THE EFFECTS OF SCHEDULING ON STUDENT ACHIEVEMENT AMONG COLLEGE-PREPARATORY HIGH SCHOOL SENIORS

JUDY ROWLAND BLEDSOE

To the Graduate Council:

I am submitting herewith a field study written by Judy Rowland Bledsoe titled "The Effects of Scheduling on Student Achievement Among College-Preparatory High School Seniors." I have examined the final copy of this field study for form and content, and recommend that it be accepted in partial fulfillment of the requirements for the degree of Education Specialist, with a major in Administration and Supervision.

Dr. Sutton Flynt, Major Professor

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THE EFFECTS OF SCHEDULING ON STUDENT ACHIEVEMENT AMONG COLLEGE-PREPARATORY HIGH SCHOOL SENIORS

A Field Study
Presented for the
Education Specialist
Degree
Austin Peay State University

Judy Rowland Bledsoe
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ABSTRACT

Since the publications of *A Nation at Risk*, *The Copernican Plan: Restructuring the American High School*, and *Prisoners of Time*, a revolution has taken place in the way American high schools conduct business. In the past two decades, approximately 40% of American high schools have converted to some form of block scheduling, and virtually all states have mandated much higher standards for student achievement. This study examined the effect of scheduling type on student achievement among college-preparatory high school seniors.

Through a review of the professional literature, some generalizations were made about block scheduling. First, Grade Point Averages (GPAs) rose significantly when schools converted to some form of block schedule. Second, ACT composite scores did not rise significantly. Third, the block scheduling concept appeared to support science curriculum more than math curriculum. Last, the block scheduling concept seemed to support both language arts and social studies curricula.

In this study, GPAs, ACT composite scores, and ACT subset scores from two graduating classes were analyzed. The 1996-97 class completed four years on a six-period day schedule, and the 2002-03 class completed four years on a 4 x 4 block schedule. Those scores were compared through two-sample *t* tests; the results showed the following: First, there was a significant rise in GPAs when the high school converted to a block schedule. Second, there was not a significant rise in the ACT composite scores. Last, there was not a significant rise in ACT subset scores in English, math, reading, and science.

Several recommendations were made concerning further research on the topic of scheduling and student achievement. Those include the following: First, school officials should conduct research to determine if the rise in GPAs was related to students on the

block schedule taking more elective classes and fewer core curriculum classes; second, research should attempt to determine if longer blocks of time promote higher student achievement in language arts; and third, research should attempt to determine if longer blocks of time support science curriculum but not math curriculum.

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PROBLEM STATEMENT

Importance of the Problem

The accountability issues of effective time management and enhanced student achievement have surfaced in the past decade as top priorities for high schools. The Carnegie Unit, established in 1907, standardized the amount of time high school students must spend in class to earn one credit in a subject. Therefore, the traditional six-period day, in which students spent 45-55 minutes daily in a class over a period of 180 days to earn one credit or one Carnegie Unit, was established. The authors of *A Nation at Risk* and *Prisoners of Time* indicated a need for high schools to develop more effective, efficient ways to manage time and to enhance student achievement. Since then, approximately 40% of U.S. high schools have converted to some form of block schedule (Mutter, Chase, and Nichols, 1997). Even though conversion to the block schedule may appear to be the answer to the accountability issues of time management and student achievement, only the results of well-planned and well-executed empirical research can provide educators with a reliable compass to direct their decision-making.

Problem

Education of all U.S. citizens has been a cornerstone for the maintenance of a democratic society and a free enterprise system. If U.S. students are to remain productive and competitive citizens in the global economic system, they must be educated in the most cost-effective, time-efficient schools in the world. Studies indicate the most important variable to success is the amount of time students spend studying the core curriculum; therefore, the schedule a school follows must be a priority.

Relationship to the Problem

Better understanding of the most effective, efficient ways to schedule time in schools is paramount in providing a world-class education for all U.S. students. All schools and communities have their own characteristics; however, empirical research in

one local school may provide a compass that can direct other schools when determining the most effective ways to schedule students to maximize achievement. The more empirical research schools conduct, the more effective leaders will be in guiding the decision-making process.

Research Questions

1. Among college-preparatory high school seniors who completed four years on a traditional six-period day schedule and those who completed four years on a 4 x 4 semester block schedule, to what extent did the schedules positively or negatively affect final Grade Point Averages (GPAs)?

2. Among college-preparatory high school seniors who completed four years on a traditional six-period day schedule and those who completed four years on a 4 x 4 semester block schedule, to what extent did the schedules positively or negatively affect ACT composite scores?

3. Among college-preparatory high school seniors who completed four years on a traditional six-period day schedule and those who completed four years on a 4 x 4 semester block schedule, to what extent did the schedules positively or negatively affect ACT subset scores in English, mathematics, reading, and science?

Research Hypothesis

College-preparatory high school seniors who completed four years on a traditional six-period day schedule will show no significant differences in their GPAs; ACT composite scores; and ACT subset scores in English, mathematics, reading, and science than those college-preparatory high school seniors who completed four years on a 4 x 4 semester block schedule.

Definitions and Terms

Definitions of Schedules. (Canady & Rettig, 1995, pp. 22-27)

1. Traditional Six-, Seven-, or Eight-Period Day Schedule--Students typically participate in six classes every day, varying in length between 40 and 60 minutes. Teachers instruct five or six of those classes.

2. The 4 x 4 Semester Block Schedule, or Accelerated Block Schedule--Students enroll in four courses that meet for approximately 90 minutes every day for 90 days. Teachers teach three courses each semester.

3. The 4 x 4 Alternating Day Block Schedule, The 4 x 4 A/B Block Schedule, or The 4 x 4 Day 1/Day 2 Block Schedule--Rather than have classes daily, students and teachers meet every other day for extended time "blocks" or at different times during the day on a rotating basis. Teachers teach three courses each day.

4. Trimester, Quarter-On-Quarter-Off, and Other Intensive Scheduling Models--Scheduling models offer shorter, more intense courses of instruction. For example, schools operating on a trimester plan schedule students to take two core courses and related subjects every 60 days.

Definitions of Instruments.

1. ACT Assessment (ACT Assessment Technical Manual, 1997, p. 4)--The ACT is designed to assess high school students' general educational development and their ability to complete college-level work. The assessment results are reported in a composite or total score and in subset scores in English, mathematics, reading, and science.

2. Grade Point Averages--Students' Grade Point Averages are calculated by the Horizon Computer Management Program using grades from the first seven semesters of high school.

Other Definitions and Terms.

1. College-Preparatory Curriculum--Students are required to complete the following:

English: 4 Units

Mathematics: 3 Units (Algebra I, Algebra II, Geometry)

Science: 3 Units (1 Physical, 1 Life, 1 Laboratory)

Social Studies: 3 Units (U.S. History, Government/Economics, World History or World Geography)

Wellness: 1 Unit

Fine Arts: 1 Unit

Foreign Language: 2 Units

2. Copernican Plan (Carroll, 1994, p. xi)--A fundamental change in the use of time, e.g. classes taught in much longer periods--90 minutes, 2 hours, or 4 hours per day--that meet only part of the school year--30 days, 45 days, or 90 days. Students are enrolled in significantly fewer classes each day, and teachers deal with significantly fewer classes and students each day. The purpose of that schedule change is to create a classroom environment that fosters vastly improved relationships between teachers and students and much more manageable work loads for teachers and students. In theory, improved teacher and student relationships and more manageable work loads should result in more successful schools.

