: 50 males using traditional scheduling, 50 females using traditional scheduling, 50 males using flexible modular scheduling, and 50 females using flexible modular scheduling. Therefore, each sample consisted of 200 scores from 10th-grade students in two large and two small Arkansas schools for each of the four subject areas, which made up the dependent variables in the study. Table 2 displays the demographics of the 200 student records, 100 males and 100 females, including gender, ethnicity, and schedule type.

Table 2

*Sample Demographic Data*

| School | Male | Female | Asian (%) | African-American (%) | Hispanic (%) | Caucasian (%) | Schedule Type |
|---|---|---|---|---|---|---|---|
| A | 25 | 25 | 0.4 | 0.5 | 5.8 | 88.8 | Trad |
| B | 25 | 25 | 1.9 | 0.6 | 5.8 | 88.6 | Trad |
| C | 25 | 25 | 1.6 | 2.0 | 4.4 | 90.4 | Flex |
| D | 25 | 25 | 0.2 | 0.7 | 6.8 | 91.2 | Flex |

*Note.* Trad = traditional scheduling format; Flex = flexible modular scheduling format.

All scores sampled for this study were from the 10th-grade 2017-2018 ACT Aspire Summative Assessment in reading, English, science, and mathematics. The samples included scores from students who required no academic accommodations or modifications and had reportable scores in all four areas of the ACT Aspire.

## Instrumentation

In the spring of 2015, the Arkansas Department of Education adopted the ACT Aspire Summative Assessment as the standard measurement of student achievement (Arkansas Department of Education, 2016). The ACT Aspire Summative Assessment is a segment of ACT Aspire, LLC, which is a member of the NCS Pearson, Inc., and is considered a potential predictor of the college entrance exam, the ACT (ACT, 2018). The ACT Aspire Summative Assessment measures readiness in reading, English, mathematics, and science for Grades 3-10 (Arkansas Department of Education, 2016). Table 3 displays information for the four content area tests.

Table 3

*ACT Aspire Summative Assessment Information*

| Content | Time in Minutes | Number of Subsections | Cronbach Alpha Reliability Coefficient | Standard Error Measurement/ Scaled Scores | Scale Score Ranges |
|---|---|---|---|---|---|
| Reading | 65 | 4 | .87-.88 | 2.73 | 400-442 |
| English | 45 | 3 | .90-.91 | 3.32 | 400-456 |
| Mathematics | 75 | 10 | .87-.90 | 2.93 | 400-460 |
| Science | 60 | 3 | .86-.89 | 3.02 | 400-449 |

The timing of content assessments ranges from 45 to 75 minutes, with English as the shortest test and mathematics being the lengthiest test. The assessment passes validity for construct and criterion-related measures, and the internal consistency of the subsections measured by Cronbach's Alpha fall in acceptable ranges (ACT Aspire, 2016).

## Data Collection Procedures

In the spring of 2019, upon the completion and approval of the Institutional Review Board process, four Arkansas high schools were invited to participate in this study. Superintendents accepted the invitation and arranged for the information from the 2017-2018 ACT Aspire Summative Assessment scores to be obtained, removing any identifiable student information to avoid a breach of confidentiality. ACT Aspire Summative Assessment data arrived within two weeks following the formal request for data. Once all information was received, the data were coded to identify the gender and school from which the student attended (traditional scheduling or flexible modular scheduling), and then entered into an Excel spreadsheet in preparation for analysis. During the collection of data and upon competition of data entry, ACT Aspire Summative Assessment information was stored in a secured location.

## Analytical Methods

*IBM Statistical Packages for the Social Science (SPSS) Version 22* was used to analyze the acquired data. A textbook was consulted to determine the correct test to use in the analysis (Leech et al., 2011). Data collected for the four hypotheses were coded according to school, class schedule type, and gender. The following codes were used for each school: class schedule type (1 = traditional, 2 = flexible modular) and gender (1 = male, 2 = female). The four hypotheses were then analyzed using the following statistical analysis.

Hypothesis 1 was analyzed with a 2 x 2 factorial between-groups ANOVA using the type of class scheduling (traditional versus flexible modular) by gender (male versus female) as the independent variables and reading achievement measured by the 2017-

2018 ACT Aspire Summative Assessment as the dependent variable for 10th-grade scores. Hypothesis 2 was analyzed with a 2 x 2 factorial between-groups ANOVA using the type of class scheduling by gender as the independent variables and English achievement measured by the 2017-2018 ACT Aspire Summative Exam as the dependent variable for 10th-grade scores. Hypothesis 3 was analyzed with a 2 x 2 factorial between-groups ANOVA using the type of class scheduling by gender as the independent variables and mathematics achievement measured by the 2017-2018 ACT Aspire Summative Exam as the dependent variable for 10th-grade scores. Finally, Hypothesis 4 was analyzed with a 2 x 2 factorial between-groups ANOVA using the type of class scheduling by gender as the independent variables and science achievement measured by the 2017-2018 ACT Aspire Summative Assessment as the dependent variable for 10th-grade scores. To test the four hypotheses, the researcher used a two-tailed test with a .05 level of significance.

## Limitations

The identification of limitations that may have an adverse effect on the results of this study was essential. Identification of these limitations allows the reader to decide how to interpret the results. The following were limitations associated with this study. First, only a select few schools in Arkansas have implemented and were using flexible modular scheduling at the time of the study. This fact limited the number of available schools that could be considered for comparison.

Second, no previous research could be located comparing the achievement of Arkansas students that participated in flexible modular scheduling and students that participated in traditional scheduling. To discover a way to deliver varied content and to

develop a more knowledgeable and successful student, school administrators explore different avenues of instructional delivery. The idea of redistributing time in a manner to achieve this may lead administrators to investigate whether traditional or flexible modular scheduling is best.

A third limitation of this study was that the research consisted of student scores from the instrument, the ACT Aspire Summative Assessment. The ACT Aspire Summative Assessment has been designed to align with the ACT Exam; however, this assessment may not have aligned with the Arkansas State Standards for each content area tested. How the Arkansas State Standards were interpreted, and the content delivered was also determined by the local school district. The alignment of the ACT Aspire Summative Assessment to each school district's delivery of Arkansas State Standards was not guaranteed.