Assumptions

The following assumptions were made for this research:

1. The samples from the traditional six-period day schedule and the samples from the 4 x 4 semester block schedule had the same curriculum backgrounds. Only college-preparatory students were chosen because they were required to complete four units of English, three units of math, three units of science,

three units of social studies, one unit of wellness, one unit of fine arts, and two units of the same foreign language.

2. The methods chosen to measure student achievement were valid and reliable: the ACT Assessment, composite and subset scores, and final GPAs.
3. The research was free from the Hawthorne and Halo effects because only students' permanent records were examined to collect the data.
4. All research articles that were analyzed for the literature review were examined for use of reliable research methods.

Limitations

The following limitations were considered for this research:

1. The samples in this study were limited to college-preparatory seniors from only one public high school in a Southeastern state.
2. Grade Point Averages from one school may not be calculated in the same way as another school, thus making generalizations questionable.
3. When attempting to generalize from this study, samples chosen for other studies may not have completed the same core curriculum.
4. A sample of approximately 400 homogeneous seniors from a large, rural high school in the Southeast may not generalize to diverse, large, urban high schools.

Delimitations

The following delimitations were considered for this research:

1. This sample was taken from only one rural high school in the Southeast.
2. This sample was limited only to college-preparatory students.

Preview

To reach the goal of contributing to the literature on time management and enhanced student achievement in high schools, a comparative research study was

conducted. Among college-preparatory high school seniors who completed four years on a traditional six-period day schedule and those who completed four years on a 4 x 4 semester block schedule, to what extent did the schedules positively or negatively affect student achievement? After the results were analyzed, information surfaced that will help schools make better decisions concerning the accountability issues of time management and student achievement.

CHAPTER II
LITERATURE REVIEW

Introduction

Questions of the Past Two Decades

What is the relationship between time and learning? Will changes in the traditional time structures of the U.S. high school make a significant difference in student achievement? Will holding students to higher standards make a significant difference? Many educators and researchers have pondered those questions, especially in the past two decades. In their attempts to identify the variables that truly make a significant difference in student achievement, researchers have begun to publish their findings. In this study, the researcher answered those questions by conducting a comparative study that examined the effects of scheduling type on student achievement among college-preparatory high school seniors.

Indicators of Risk

During the past two decades, two government publications, *A Nation at Risk* (1983) and *Prisoners of Time* (1994), have become the catalysts for reform in secondary education. Two more recent sources of information deserve mention. The No Child Left Behind Act of 2001 adds accountability to schools for achieving and maintaining higher standards (Office of Elementary and Secondary Education, 2003). Also, information released by the National Assessment of Educational Progress is serving as a catalyst for students to achieve at higher levels academically (Rosenshine, 2003).

In 1981 the U.S. secretary of education created the National Commission on Excellence in Education and directed it to report on the quality of education in the United States. In 1983 the commission published its report in *A Nation at Risk: The Imperative for Educational Reform*. In 1991 the National Education Commission on Time and Learning was asked to report on the relationship between time and learning in U.S.

schools. In 1994 the Commission on Time and Learning published its findings in *Prisoners of Time*.

Quotations from the two publications, such as those listed below, have been used to highlight the risks that now exist for publicly educated students in the United States.

"If an unfriendly power had attempted to impose on America the mediocre educational performance that exists, we might have viewed it as an act of war" (*A Nation at Risk*, 1983, p. 5).

"Time is the missing element in our great national debate about learning and the need for higher standards for all students. Our schools ... are prisoners of time, captives of the school clock and calendar. We have been asking the impossible of our students--that they learn as much as their foreign peers while spending only half as much time in core academic subjects" (*Prisoners of Time*, 1994, p. 7).

The report on excellence in education contained 13 indicators of risk. At least 10 of the 13 indicators related to low academic achievement among high school and college bound students. A brief summary follows:

1. Compared with foreign students on 19 tests, U.S. students never achieved the highest scores.
2. Complaints by college, business, and military leaders indicated deficiencies in reading, writing, spelling, mathematics, science, and problem-solving (*A Nation at Risk*, 1983).

Change Initiatives

Two important initiatives developed in secondary education as a result of the commissions' reports. First, high schools throughout the United States began to develop standards, especially in the core curriculum, that all students were required to meet (*Prisoners of Time*, 1994). Second, high schools began to analyze the schedules students followed, to realize that time must be used more efficiently, and to experiment with

schedules that had been purported to result in higher student achievement (*A Nation at Risk*, 1983).

The Copernican Plan: A Challenge for Change

One important change initiative began in 1989 with the Copernican Plan--a landmark pilot program that analyzed the relationship between high school schedule type and student achievement. The Copernican Plan challenged the traditional schedule, based on the Carnegie Unit, in which students enrolled in five or six classes taught for 45-55 minutes a day for 180 days. All classes, even laboratory science, were scheduled for 45-55 minutes a day. The Copernican Plan, named by Joseph Carroll--author of *The Copernican Plan Evaluated* (1994), called for a fundamental change in the use of time at the high school level. The plan also recommended classes be taught in larger periods or **blocks**--90 minutes, 2 hours, or 4 hours per day--in which students would meet for only part of the 180 days--possibly 90, 60, 45, or 30 days. Educators considered the Copernican Plan a success. As a result, **block scheduling** became a popular way to initiate change at the secondary level (*The Copernican Plan Evaluated*, 1994).

Canady and Rettig (1995), prolific writers on the subject of block scheduling, listed benefits of the block compiled by Calwelti (1994). Those benefits listed below should enhance student achievement. The block schedule:

1. Increases length of class periods
2. Enables teachers to use a variety of instructional approaches
3. Decreases the number of class changes
4. Saves time
5. Limits number of preparations for teachers
6. Provides opportunity for interdisciplinary teaching
7. Decreases number of students taught each day
8. Increases planning time for teachers
9. Helps teachers develop closer relationships with students

10. Provides opportunities for project work

11. Provides additional opportunities for teachers to help students

When Carroll's Copernican Plan--which compared student achievement in schools on block schedules with student achievement in schools on traditional schedules--was evaluated by a team of qualified professors from Harvard University, the findings were reported as follows: After examining 33 comparisons of students' performance data, 27 favored the Copernican Plan, one showed no change, and five favored the traditional schedule (Carroll, 1994).

Research Findings

Call for Further Research

Evidence from such reports as *A Nation at Risk, Prisoners of Time,* and *The Copernican Plan* indicated that U.S. high schools must continue the initiatives of meeting high standards and using time effectively. Some motivation for establishing new standards and using time more efficiently have come from unfavorable comparisons of U.S. and foreign students' academic achievement. U.S. students spent approximately 1,460 hours during four years of high school studying core academics. In contrast, Japanese students spent 3,170 hours, French students spent 3,280 hours, and German students spent 3,520 hours (*Prisoners of Time*, 1994).

After examining available data, most authors called for further research on time and learning. Both large, comprehensive studies and small, limited studies indicated the need for extensive, empirical research. For example, Piska, Harmston, and Hackmann (2001) correlated ACT composite scores in 568 Iowa and Illinois public high schools that followed some form of block or traditional schedules. They concluded that scheduling type did not enhance the ability to explain variations in ACT composite scores at the high school level. They called for further analysis of data from individual schools to identify time and instructional variables that will predict more closely high student achievement. In a smaller research study, Fletcher (1997) examined teacher and student attitudes toward

the effectiveness of block scheduling in six Southeastern high schools. He found that 75% of both groups favored block schedules over traditional schedules. He called for a comprehensive study comparing student achievement after high schools had been on block schedules four years.