Further, the fourth limitation of this study was that research did not take into consideration the years of experience, educational levels, and specialized training or professional development of the teachers in each school or each subject. Teaching experience varied from district to district, and with the acknowledgment of the Arkansas Department of Education regarding a shortage of teachers, this characteristic was challenging to quantify equally across districts.

The fifth limitation of this study involved the inability to factor in the culture or climate in the schools, which also included the leadership styles of each building or the district. Although the schools selected for this study aligned in several demographic categories, the immeasurable variables of teacher/student relationships, teacher/student

motivation, and the absence of or implementation of a school-wide or district-wide character development program were not considered.

Finally, the research design for this study was causal-comparative, not experimental, which established a limitation. In this study, the researcher was unable to manipulate the independent variables or randomly assign participants. This design alone was a limitation that produced less conclusive results. However, this design has been widely used because of the inability and lack of willingness for administrators to reconfigure their classes to perform experimental studies.

The design of a study and influences or uncontrollable characteristics may impact the outcome or data interpretation of research. The limitations identified in this study did not seem to surpass the ordinary circumstances that were often experienced by researchers when schools were used for research studies. Though limitations existed, the findings of this study supplied information for school districts faced with improving academic results and an objective for further research.

# CHAPTER IV

# RESULTS

The purpose of this study was to determine the effects by gender between traditional scheduling versus flexible modular scheduling on reading, English, mathematics, and science achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools. The independent variables were high school class scheduling type and gender. The dependent variables for Hypotheses 1-4 included the student achievement from the ACT Aspire Summative Assessment in reading, English, mathematics, and science, respectively, for 10th-grade scores in two large and two small Arkansas high schools.

## Analytical Methods

Data for this study were collected and coded for the four hypotheses: schedule type (1 = traditional, 2 = flexible modular) and gender (1 = female, 2 = male). Using *IBM Statistical Packages for the Social Sciences (SPSS) Grad Pack 26*, each of the four hypotheses was analyzed using a 2 x 2 factorial ANOVA with a between-groups design. The study used scores from 200 students enrolled in four Arkansas high schools in 2018. The gender categorization of the sample population consisted of 100 males and 100 females. Histograms were used to check assumptions of normality. Homogeneity of variances was checked with the Levene's test of variance. Assumptions of normality were assessed before the statistical analysis.

## Hypothesis 1

Hypothesis 1 stated no significant differences will exist by gender between traditional period scheduling versus flexible modular scheduling on reading achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools. To test this hypothesis, a 2 x 2 factorial ANOVA was conducted. Before conducting the necessary statistical analysis for the factorial ANOVA, data were screened for entry errors and missing values, with none found. Data were also screened for outliers and the assumptions of independence of observations, assumptions of normality, and homogeneity of variances. Descriptive statistics and inferential results were also reviewed. Table 4 displays the group means and standard deviations for reading achievement by schedule type and gender.

Table 4

*Means, Standard Deviations, and Numbers for ACT Aspire Summative Assessment Reading Achievement Scale Scores*

| Schedule Type | Gender | *M* | *SD* | *n* |
|---|---|---|---|---|
| Traditional | Female | 425.58 | 7.62 | 50 |
| | Male | 425.72 | 7.55 | 50 |
| | Total | 425.65 | 7.54 | 100 |
| Flexible Modular | Female | 423.60 | 7.72 | 50 |
| | Male | 422.24 | 8.90 | 50 |
| | Total | 422.92 | 8.31 | 100 |
| Total | Female | 424.59 | 7.69 | 100 |
| | Male | 423.98 | 8.39 | 100 |

Levene's test of equality of variance, $F(3, 196) = 1.30$, $p = .276$, indicated that the assumption of homogeneity of variances was not significant and therefore, not violated. The skewness and kurtosis values were within the 1.0 and -1.0 range. No outliers were present as demonstrated by a histogram. The Shapiro Wilks test was used to test for normality for the four groups (traditional female, $p = .294$; traditional male, $p = .006$; flexible modular female, $p = .010$; flexible modular male, $p = .034$). All but the traditional female group violated normality. Although these abnormalities existed with the data, the factorial ANOVA was quite robust to violations of normality (Leech et al., 2015). The results of the factorial ANOVA analysis are displayed in Table 5.

Table 5

*Factorial Analysis of Variance Results for ACT Aspire Summative Assessment Reading Scale Scores by Schedule Type and Gender*

| Source | *SS* | *df* | *MS* | *F* | *p* | *ES* |
|---|---|---|---|---|---|---|
| Schedule Type | 372.65 | 1 | 372.65 | 5.88 | .016 | 0.029 |
| Gender | 18.61 | 1 | 18.61 | 0.29 | .589 | 0.001 |
| Schedule Type*Gender | 28.13 | 1 | 28.13 | 0.44 | .506 | 0.002 |
| Error | 12429.38 | 196 | 63.42 | | | |

Results of the factorial ANOVA analysis indicated no significant interaction between class schedule type and gender, $F(1, 196) = 0.44$, $p = .506$, $ES = 0.002$. Therefore, class schedule type and gender did not combine significantly to affect the reading achievement scores, and the null hypothesis could not be rejected. However, a statistically significant main effect for schedule type existed, $F(1, 196) = 5.88$, $p = .016$, $ES = 0.029$, as displayed in Figure 1. This result had a small effect size (Cohen, 1988).