Research on Academic Achievement

Grade Point Averages

Nichols (2000) published a report in which he analyzed longitudinal student data from six Midwestern urban high schools. Three schools used an alternating day block-8 schedule, two schools used a 4 x 4 block schedule, and one school used a traditional six-period day/55-minute class schedule. Nichols (2000) found that the percentage of students earning higher GPAs went up after the conversion to block schedules. However, the percentage of students earning higher GPAs also rose in the school using the traditional schedule. Even though student achievement determined by GPAs did not indicate a significant difference in the two schedules, Nichols (2000) concluded that proper planning and documentation of school effectiveness and student success were the keys to the continued success of school-improvement initiatives.

Deuel (1999) investigated the effects of block scheduling on a large, urban school district in Florida. The research contrasted, on key indicators of student achievement, 10 high schools using block schedules and 13 high schools using seven-period rotator schedules. In schools with block scheduling, a significant increase in As earned and a significant decrease in Cs, Ds, and Fs earned were noted. Deuel (1999) concluded that the school district experienced enough benefits from block scheduling that it expected to observe important, long-term improvements in student achievement as well as behavior.

Snyder (1992) analyzed the two-year outcomes of a moderate-sized high school in Angola, Indiana, that converted to a 4 x 4 block schedule. Schoolwide GPAs went up significantly after the change to a block schedule. Snyder found improvements in many

other areas of the high school after the conversion, but he concluded the schedule was simply the vehicle that allowed improvements in teaching strategies.

Williams (1999) investigated the effects of block scheduling on the GPAs of approximately 200 students in a rural high school in West Virginia. The GPAs of ninth-graders on a traditional seven-period day schedule were correlated with their GPAs as tenth-graders on a 4 x 4 block schedule. The results showed no significant differences in the students' GPAs. Williams (1999) concluded that researchers should study academic achievement and other benefits that support block scheduling. Student benefits included fewer classes each term, opportunities to take more classes, and reduced stress.

Trenta and Newman (2001) examined the relationship between block scheduling and cumulative GPAs of students in a small Midwestern town. Even though GPAs rose under the block schedule, the difference was not significant. However, a significant difference in the subject-area grades of students was noted. Trenta and Newman (2001) concluded the significant, positive relationship of the subject-area grades gave credibility to the inference that block scheduling influenced academic success in high school.

In the research analyzed above, two high schools were in large, urban areas; one was in a moderate-sized community; and two were in small, rural towns. Regardless of high school size or location, it appeared academic gains had been made when schools converted to block schedules. However, gains had not been so significant that other variables should be ignored.

ACT Composite Scores

Piska, Harmston, and Hackmann (2001) correlated ACT composite scores of 38,089 seniors in 568 public high schools in Iowa and Illinois. The study examined the relationship between three schedule types--4 x 4 semester block, eight-block alternating day, and traditional eight-period day. The mean ACT composite score for the 4 x 4 block schools was 21.36, the eight-block alternating day schools was 21.13, and the eight-period day schools was 21.28. The mean composite-score differences between schedule types

were negligible. Piska's et al. (2001) conclusion recommended the keys to successful implementation of a block schedule included understanding the change process, involving stakeholders, and providing professional development on changing instructional methods.

Trenta and Newman (2001) investigated the relationship between block scheduling and ACT composite scores at a small high school in the Midwest. The authors found no significant relationship between a block schedule and ACT composite scores. Trenta and Newman (2001) concluded that students on the block and students on the traditional schedule appeared to do equally well according to most achievement indicators. However, students on the block schedule showed significant achievement in their academic subjects.

Lare, Jablonski, and Salvaterra (2002) investigated the 4 x 4 block schedule's effectiveness in promoting continuous improvement in student achievement, compared with the traditional seven-period day schedule. The study took place in a small school in the Western United States. Composite scores from the ACT Assessment were used as one source to measure student performance. Composite scores rose somewhat after the conversion to the 4 x 4 block schedule. Lare et al. (2002) suggested that the overall program improved significantly. Also, the switch to the block schedule had been effective, even though no sizable improvement in student performance on standardized assessments was noted.

Snyder (1992) described a two-year study of block scheduling at a high school in Indiana. The study compared the results of ACT composite scores and other standardized assessment scores before and after implementation of block scheduling. Snyder (1992) found that significantly improved ACT scores indicated improved learning on the block-scheduling format. One conclusion presented by Snyder (1992) included the 4 x 4 block schedule was only the means through which improved teaching methods had been implemented.

In a report conducted by the Texas Education Agency (1999), the relationship between block scheduling and overall student performance was examined. One of the measures of overall student performance was the number of students who took the ACT and/or SAT examinations. The highest participation rate (66.9%) came from the high schools on the A/B alternating-day block schedule, and the lowest participation rate (61.0%) came from the high schools on the accelerated block schedule. The Texas (1999) study concluded it seemed to matter more how effectively students and teachers engaged in the teaching and learning process than the particular type of schedule followed.

After examining the five articles related to ACT composite scores, it was found that the scores did not indicate a significant improvement in student achievement. The articles were classified as follows:

1. Three articles reported no significant gains.
2. One reported significant gains.
3. One reported a higher percentage of students who took ACT and/or SAT examinations.

In general, researchers found significant improvement in overall school functioning.

Math and Science

Lare, Jablonski, and Salvaterra (2002) compared ACT math and science subset scores of students whose schedules were converted from a seven-period day to a 4 x 4 block. The small high school was located in the Western United States. They found a small increase in math and science scores during the second year of the block; however, the differences were not significant. Lare et al. (2002) concluded the study by stating that the number of students on the honor roll had increased significantly, which possibly indicated improved student performance.

McCreary and Hausman (2001) compared student achievement from high schools in a large urban district that followed a semester, block, or trimester schedule. Students on the semester schedule, a schedule in which classes met daily, had significantly higher

Stanford Achievement Test (9) scores in math than students on the block and trimester schedules. In the same study students on the block and trimester schedules had significantly higher Stanford Achievement Test (9) scores in science. McCreary and Hausman (2001) gave a possible explanation for the results. Students may profit more from math classes that meet daily for shorter periods of time because of the sequential nature of mathematics. Students may profit more from science classes that meet for longer periods of time, allow in-depth study, and provide hands-on laboratory experiences.

Gruber and Onwuegbuzie (2001) analyzed student achievement on the Georgia High School Graduation Tests (GHSGT). Participants either had been on a block schedule or a traditional six-period day schedule. Statistical analysis showed large significant differences in math and science that favored the traditional schedule. Again, it appeared that other intervening variables should be researched to find empirical evidence that supports the most effective time management tools to enhance student achievement.

The Georgia State Department of Education (2000) summarized data collected from GHSGT scores. At Jasper County High School the percentage of students who passed the GHSGT in math and science increased slightly each year after the conversion to block. Math scores from the Scholastic Aptitude Test increased only one year after the conversion to block.

Trenta and Newman (2001) examined the relationship between block scheduling in Ohio and student performance on core courses. The core courses included math and science. The authors concluded the students' performances on math and science since the conversion to block scheduling showed a significant positive relationship.

Hess, Wronkovich, and Robinson (1994) studied student performance outcomes at Coventry High School in Ohio. The researchers used the Educational Testing Service subject-area tests to compare student achievement on a traditional schedule vs. a block schedule. Results showed no significant difference in geometry; however, a significant difference in biology favored the block schedule. Hess et al. (1994) recommended any

switch to a block schedule should be tied to curricular reform; block scheduling itself probably would not raise student achievement.

Lawrence and McPherson (2000) compared student achievement on end-of-course test results in two North Carolina high schools. In Algebra I and biology, students who learned under the traditional schedule scored significantly higher. Lawerence and McPherson (2000) concluded that block scheduling alone may not be the best long-term solution to enhanced student achievement at the high school level.

The North Carolina State Department of Public Instruction (1994) published data comparing gains in geometry and Algebra II of schools that had converted to block schedules. Thirteen of the schools had gains in geometry, and eight had losses. Nine schools had gains in Algebra II, and twelve had losses. The study concluded that the conversion to block scheduling had not significantly affected end-of-course tests. The study reported a finding similar to Brake (2000)--that students spent less time studying core academics on the block. The study showed a 54% to 41% drop in the number of core classes in which students enrolled.

Math

Brake (2000) investigated academic achievement outcomes of students who had completed four years on a traditional six-period day schedule with achievement outcomes of students who completed four years on a block schedule. Both schools were located in a medium-sized town, and both had a mixture of rural and suburban students. An analysis showed a significant decline in the math scores of both schools after converting to block schedules. Brake's (2000) analysis showed a significant decrease in the amount of time students on the block schedules spent studying core academic subjects. Brake (2000) stated the amount of time students studied the academic core was a strong predictor of success on college-readiness tests, such as the ACT. Since students on the block spent significantly less time studying core academic subjects and math scores dropped significantly, Brake's (2000) major concern was that the massive move to block

scheduling may be "putting aside core academic curriculum for student choice and differentiation" (p. 25).

Pisapia and Westfall (1997) analyzed student achievement information in five Virginia high schools that had converted to block schedules. SAT math scores increased in two of the five block schools after two to three years on the schedule. Again, scores on standardized measures did not indicate remarkable improvements.

Ten articles were reviewed from the math and science areas. The results follow:

1. Three reported negative results in math and science on the block schedule.
2. Two reported negative results only in math on the block schedule.
3. Two reported somewhat positive results in math and science on the block schedule.
4. One reported positive results in math and science on the block schedule.
5. One reported somewhat positive results only in math on the block schedule.
6. One reported negative results for math and positive results for science.

Many researchers agreed that variables other than schedule must be identified for school officials to know how to maximize academic achievement in high schools.

Language Arts and Social Studies

Hess, Wronkovich, and Robinson (1994) analyzed student performance on data from Coventry High School in Ohio. The authors used the Educational Testing Service subject-area tests to compare achievement in English and world history. Results showed no significant difference in world history; however, a significant difference in English favored the block.

The North Carolina State Department of Public Instruction (1994) published data in which it had compared gains in English I and U.S. history. The schools had changed to block scheduling. Twelve of the schools had gains in English I, and fifteen had losses. Ten had gains in U.S. history, and fifteen had losses. Findings indicated the conversion to block had no significant impact on end-of-course tests.

Lawrence and McPherson (2000) analyzed student achievement on end-of-course tests in two North Carolina high schools on block schedules. In English I and U.S. history, students who attended schools on traditional schedules scored significantly higher.

The Georgia State Department of Education (2000) examined data from the GHSGT. At Jasper County High School, the percentage of students who passed language arts and writing increased approximately 8% and 9%, respectively, after the conversion to block. Social-studies scores did not increase.

Gruber and Onwuebuize (2001) analyzed student achievement on the GHSGT. Students attended high school on either a block or a traditional six-period day schedule. Statistical analysis indicated a moderate significant difference in language arts, no significant difference in writing, and a large significant difference in social studies. The significant differences in language arts and social studies favored the traditional schedule.

Language Arts

Brake (2000) investigated performance outcomes of students on block schedules and students on traditional six-period day schedules. He found ACT English scores dropped in three of the four graduating classes that were sampled. The other class remained equal.

Geismar and Pullease (1996) examined ACT and SAT scores of students from Boyd Anderson High School in Florida. Boyd Anderson changed from a traditional seven-period day schedule to a trimester block schedule. Researchers found no significant differences in ACT English scores and SAT verbal scores when they compared students from both schedule types.

Lare, Jablonski, and Salvaterra (2002) compared ACT English and reading subset scores of students whose schedules were changed from a traditional seven-period day to a 4 x 4 block. They found only a small increase in English and reading scores. The most interesting result reported by Lare et al. (2002) was the significant increase in Preliminary

Scholastic Aptitude Test (PSAT) verbal scores, which has been maintained since the conversion to block scheduling.

Pisapia and Westfall (1997) analyzed student-achievement information in seven Virginia high schools that had converted to block schedules. Verbal scores on the SAT rose in four of the seven schools during the first year of conversion to block. Since the conversion, verbal scores rose in six of the seven schools.

When the above articles on language arts and social studies were analyzed, the following results were found:

1. Six articles reported increases in language arts on the block schedule.
2. Three articles reported increases in social studies on the block schedule.
3. One article reported decreases in language arts on the block schedule.
4. One article reported decreases in social studies on the block schedule.
5. One article reported no differences in language arts between the traditional and block schedules.
6. One article reported increases in language arts on the traditional schedule.
7. One article reported increases in social studies on the traditional schedule.

In general, researchers reported gains in language arts skills when schools have converted to block schedules. The longer blocks of time appear to promote learning of the language arts skills of verbal interaction, reading, and writing.

Conclusion

After reviewing the literature on block scheduling and student achievement, a small amount of evidence had accumulated to support some generalizations about the relationship between the two variables. The generalizations included the following:

1. Grade Point Averages have risen when schools have converted to block schedules.
2. Composite scores from the ACT have not risen significantly.

3. The block-scheduling concept appears to support science curriculum more than math curriculum.
4. The block-scheduling concept appears to support both language arts and social-studies curricula.

Still, issues other than scheduling must be considered when deciding which variables are most likely to enhance student achievement. For example, the Texas Education Agency (1999) reported that it seemed to matter more how effectively students and teachers engaged in the teaching and learning process than the particular type of schedule followed.

CHAPTER III
METHODOLOGY

Sample

Selection Characteristics and Size

The subjects in this comparative study were selected from the graduating classes of 1996-97 and 2002-03. Those seniors attended a rural, comprehensive high school located in a Southeastern state. The high school is located in a county with a population of approximately 43,000, an annual average household income of approximately $23,500, an average white-collar population of approximately 17%, and an average blue-collar population of approximately 83%. Approximately 33% of the students received free or reduced lunches. The high school has a relatively stable student population of approximately 1,600. Of those 1,600, approximately 47% attend a four-year university and approximately 5% attend a two-year technical school (*Dickson County Fact Book*, 2002).

The homogeneous cluster sample consisted of approximately 200 college-preparatory seniors from each of the two graduating classes. The 1996-97 class was chosen because it was the last class to complete four years on a traditional six-period day schedule; the 2002-03 class was selected because it was the first class to complete four years on a 4 x 4 semester block schedule. The total population of seniors--male and female--who completed the college-preparatory curriculum was selected as subjects.

Safeguards

The following safeguards were implemented to ensure students' records were handled confidentially:

1. Permission to conduct the research was obtained from the Institutional Review Board at the university.
2. Permission to collect data was obtained from the County Board of Education.

3. When collecting data, information was coded to maintain student confidentiality.
4. Demographic data were stratified only by gender.
5. Data were collected and stored in the security of the records room at the high school.

Design, Instrumentation, and Procedures

Design

The design for this study was comparative. The study examined the extent to which the schedules students followed positively or negatively affected their academic achievement. Academic achievement was determined by final Grade Point Averages (GPAs) and American College Test (ACT) composite and subset scores. The investigation included subjects from two graduating classes. Those subjects attended the same high school. One senior class completed four years on a traditional six-period day schedule; the other senior class completed four years on a semester 4 x 4 block schedule.