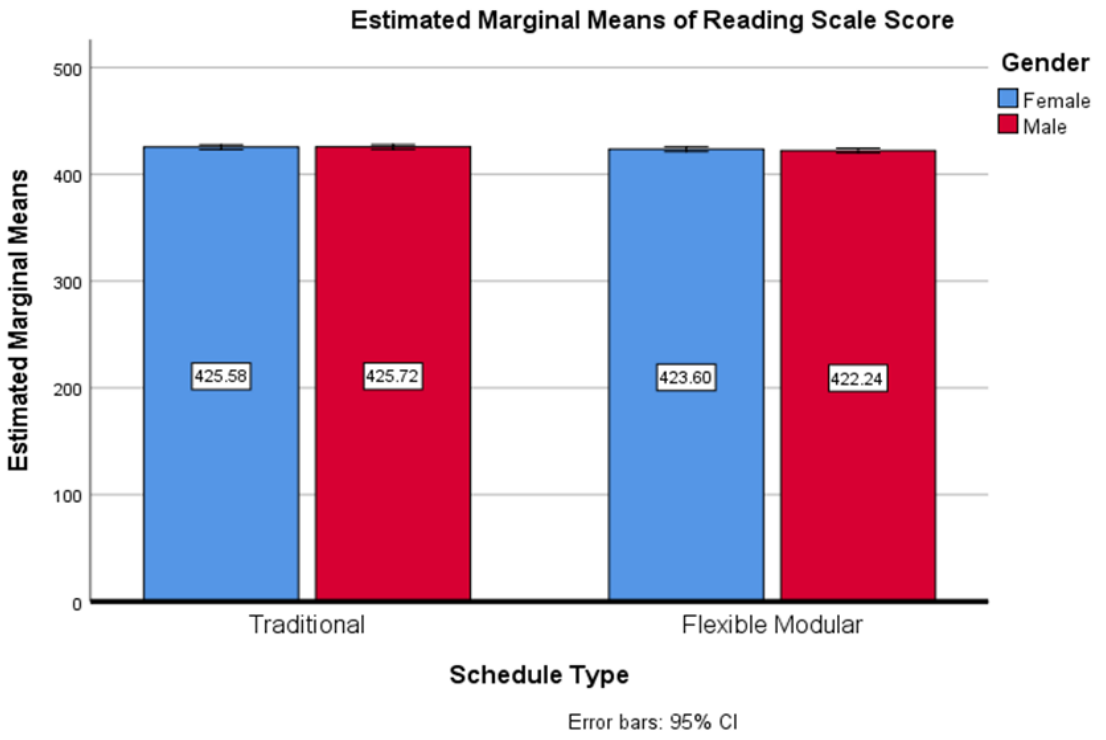


*Figure 1*. Means for reading achievement by schedule type and gender.

The mean of the reading scores of the flexible modular schedule group ($M$ = 422.92, $SD$ = 8.31) was significantly lower compared to the mean of the group from the traditional schedule ($M$ = 425.65, $SD$ = 7.54). No statistically significant main effect for gender existed, $F(1, 196) = 0.29$, $p = .589$, $ES = 0.001$. The mean of the reading scores for the male students ($M$ = 423.98, $SD$ = 8.39) was not significantly different from the mean of the female students ($M$ = 424.59, $SD$ = 7.69). Overall, the results indicated no combined or individual effect of gender on the reading performance of 10th-grade students' scores on the ACT Aspire Summative Assessment. However, the main effect for schedule type, regardless of gender, was significant.

## Hypothesis 2

Hypothesis 2 stated no significant differences will exist by gender between traditional period scheduling versus flexible modular scheduling on English achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools. To test this hypothesis, a 2 x 2 factorial ANOVA was conducted. Before conducting the necessary statistical analysis for the factorial ANOVA, data were screened for entry errors and missing values, with none found. Data was also screened for outliers and the assumptions of independence of observations, assumptions of normality, and homogeneity of variances. Descriptive statistics and inferential results were reviewed. Table 6 displays the group means and standard deviations for English achievement by schedule type and gender.

Table 6

*Means, Standard Deviations, and Numbers for ACT Aspire Summative Assessment English Achievement Scale Scores*

| Schedule Type | Gender | *M* | *SD* | *n* |
|---|---|---|---|---|
| Traditional | Female | 434.00 | 9.47 | 50 |
| | Male | 431.58 | 8.9 | 50 |
| | Total | 432.79 | 9.22 | 100 |
| Flexible Modular | Female | 430.86 | 9.72 | 50 |
| | Male | 429.18 | 10.04 | 50 |
| | Total | 430.02 | 9.87 | 100 |
| Total | Female | 432.43 | 9.68 | 100 |
| | Male | 430.38 | 9.51 | 100 |

The Levene's test of equality of variance, $F(3, 196) = 0.34$, $p = .796$, indicated that the assumption of homogeneity of variances was not violated. The skewness and kurtosis values were within the 1.0 and -1.0 range. No outliers adversely affected the analysis as demonstrated by a histogram. The Shapiro Wilks test was used to test for normality for the four groups (traditional female, $p = .461$; traditional male, $p = .167$; flexible modular female, $p = .017$; flexible modular male, $p = .920$). Only the flexible modular female group violated normality. Although these abnormalities existed with the data, the factorial ANOVA was quite robust to violations of normality (Leech et al., 2015). The results of the factorial ANOVA analysis are displayed in Table 7.

Table 7

*Factorial Analysis of Variance Results for ACT Aspire Summative Assessment English Scale Scores by Schedule Type and Gender*

| Source | *SS* | *df* | *MS* | *F* | *p* | *ES* |
|---|---|---|---|---|---|---|
| Schedule Type | 383.65 | 1 | 383.65 | 4.22 | .041 | 0.021 |
| Gender | 210.13 | 1 | 210.13 | 2.31 | .130 | 0.012 |
| Schedule Type*Gender | 6.85 | 1 | 6.85 | 0.08 | .784 | 0.000 |
| Error | 17837.58 | 196 | 91.00 | | | |

Results of the factorial ANOVA analysis indicated no significant interaction between class schedule type and gender, $F(1, 196) = 0.08$, $p = .784$, $ES = 0.000$. Therefore, class schedule type and gender did not combine to affect the English achievement scores, and the null hypothesis could not be rejected. However, a statistically significant main effect for schedule type existed, $F(1, 196) = 4.22$, $p = .041$, $ES = 0.021$, as displayed in Figure 2. This result had a small effect size (Cohen, 1988).

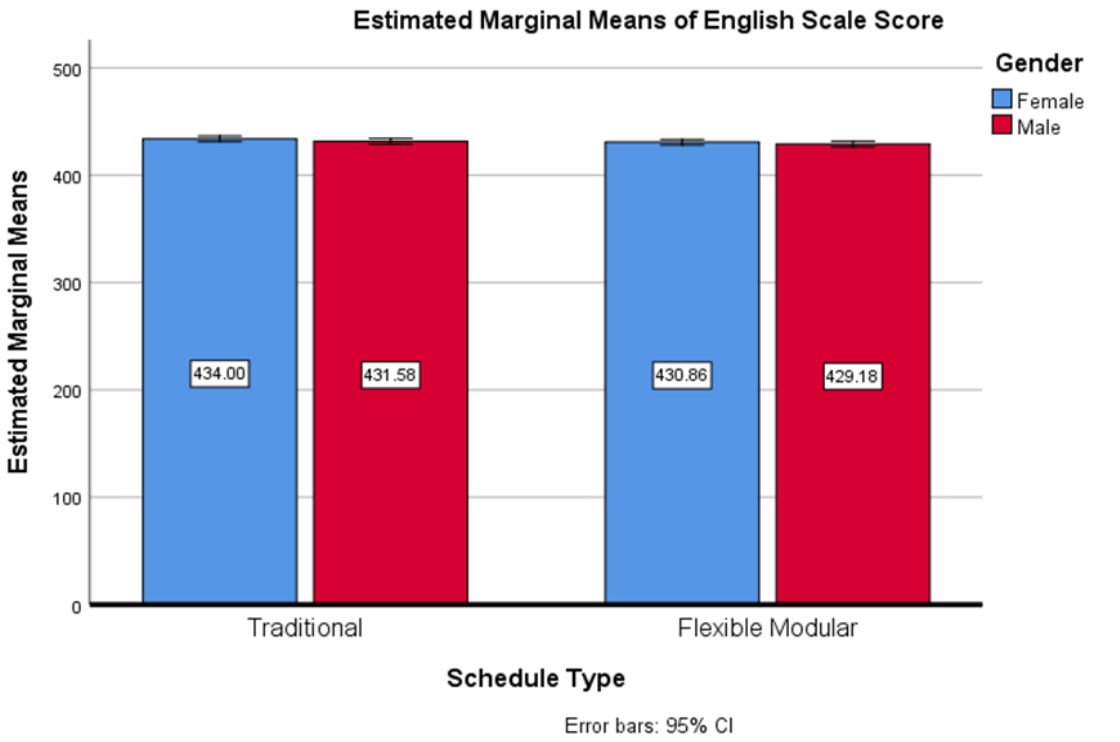


*Figure 2*. Means for English achievement by schedule type and gender.

The mean of the English scores of the flexible modular group ($M$ = 430.02, $SD$ = 9.87) was significantly lower compared to the mean of the group from the traditional schedule ($M$ = 432.79, $SD$ = 9.22). No statistically significant main effect for gender existed, $F(1, 196) = 2.31$, $p = .130$, $ES = 0.012$. The mean of the English scores for male students ($M$ = 430.38, $SD$ = 9.51) was not significantly different from the mean of the female students ($M$ = 432.43, $SD$ = 9.68). Overall, the results indicated no combined or individual effect of gender on the English performance of 10th-grade students' scores on the ACT Aspire Summative Assessment. However, schedule type, when considered independently, appeared to exert a strong influence on English achievement regardless of gender.

## Hypothesis 3

Hypothesis 3 stated no significant differences will exist by gender between traditional period scheduling versus flexible modular scheduling on mathematics achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools. To test this hypothesis, a 2 x 2 factorial ANOVA was conducted. Before conducting the necessary statistical analysis for the factorial ANOVA, data were screened for entry errors and missing values, with none found. Data were also screened for outliers and the assumptions of independence of observations, assumptions of normality, and homogeneity of variances. Descriptive statistics and inferential results were also reviewed. Table 8 displays the group means and standard deviations for mathematics achievement by schedule type and gender.

Table 8

*Means, Standard Deviations, and Numbers for ACT Aspire Summative Assessment Mathematics Achievement Scale Scores*

| Schedule Type | Gender | *M* | *SD* | *n* |
|---|---|---|---|---|
| Traditional | Female | 428.66 | 7.87 | 50 |
| | Male | 428.66 | 8.30 | 50 |
| | Total | 428.66 | 8.05 | 100 |
| Flexible Modular | Female | 426.82 | 7.12 | 50 |
| | Male | 426.50 | 8.59 | 50 |
| | Total | 427.74 | 7.85 | 100 |
| Total | Female | 427.74 | 7.52 | 100 |
| | Male | 427.58 | 8.47 | 100 |

Levene's test of equality of variance, $F(3, 196) = 0.88$, $p = .452$, indicated that the assumption of homogeneity of variances was not violated. The skewness and kurtosis values were within the 1.0 and -1.0 range. No outliers were present as demonstrated by a histogram. The Shapiro Wilks test was used to test for normality for the four groups (traditional female, $p = .502$; traditional male, $p = .458$; flexible modular female, $p = .773$; flexible modular male, $p = .211$). None of the four groups violated normality. The results of the factorial ANOVA analysis are displayed in Table 9.

Table 9

*Factorial Analysis of Variance Results for ACT Aspire Summative Assessment Mathematics Scale Scores by Schedule Type and Gender*

| Source | *SS* | *df* | *MS* | *F* | *p* | *ES* |
|---|---|---|---|---|---|---|
| Schedule Type | 200.00 | 1 | 200.00 | 3.13 | .078 | 0.016 |
| Gender | 1.28 | 1 | 1.28 | 0.02 | .888 | 0.000 |
| Schedule Type*Gender | 1.28 | 1 | 1.28 | 0.02 | .888 | 0.000 |
| Error | 12508.32 | 196 | 63.82 | | | |

Results of the factorial ANOVA analysis indicated no significant interaction between class schedule type and gender, $F(1, 196) = 0.02$, $p = .888$, $ES = 0.000$. Therefore, class schedule type and gender did not combine to affect the mathematics achievement scores, and the null hypothesis could not be rejected. Likewise, there was not a statistically significant main effect for schedule type, $F(1, 196) = 3.13$, $p = .078$, $ES = 0.016$. Figure 3 displays the means of the four groups.