Instrumentation

Students' academic achievement data were collected from two sources. The first source was students' ACT composite and subset scores. The ACT was designed to assess high school students' general educational development and their ability to complete college-level work. The test covered four skill areas: English, mathematics, reading, and science reasoning. The second source was students' final GPAs. Students' GPAs were calculated by the Horizon Computer Management Program that used grades from the first seven semesters of high school.

Procedures for Data Collection

A secondary educator with 25 years' experience--12 years as a classroom teacher and 13 years as a school counselor--collected the data. The educator examined each student's permanent record to determine if that individual followed the college-preparatory curriculum. After that information was determined, ACT composite and

subset scores and GPAs--stratified by gender--were collected. Student identification was not necessary to collect the data; therefore, student confidentiality was maintained.

Statistical Procedures and Proposed Analysis

When all data were collected, the information was entered into the computer for statistical analysis. Descriptive and inferential statistics were used in all phases of the analysis. Much planning and precaution were evident in the methodology to provide external and internal validity checks.

Simple and multiple relationships were analyzed using ACT composite and subset scores as well as GPAs. Means and standard deviations were calculated. Two-sample *t* tests were performed to measure the relationship between independent and dependent variables. Statistical significance was determined at the .05 level. Tables and charts were designed to clarify further the information that was presented in the written analysis.

Discussion

In summary, block scheduling has been the fastest-growing change to take place in U.S. high schools in the past two decades. The study contributed to the literature on this topic by conducting research to answer the following question: Among college-preparatory high school seniors who completed four years on a traditional six-period day schedule and those who completed four years on a 4 x 4 semester block schedule, to what extent did the schedules positively or negatively affect student achievement?

Three limitations of this study deserve mention. First, this study used only college-preparatory seniors from one rural high school in the Southeast. Caution should be exercised when making generalizations to other populations. Second, when generalizing about GPAs, it would be wise to consider the core-curriculum background of the samples. Third, the two groups possibly did not have the same teachers and instructional materials. Teachers and instructional materials change from year to year, and those changes could affect the researcher's ability to generalize among the two groups.

Two strengths of this study also deserve mention. First, the samples from the traditional schedule and the samples from the block schedule had the same core-curriculum backgrounds. Second, statistically sound generalizations were made using the ACT, a universally known college-readiness test with high reliability and validity data.

In light of the data collected on time management and student achievement from this study, secondary educators should be able to read more clearly the compass that will guide their decision-making in those areas.

CHAPTER IV
RESULTS

Areas of Comparison

Data for this study were collected from the permanent records of college-preparatory seniors at a rural high school in a Southeastern state. Six types of scores were collected. Those were final GPAs; ACT composite scores; and ACT subset scores in English, math, reading, and science.

Once this data was collected, two-sample *t* tests were performed for the six types of scores. It appears that the schedule type a student followed did not make a significant difference in overall student achievement. On the six indicators of student achievement, there was only one area in which students on a block schedule performed significantly higher than students on the six-period day schedule. The other five indicators did not show a significant difference. Discussion, data, and charts that report the results of the statistical analyses appear on the following pages.

Research Questions

The first question was: *Among college-preparatory high school seniors who completed four years on a traditional six-period day schedule and those who completed four years on a 4 x 4 semester block schedule, to what extent did the schedules positively or negatively affect final GPAs?*

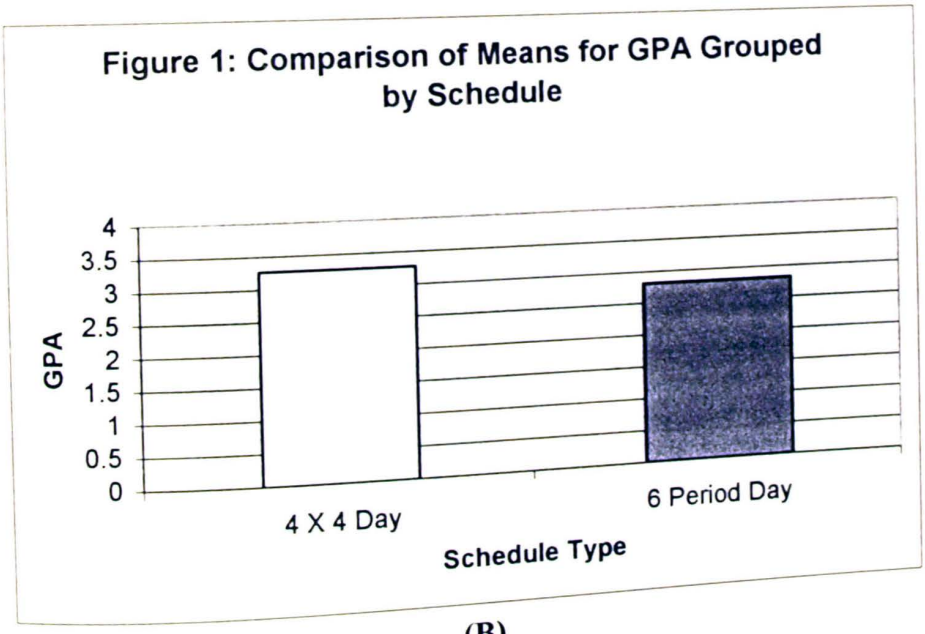
To answer the first question, a two-sample *t* test was conducted. The mean GPA for seniors on the 4 x 4 schedule was 3.264; the mean GPA for seniors on the six-period day schedule was 2.810. The difference was significant ($t(436) = 7.796$, $p<.001$).

Table 1: Two-sample *t* test on Grade Point Average Grouped by Schedule

Group	N	Mean	SD
4 x 4 Schedule	197	3.264	0.544
6-Period Schedule	241	2.81	0.653

Pooled Variance: t = 7.796, df = 436, Prob = 0.000

(A)



(B)

Figure 1. Comparison of GPAs (A) *t* test, (B) mean scores.

The second question was: *Among college-preparatory high school seniors who completed four years on a traditional six-period day schedule and those who completed four years on a 4 x 4 semester block schedule, to what extent did the schedules positively or negatively affect ACT composite scores?*

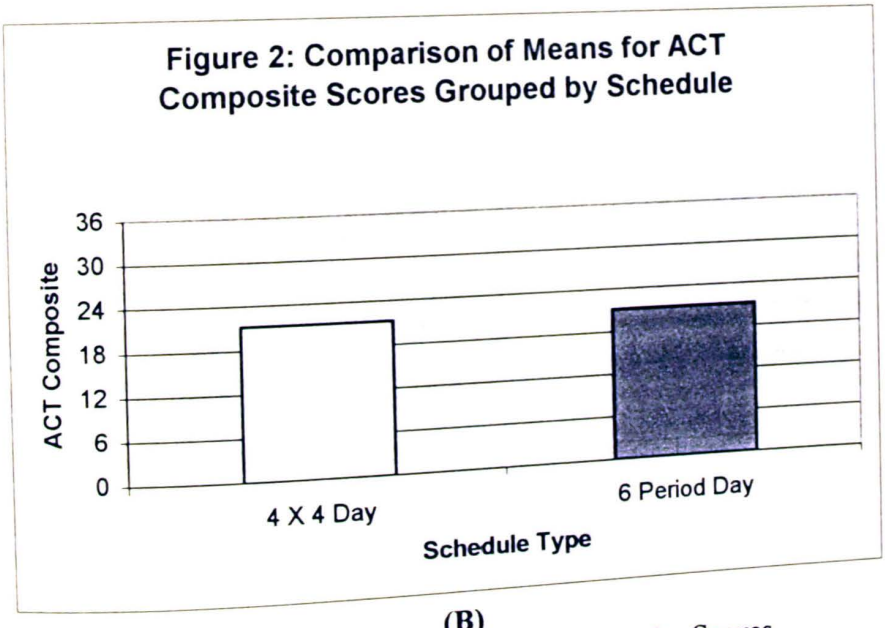
To answer the second question, a two-sample *t* test was completed. The mean ACT composite score for the seniors on the 4 x 4 schedule was 21.259; the mean ACT composite score for the seniors on the six-period day schedule was 21.162. The difference was not significant ($t(436) = .243$, $p>.05$).