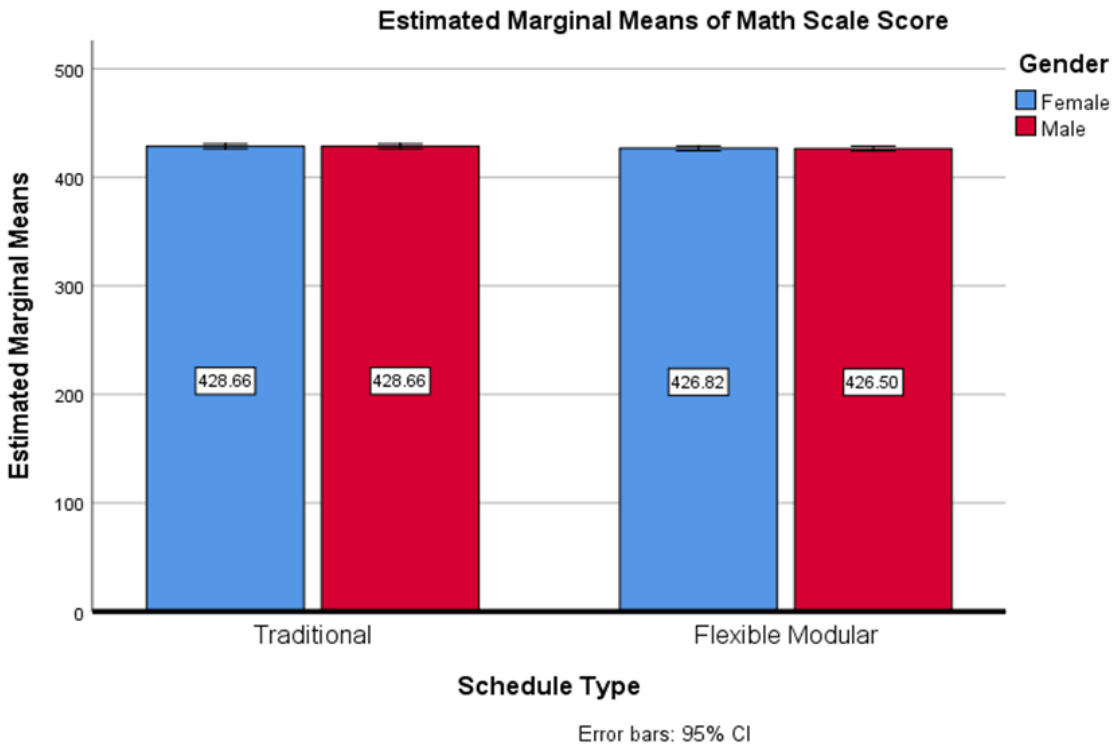


*Figure 3*. Means for mathematics achievement by schedule type and gender.

The mean of the mathematic scores of the flexible modular scheduled group ($M$ = 426.66, $SD$ = 7.85) was not significantly different compared to the mean of the group from the traditional schedule ($M$ = 428.66, $SD$ = 8.05). In addition, no statistically significant main effect for gender existed, $F(1, 196) = 0.02$, $p = .888$, $ES = 0.000$. The mean of the mathematics scores for male students ($M$ = 427.58, $SD$ = 8.47) was not significantly different from the mean of the female students ($M$ = 427.74, $SD$ = 7.52). These results suggest that no combined effect of schedule type and gender or main effect of each variable significantly affected mathematics performance for 10th-grade students on the ACT Aspire Summative Assessment.

## Hypothesis 4

Hypothesis 4 stated no significant differences will exist by gender between traditional period scheduling versus flexible modular scheduling on science achievement measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in two large and two small Arkansas schools. To test this hypothesis, a 2 x 2 factorial ANOVA was conducted. Before conducting the necessary statistical analysis for factorial ANOVA, data were screened for entry errors and missing values, with none found. Data was also screened for outliers and the assumptions of independence of observations, assumptions of normality, and homogeneity of variances. Descriptive statistics and inferential results were also reviewed. Table 10 displays the group means and standard deviations for science achievement by schedule type and gender.

Table 10

*Means, Standard Deviations, and Numbers for ACT Aspire Summative Assessment Science Achievement Scale Scores*

| Schedule Type | Gender | *M* | *SD* | *n* |
|---|---|---|---|---|
| Traditional | Female | 430.10 | 7.37 | 50 |
| | Male | 429.24 | 8.25 | 50 |
| | Total | 429.67 | 7.79 | 100 |
| Flexible Modular | Female | 427.84 | 7.18 | 50 |
| | Male | 427.24 | 9.41 | 50 |
| | Total | 427.54 | 8.33 | 100 |
| Total | Female | 428.97 | 7.33 | 100 |
| | Male | 428.24 | 8.86 | 100 |

The Levene's test of equality of variance, $F(3, 196) = 0.88$, $p = .452$, indicated that the assumption of homogeneity of variances was not violated. The skewness and kurtosis values were within the 1.0 and -1.0 range. No outliers were present as demonstrated by a histogram. The Shapiro Wilks test was used to test for normality for the four groups (traditional female, $p = .428$; traditional male, $p = .019$; flexible modular female, $p = .147$; flexible modular male, $p = .066$). Only the traditional male group violated normality. Although these abnormalities existed with the data, the factorial ANOVA was quite robust to violations of normality (Leech et al., 2015). The results of the factorial ANOVA analysis are displayed in Table 11.

Table 11

*Factorial Analysis of Variance Results for ACT Aspire Summative Assessment Science Scale Scores by Schedule Type and Gender*

| Source | *SS* | *df* | *MS* | *F* | *p* | *ES* |
|---|---|---|---|---|---|---|
| Schedule Type | 226.85 | 1 | 226.85 | 3.46 | .064 | 0.017 |
| Gender | 26.65 | 1 | 26.65 | 0.41 | .525 | 0.002 |
| Schedule Type*Gender | 0.85 | 1 | 0.85 | 0.01 | .910 | 0.000 |
| Error | 12859.46 | 196 | 65.61 | | | |

Results of the factorial ANOVA analysis indicated no significant interaction between class schedule type and gender, $F(1, 196) = 0.01$, $p = .910$, $ES = 0.000$. Therefore, class schedule type and gender did not combine to affect the science achievement scores, and the null hypothesis could not be rejected. Likewise, there was not a statistically significant main effect for schedule type, $F(1, 196) = 3.46$, $p = .064$, $ES = 0.017$. Figure 4 displays the means of the four groups.