Table 2: Two-sample *t* test on ACT Composite Scores Grouped by Schedule

Group	N	Mean	SD
4 x 4 Schedule	197	21.259	4.004
6-Period Schedule	241	21.162	4.271

Pooled Variance: t = 0.243, df = 436, Prob = 0.808

(A)



(B)

Figure 2. Comparison of ACT Composite Scores (A) *t* test, (B) mean scores.

The third question was: *Among college-preparatory high school seniors who completed four years on a traditional six-period day schedule and those who completed four years on a 4 x 4 semester block schedule, to what extent did the schedules positively or negatively affect ACT subset scores in English, mathematics, reading, and science?*

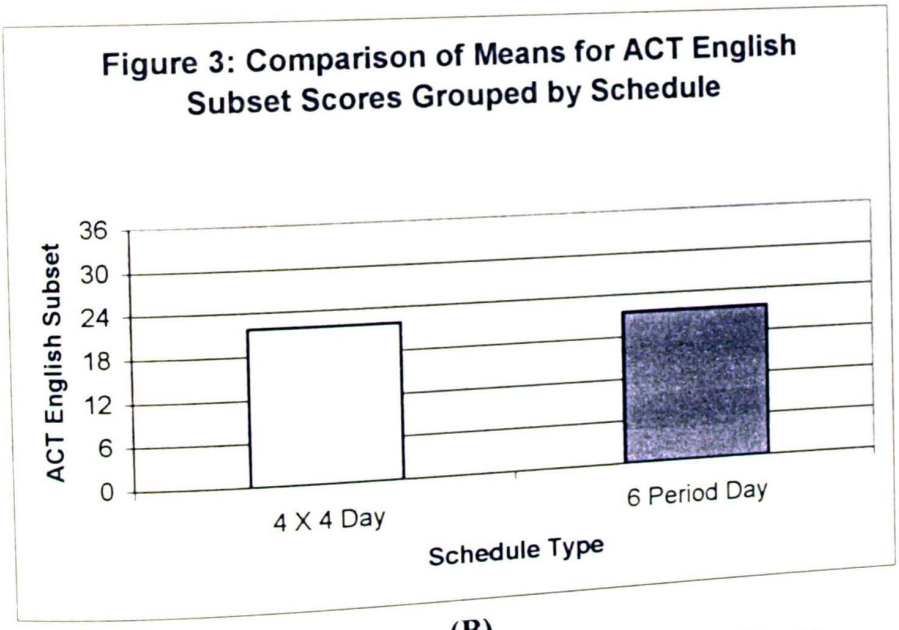
To answer the last question about ACT subset scores, two-sample *t* tests were conducted on each set of scores. First, the means for the English subset scores for seniors on the 4 x 4 block schedule and the six-period day schedule were, respectively, 21.797 and 21.568. The difference was not significant ($t(436) = .459$, $p > .05$).

Table 3: Two-sample *t* test on ACT English Subset Scores Grouped by Schedule

Group	N	Mean	SD
4 x 4 Schedule	197	21.797	5.05
6-Period Schedule	241	21.568	5.29

Pooled Variance: t = 0.459, df = 436, Prob = 0.646

(A)



(B)

Figure 3. Comparison of ACT English Subset Scores (A) *t* test, (B) mean scores.

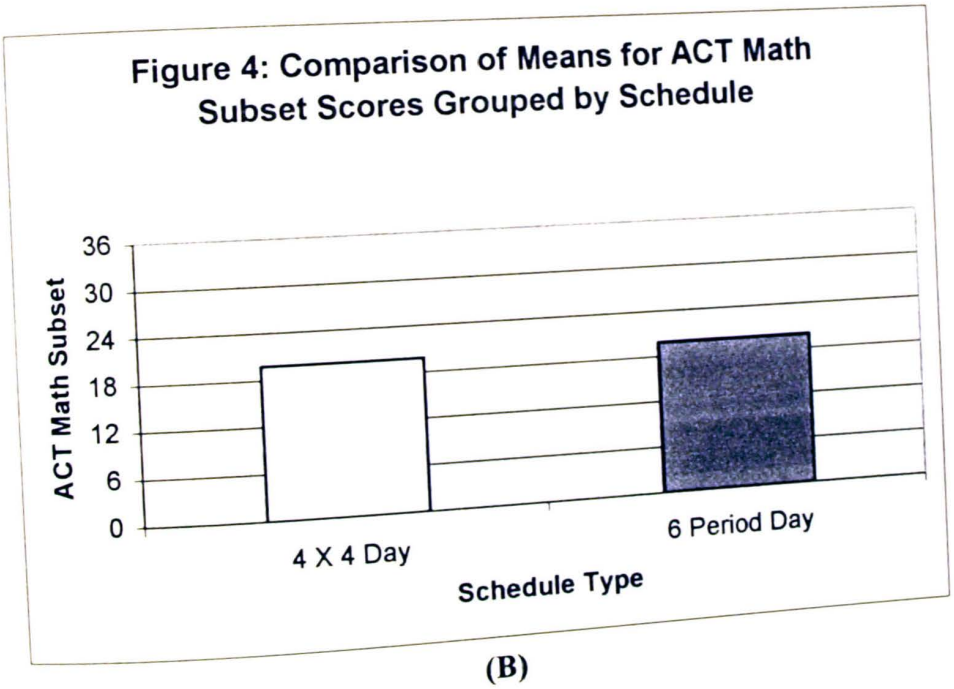
Second, the means for the math subset scores for seniors on the 4 x 4 block schedule and the six-period day schedule were, respectively, 19.822 and 19.842. The difference was not significant ($t(436) = -.048$, $p>.05$).

Table 4: Two-sample *t* test on ACT Math Subset Scores Grouped by Schedule

Group	N	Mean	SD
4 x 4 Schedule	197	19.822	4.269
6-Period Schedule	241	19.842	4.456

Pooled Variance: t = -0.048, df = 436, Prob = 0.962

(A)



(B)

Figure 4. Comparison of ACT Math Subset Scores (A) *t* test, (B) mean scores.