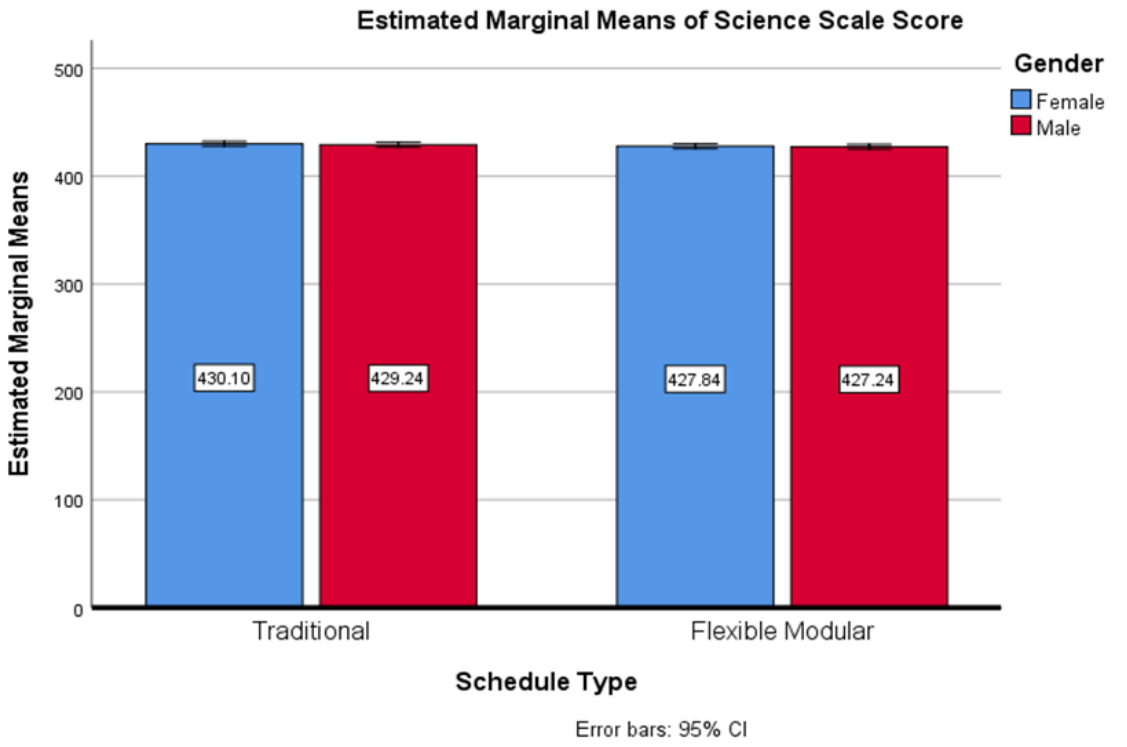


*Figure 4*. Means for science achievement by schedule type and gender.

The mean of the science scores of the flexible modular group ($M$ = 427.54, $SD$ = 8.33) was not significantly different compared to the mean of the group from the traditional schedule ($M$ = 429.67, $SD$ = 7.79). In addition, no statistically significant main effect for gender existed, $F(1, 196) = 0.41$, $p = .525$, $ES = 0.002$. The mean of the science scores for the male students ($M$ = 428.24, $SD$ = 8.86) was not significantly different from the mean of the female students ($M$ = 428.97, $SD$ = 7.33). Overall, the results indicated no combined or individual effect of either schedule type or gender on science performance of 10th-grade students' scores on the ACT Aspire Summative Assessment.

## Summary

The purpose of this study was to determine the effects of class schedule type and gender on reading, English, mathematics, and science achievement on the ACT Aspire

Summative Assessment for 10th grade-students in four Arkansas high schools. Table 12 summarizes the results of the interaction and main effects of the four hypotheses.

Table 12

*Summary of Statistical Significance of Schedule Type and Gender on Reading, English, Mathematics, and Science Performance by Hypothesis*

| Variables by $H_0$ | H1 | H2 | H3 | H4 |
|---|---|---|---|---|
| Schedule Type | .016 | .041 | .078 | .064 |
| Gender | .589 | .130 | .888 | .525 |
| Schedule Type*Gender | .506 | .784 | .888 | .910 |

Overall, no significant interaction between class schedule type and gender for the four hypotheses existed. For Hypothesis 1, a significant main effect of class schedule type on reading achievement existed. In this analysis, the group using the traditional schedule scored significantly higher, overall, compared to the flexible modular group. However, the effect size was small. For Hypothesis 2, a significant main effect of class schedule type on English achievement existed. In the second analysis, again, the group using the traditional schedule scored significantly higher, overall, compared to the flexible modular group. This analysis also yielded a small effect size. For Hypotheses 3-4, there were no significant main effects for schedule type or gender.

# CHAPTER V

# DISCUSSION

School leaders continuously search for a specific program, curriculum, or class schedule type that will contribute to increased student achievement. As high schools struggle to determine what type of class scheduling should be implemented, research-based decisions are necessary. Whether traditional or flexible modular scheduling is chosen, the goal for every school is to increase student achievement by providing an environment where students are given enough time to complete an attainable task and where teachers carry a viable workload.

The purpose of this study was to determine the effects by gender between traditional scheduling versus flexible modular scheduling on reading, English, mathematics, and science achievement as measured by the ACT Aspire Summative Assessment using 10th-grade students' scores in two large and two small Arkansas schools. The independent variables were high school class scheduling type (traditional scheduling versus flexible modular scheduling) and gender (male versus female). The dependent variables for Hypotheses 1-4 included the student achievement from the ACT Aspire Summative Assessment in reading, English, mathematics, and science, respectively, for 10th-grade students in four Arkansas high schools. This chapter presented a summary of the findings and conclusion connected to each hypothesis, the

implications of the findings in the context of the broader literature review, recommendations for potential practice or policy, and future research considerations.

## Conclusions

For Hypotheses 1-4, 2 x 2 factorial ANOVAs were conducted using the class scheduling type (traditional scheduling versus flexible modular scheduling) and gender (male versus female) as the independent variables and the student achievement from the ACT Aspire Summative Assessment in reading, English, mathematics, and science, respectively, using 10th-grade students' scores in four Arkansas high schools as the dependent variable.

### Hypothesis 1

Hypothesis 1 stated that no significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on reading achievement measured by the ACT Aspire Summative Exam for 10th-grade students' scores in two large and two small Arkansas schools. The results for the combination of schedule type and gender indicated no statistical significance. Because no statistical significance existed, the null hypothesis could not be rejected. Similarly, the results for the main effect of gender indicated no statistical significance; therefore, the null hypothesis could not be rejected. Even though female students scored slightly higher than the male students, the results were not statistically significant. However, the results indicated that the main effect for schedule type on reading performance measured by scores on the ACT Aspire Summative Assessment was statistically significant with a large effect. In this analysis, the group using the traditional schedule scored significantly higher, overall, compared to the flexible modular schedule group.

**Hypothesis 2**

Hypothesis 2 stated that no significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on English achievement measured by the ACT Aspire Summative Exam for 10th-grade students' scores in two large and two small Arkansas schools. The results for the combination of schedule type and gender indicated no statistical significance. Because no statistical significance existed, the null hypothesis could not be rejected. Similarly, the results for the main effect of gender indicated no statistical significance; therefore, the null hypothesis could not be rejected. Even though female students scored slightly higher than the male students, the results were not statistically significant. However, the results indicated that the main effect for schedule type on English performance measured by scores on the ACT Aspire Summative Assessment was statistically significant with a large effect. In the analysis, the group using the traditional schedule scored significantly higher, overall, compared to the flexible modular schedule group.

**Hypothesis 3**

Hypothesis 3 stated that no significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on mathematics achievement measured by the ACT Aspire Summative Exam for 10th-grade students' scores in two large and two small Arkansas schools. The results for the combination of schedule type and gender indicated no statistical significance. Because no statistical significance existed, the null hypothesis could not be rejected. Similarly, the results for the main effect of gender was no statistically significant. The groups produced almost identical means. In addition, the results of the main effect of schedule type indicated no statistical

significance; therefore, the null hypothesis could not be rejected. Students in the traditional schedule scored slightly higher than the students in the flexible modular schedule, but the results were not statistically significant. However, even though no statistical significance existed, a large effect size was noted between the means of the groups.

### Hypothesis 4

Hypothesis 4 stated that no significant differences will exist by gender between traditional scheduling versus flexible modular scheduling on science achievement measured by the ACT Aspire Summative Exam for 10th-grade students' scores in two large and two small Arkansas schools. The results for the combination of schedule type and gender indicated no statistical significance. Because no statistical significance existed, the null hypothesis could not be rejected. Similarly, the results for the main effect of gender indicated no statistical significance; therefore, the null hypothesis could not be rejected. Again, the groups produced almost identical means. In addition, the results of the main effect of schedule type indicated no statistical significance; therefore, the null hypothesis could not be rejected. Students in the traditional schedule scored higher than the students in the flexible modular schedule, but the results were not statistically significant. However, even though no statistical significance existed, a large effect size was noted between the means of the groups.

## Implications

### Class Schedule Type (Traditional Versus Flexible Modular)

The idea of time being an essential variable for student achievement is not new. School administrators have investigated ways to use time more productively (Canady &

Rettig, 1995), and many administrators have successfully transitioned high schools to the nontraditional flexible modular scheduling type. This study determined that students with traditional scheduling scored statistically higher on standardized assessments in reading and English. Although traditional scheduling does not allow for individualized time segments for specific content, a constant amount of instructional time was provided. Offering a standard amount of time for instruction may result in less opportunity for student distraction or anxiety associated with a changing daily schedule. Student success resulting from sufficient exposure to content was an important factor that has not been overlooked.

As school districts and administrators explore avenues of change to increase student success, the adjustment of instructional time is a factor that may be considered. A review of the related literature noted that as school administrators attempted to adjust schedule types to increase student achievement, no conclusive results were found that identified a specific schedule type as more likely to result in significant academic achievement (Lawrence & McPherson, 2000; Smith, 2004). Although some researchers noted that the flexible modular scheduling or other nontraditional scheduling types would increase student achievement, Wright (2010) stated that students with traditional class schedules scored significantly higher on standardized assessments in the areas of mathematics and reading. Schedule type was the main focus of the investigation; however, exploration of success by gender was not considered. In the current study conducted by this researcher, results supported the higher scores in the area of reading but not mathematics.

A significant main effect on reading achievement and English achievement existed for the main effect of schedule type in the present study with the group using the traditional schedule type scoring significantly higher overall when compared to the flexible modular group. The results of this study differed from Vawter's (1999) in that schools using nontraditional class scheduling produced the most significant gains in student academic performance. This study's results also contradicted Veal and Schreiber's (1999) findings that no significant difference in reading scores existed regardless of schedule type. Gruber and Onwuegbuzie (2001) determined no statistically significant difference in student grade point averages existed between traditional and nontraditional scheduled students. Although their results concluded that traditionally-scheduled students experienced higher assessment scores in core subject areas, this study supported that conclusion in the reading and English content areas only.

This study's results indicated that no significant main effect existed for schedule type in the areas of mathematics or science on the ACT Aspire Summative Assessment. These results supported previously conducted research by Canady and Rettig (1995) and Shortt and Thayer (1999). Their research concluded that no significant difference existed in academic performance for students in schools that used traditional or flexible modular scheduling. The results of this study suggested the same.

**Gender**

The concept of time management and influence on academic performance was one factor this study investigated, but the possibility that a difference existed between male and female students' achievement was also explored. The traditional schedule and the flexible modular schedule differed in the amount of time a student was engaged in

direct instruction and the time a student was able to work independently. The present study explored the idea that an interaction could exist between class schedule type and gender on academic performance with an underlying perception that males may not perform as well in the flexible modular schedule due to their lack of time management skills.

When reviewing student performance by gender, a minimal amount of research was found on the influence of flexible modular scheduling. In this study, except for reading scores, female students outperformed male students on the ACT Aspire Summative Assessment regardless of schedule type. Noted by Hartzell (1999), females spent a more significant amount of time working on and completing more homework than their male counterparts. A student in a traditional schedule had more of a uniform exposure to content and consistent time segments for personal organization. This researcher can only hypothesize that the greater attention to homework by female students would result in higher academic performance in any schedule type.

## Recommendations

### Potential for Practice and Policy

This study examined the influence the type of class scheduling and gender had on student achievement as measured by the ACT Aspire Summative Assessment on students' scores in two schools participating in traditional scheduling and two schools participating in flexible modular scheduling. The results of this study could evolve into a direct influence on practices and policies of Arkansas high schools with a current Grade 9-12 configuration. Although this study focused on the 10th-grade students' scores, schools should consider the adjustment of ninth-grade students that are entering high

school with the rigor of content, the time requirement for academic work, and the adjustment from any previous schedule type.