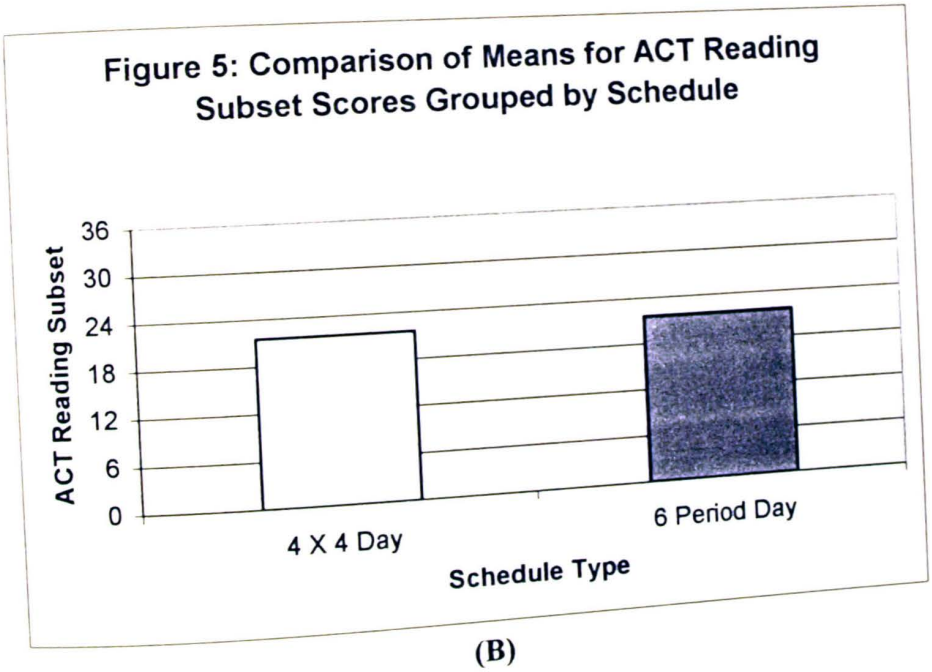
Third, the means for the reading subset scores for seniors on a 4 x 4 block schedule and a six-period day schedule were, respectively, 21.543 and 21.660. The difference was not significant ($t(436) = -.218$, $p>.05$).

Table 5: Two-sample *t* test on ACT Reading Subset Scores Grouped by Schedule

Group	N	Mean	SD
4 x 4 Schedule	197	21.543	5.524
6-Period Schedule	241	21.66	5.589

Pooled Variance: t = -0.218, df = 436, Prob = 0.827

(A)



(B)

Figure 5. Comparison of ACT Reading Subset Scores (A) *t* test, (B) mean scores.

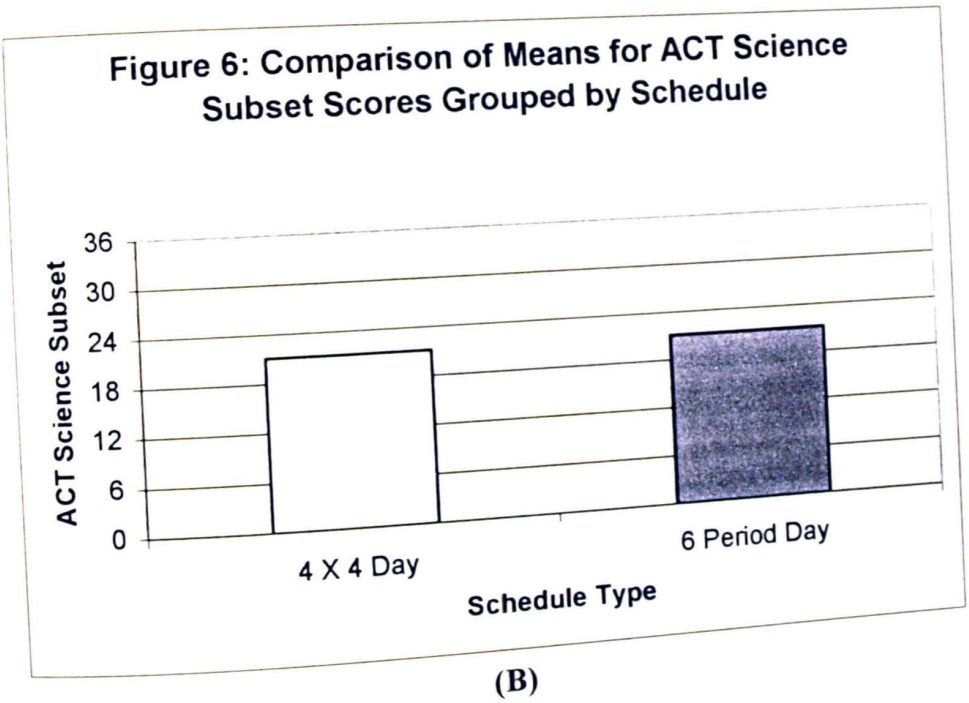
Fourth, the means for the science subset scores for seniors on the 4 x 4 block schedule and the six-period day schedule were, respectively, 21.152 and 21.108. The difference was not significant ($t(436) = .113$, $p>.05$).

Table 6: Two-sample *t* test on ACT Science Subset Scores Grouped by Schedule

Group	N	Mean	SD
4 x 4 Schedule	197	21.152	3.732
6-Period Schedule	241	21.108	4.350

Pooled Variance: t = 0.113, df = 436, Prob = 0.910

(A)



(B)

Figure 6. Comparison of ACT Science Subset Scores (A) *t* test, (B) mean scores.

Research Hypothesis

The research hypothesis was: *College-preparatory high school seniors who completed four years on a traditional six-period day schedule will show no significant differences in their GPAs; ACT composite scores; and ACT subset scores in English, mathematics, reading, and science than those college-preparatory high school seniors who completed four years on a 4 x 4 semester block schedule.*

It appears that the data support the hypothesis except in one of the cases. The one exception was the GPAs; there was a significant rise in the GPAs of students on the 4 x 4 block schedule. The data showed no significant differences in the ACT composite scores, nor did the data show any significant differences in the ACT subset scores in English, math, reading, and science.

First, a two-sample *t* test was conducted on GPAs of both senior classes. The mean GPA for the seniors on the 4 x 4 schedule was 3.264; the mean GPA for the seniors on the six-period day schedule was 2.810. The difference was significant ($t(436) = 7.796$, $p<.001$).

Second, a two-sample *t* test was completed on the ACT composite scores. The mean ACT composite score for the seniors on the 4 x 4 schedule was 21.259; the mean ACT composite score for the seniors on the six-period day schedule was 21.162. The difference was not significant ($t(436) = .243$, $p>.05$).

Next, two-sample *t* tests were conducted on each set of ACT subset scores. First, the means for the English subset scores for seniors on the 4 x 4 block schedule and the six-period day schedule were, respectively, 21.797 and 21.568. The difference was not significant ($t(436) = .459$, $p> .05$). Second, the means for the math subset scores for seniors on the 4 x 4 block schedule and the six-period day schedule were, respectively, 19.822 and 19.842. The difference was not significant ($t(436) = -.048$, $p>.05$). Third, the means for the reading subset scores for seniors on a 4 x 4 block schedule and a six-period day schedule were, respectively, 21.543 and 21.660. The difference was not significant

($t(436) = -.218$, $p>.05$). Fourth, the means for the science subset scores for seniors on the 4 x 4 block schedule and the six-period day schedule were, respectively, 21.152 and 21.108. The difference was not significant ($t(436) = .113$, $p>.05$).

CHAPTER V
SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Summary

This study was conducted to determine if the schedule type college-preparatory high school seniors followed made a significant difference in student achievement. First, professional literature was examined. Through this literature review, it was determined that, in general, schedule type did not make a significant difference in student achievement; other variables seem to play an important role in student achievement. One important variable appeared to be the quality of how teachers and students engaged in the teaching and learning process. Another important variable was the amount of time students spent studying the core curriculum. Second, GPAs, ACT composite scores, and ACT subset scores of the two senior classes from a rural, comprehensive high school in the Southeast were examined. One class completed four years on a 4 x 4 block schedule, and the other completed four years on a six-period day schedule. The results of this exploration confirmed much of the information found in the professional literature review. When schools converted to a block schedule, GPAs usually rose. GPAs for the students in this study also rose. However, other indicators of student achievement as reviewed in the literature did not change significantly; neither did the ACT composite and subset scores from the students in this study.