Before an Arkansas school district converts from a traditional schedule to a flexible modular schedule or any schedule change, several considerations should be made. When converting to a traditional schedule from a flexible modular schedule, one must decide whether the blocks of time will be a 55-minute, 7-period day or a 45-minute, 8-period day. The decision regarding the number of periods in the school day, as well as the length of time allocated for each period, may be determined based upon the number of course offerings needed or the distribution of students for equality in numbers for each class. The school districts that decide to move from a traditional schedule should decide which type of nontraditional schedule would offer the appropriate time allocation for instruction and extracurricular programs needed by the district. A course of action may include tasks and procedures that involve a needs analysis, a review of literature and research about the traditional schedule, revision of curriculum maps, professional development, dissemination of information to all stakeholders, and an assessment process. Ongoing staff development after the transition is essential. Teacher development of lesson designs that are focused on delivering content based upon item analysis of the ACT Aspire Summative Assessment is important and provides the skills necessary for students to complete the assessment promptly, representing their knowledge. Schools that are considering a change from a flexible modular schedule to a traditional schedule need to identify and implement plans to facilitate the transition of students and teachers alike.

Some potential limitations to teaching traditionally are related to student motivation, apathy, and the value-system associated with work. Literature supported that

student apathy was reduced in nontraditional schedules like flexible modular scheduling. Canady and Rettig (1995) suggested that student apathy was lessened in nontraditional compared to traditional schedules because student interest was captured by opportunities for increased differentiation of instruction with more individualized time within class periods. Carrol (1990) concluded that student stress might lessen due to the decreased demands on teacher-subject preparation. In short, these researchers suggested that nontraditional scheduling, such as flexible modular, provided increased time for more meaningful relationships between students and their learning. Deeper relationships might decrease an apathetic student response, but the current study did not address these issues.

Changing the structure of how time is allocated during the school day can result in systemic change in the high school setting. O'Neil (1995) identified flexible modular scheduling as a significant stimulant for change. Existing research and literature reinforced the idea that nontraditional type scheduling, such as flexible modular, may promote a positive school climate, lessen the number of referrals regarding discipline, and better provide for course requirements for individual students to be met. Although this study did not investigate these ideas, the underlying idea that the presence of independent study time may result in lower academic achievement was noted.

**Future Research Considerations**

This research study did not provide sufficient evidence that the interaction of class schedule type and gender had any influence on the student achievement for reading, English, mathematics, and science on the ACT Aspire Summative Assessment. The following recommendations were offered for future research considerations:

1. The present study used a single year of achievement data. The 10th-grade year was selected because the ninth-grade year is often considered the first year, a transition year, in the high school setting. A longitudinal study could be implemented to examine the trends from the students' scores over multiple years, the performance on the assessments taken for each grade level, and the interaction of the time distribution throughout the successive years.
2. The number of schools in Arkansas using flexible modular scheduling was limited and may have affected the sample size of the study. Future researchers might consider including charter schools and schools of innovation to increase the sample size in replicating this study.
3. The instrument, the ACT Aspire Summative Assessment that was used in the present study, may not truly align with the Arkansas State Standards for each of the subjects assessed. A future study may examine how or if any alignment exists to the Arkansas State Standards and how these standards are interpreted and content delivered by each district or school.
4. The present study reported the student/teacher ratio for each school involved in the research. Although the student/teacher ratio was considered, the years of teaching experience, the educational levels, and the specialized training in the content areas for the teachers could be considered in a future study.
5. One variable for choosing the specific schools for the present study involved the examination of several demographic categories. Future research may also explore variables that reflect the climate of the school that may include academic success, teacher/student relationships, or even the

participation/nonparticipation of a school-wide character development program.

6. The present study was not experimental but causal-comparative in design, which resulted in less conclusive findings. If the study was experimental in design, where the schools implemented a traditional schedule and a flexible modular schedule on the same campus, more interactions between the variables might exist.
7. The investigation in this present study may be applied to the other types of nontraditional schedules and may address the same questions concerning student achievement and gender.
8. The present study explored the presence of an influence on the ACT Aspire Assessment scores by gender; however, a future investigation may consider the grade-point-averages (GPA) of male and female students. The GPA could be a better representation of influence as opposed to a single assessment.

## Summary

This study was an attempt to determine the effects by gender between traditional scheduling versus flexible modular scheduling on reading, English, mathematics, and science achievement as measured by the ACT Aspire Summative Assessment for 10th-grade students' scores in Arkansas schools. The description of an overview of the conclusion of the results for each of the four hypotheses, implications, and recommendations for future practice and research has been included in Chapter V. The findings of this study have contributed to the body of knowledge regarding whether a significant difference in student achievement exists, measured by the ACT Aspire

Summative Assessment, between high schools that are implementing traditional scheduling and high schools that are using flexible modular scheduling.

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**APPENDIX**

HARDING UNIVERSITY
INSTITUTIONAL REVIEW BOARD

## Status of Request for Exemption from IRB Review

*(For Board Use Only)*

Date: 5.13.19

Proposal Number: 2019-57

Title of Project: Effects of Traditional Scheduling versus Flexible Modular Scheduling on Academic Achievement

Principal Investigator(s) and Co-Investigator(s): Kenny Holland, khollan1@harding.edu

■ Research exempted from IRB review.

☐ Research requires IRB review.

☐ More information is needed before a determination can be made. (See attachment.)

I have reviewed the proposal referenced above and have rendered the decision noted above.
This study has been found to fall under the following exemption(s):

1 ☐ 2 ☐ 3 ☐ 4 ■ 5 ☐ 6 ☐

In the event that, after this exemption is granted, this research proposal is changed, it may require a review by the full IRB. In such case, a ***Request for Amendment to Approved Research*** form must be completed and submitted.

This exemption is granted for one year from the date of this letter. Renewals will need to be reviewed and granted before expiration.

The IRB reserves the right to observe, review and evaluate this study and its procedures during the course of the study.

Rebecca O. Weaver

Chair, Harding University Institutional Review Board