Discussion

The analyses within this study were completed to determine if the schedule a college-preparatory high school student followed made a significant difference in academic achievement. First, the researcher sought to determine if a significant difference existed in GPAs. Second, the researcher sought to determine if a significant difference existed in ACT composite and subset scores.

Results were examined in six achievement areas. Those areas were GPAs; ACT composite scores; and ACT subset scores in English, math, reading, and science.

First, results from the literature review on GPAs indicated that regardless of high school size or location, it appeared academic gains were made when schools converted to block schedules. However, gains were not so significant that other variables should be ignored. When a two-sample *t* test was performed on GPAs from college-preparatory high school seniors described in this study, a significant rise in GPAs was found when the school converted to a 4 x 4 block schedule. The mean GPA for the seniors on the 4 x 4 schedule was 3.264; the mean GPA for the seniors on the six-period day schedule was 2.810. The difference was significant ($t(436) = 7.796$, $p<.001$). This finding was consistent with the research findings from the literature.

Second, the literature review on ACT composite scores indicated that the scores did not rise significantly when schools switched to a block schedule. Results from the two-sample *t* test performed on ACT composite scores of college-preparatory seniors in this study were consistent with those found in the literature review. The mean ACT composite score for the seniors on the 4 x 4 schedule was 21.259; the mean ACT composite score for the seniors on the six-period day schedule was 21.162. The difference was not significant ($t(436) = .243$, $p>.05$).

Third, the literature review on student achievement in the areas of language arts and social studies showed a significant rise in verbal scores when schools converted to a block schedule. The results of the two-sample *t* tests performed on ACT English and reading subset scores of students in this study were inconsistent with the findings in the literature review. The means for the English subset scores for seniors on the 4 x 4 block schedule and the six-period day schedule were, respectively, 21.797 and 21.568. The difference was not significant ($t(436) = .459$, $p> .05$). The means for the reading subset scores for seniors on a 4 x 4 block schedule and a six-period day schedule were, respectively, 21.543 and 21.660. The difference was not significant ($t(436) = -.218$, $p>.05$). The results for the students in this study showed no significant differences in the English and reading subset scores.

Fourth, information from the literature review related to math and science showed mixed results. Some schools on block schedules had higher student achievement in math and science, and others had lower student achievement. Findings concluded that variables other than schedule make a difference in student performance in the math and science areas. Specific results from the two-sample *t* tests calculated on college-preparatory seniors' math and science subset scores from this study showed no significant differences in schedule types. The means for the math subset scores for seniors on the 4 x 4 block schedule and the six-period day schedule were, respectively, 19.822 and 19.842. The difference was not significant ($t(436) = -.048$, $p>.05$). The means for the science subset scores for seniors on the 4 x 4 block schedule and the six-period day schedule were, respectively, 21.152 and 21.108. The difference was not significant ($t(436) = .113$, $p>.05$).

Recommendations

An analysis of the data indicated that further research needs to be conducted to determine what specific variables have the most significant impact on student achievement. The following recommendations are being made as a result of this study:

1. The review of literature and the results of a two-sample *t* test on GPAs of students in this study indicated a significant rise when schools converted to a block schedule. It is recommended that school officials conduct research to determine if the rise in GPAs is related to students taking more elective classes on the block schedule. This is of concern because some research indicated that the more students study the core curriculum, the more successful they are after high school.

2. In this study, the review of literature indicated a significant rise in verbal scores when schools converted to a block schedule. Results of two-sample *t* tests on ACT English and reading scores from college-preparatory seniors in this research indicated no significant differences. The discrepancy in the findings indicated that school officials need to determine if longer blocks of time promote more reading, writing, and verbal

interaction among students, thereby increasing student achievement in the area of language arts.

3. In this study, the review of literature showed mixed findings in the areas of math and science. Results of two-sample *t* tests for students in this research indicated no significant differences in ACT math and science scores. It is recommended that school officials conduct research to determine if student achievement is higher in math when periods are shorter but continue throughout the school year. Research should explore if student achievement is higher in science when periods are longer to accommodate laboratory and hands-on work.

In conclusion, the researcher will end with some statements made in Chapter I of this study. Better understanding of the most effective, efficient ways to schedule time in schools is paramount in providing a world-class education for all U.S. students. All schools and communities have their own characteristics; however, empirical research in one local school, like the research described in this paper, may provide a compass that can direct other schools when determining the most effective ways to schedule students to maximize achievement. The more empirical research schools conduct, the more effective leaders will be in guiding the decision-making process.

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APPENDIX

Austin Peay State University
Institutional Review Board

April 11, 2003

Judy Bledsoe
c/o Sutton Flynt
Education
APSU Box 4545

RE: Your application dated March 4, 2003 regarding study number 03-032: The Effects of Scheduling on Student Achievement Among College-Preparatory High-School Seniors (Austin Peay State University)

Dear Ms. Bledsoe:

Thank you for your response to requests from a prior review of your application for the new study listed above.

Congratulations! This is to confirm that your application is now fully approved. The protocol is approved through one calendar year. . . . . This approval is subject to APSU Policies and Procedures governing human subjects research. You may want to review this policy which can be viewed on the APSU website at: www@apsu.edu/www/computer/policy/2002.htm

You are granted permission to conduct your study as most recently described effective immediately. The study is subject to continuing review on or before March 17, 2004, unless closed before that date. Enclosed please find the forms for reporting a closed study and for requesting approval of continuance.

Please note that any changes to the study as approved must be promptly reported and approved. Some changes may be approved by expedited review; others require full board review. If you have any questions at all do not hesitate to contact Lou Beasley (221-7414; fax 221-7641; email: beasleyl@apsu.edu) or any member of the APIRB.

Again, thank you for your cooperation with the APIRB and the human research review process. Best wishes for a successful study!

Sincerely,

Lou M. Beasley

Dr. Lou M. Beasley
Chair, Austin Peay Institutional Review Board

Figure A-1. Letter of Approval From the University Institutional Review Board

Brooks D. Duke
Director of Secondary Education
(615) 446-7571 FAX (615) 441-1375

Dickson County Board of Education
817 North Charlotte Street
Dickson, TN 37055

August 20, 2002

Mrs. Judy Bledsoe
1077 Hickman Road
Bon Aqua, TN 37025

Dear Mrs. Bledsoe:

In response to your request, you have been granted permission to collect data from permanent records of Dickson County High School students for the purpose of your study. You may use the information in statistical form as long as individual student's information is kept confidential.

I wish you well with your study and am very interested to learn of your results.

Sincerely,

Brooks D. Duke

Figure A-2. Letter of Approval From the County Board of Education

GPAS AND ACT COMPOSITE AND SUBSET SCORES

SCHEDULE	GENDER	PATH	GPA	ENGL	MATH	READ	SCIE	COMP

Figure A-3. Sample Data Collection Sheet
Indicating Coding and Stratification by Gender
(Data were collected and stored in the records room at the high school.)

VITA

Judy Rowland Bledsoe was born in Bruceton, Tennessee, on June 9, 1954. She attended Hollow Rock Elementary School for grades 1-5 and Dickson Elementary School for grades 6-8. She graduated from Dickson High School in May, 1972. The following September, she entered Austin Peay State University and in June, 1976, received the degree of Bachelor of Science in Secondary English and Sociology Education. She entered Austin Peay State University in June, 1985, and received a Master of Science in Guidance and Counseling in August, 1989. In August, 2001, she reentered Austin Peay State University to complete an Education Specialist degree with a major in Administration and Supervision.

She taught English twelve years at Charlotte Junior High School in Dickson County. She worked as the vocational counselor for Dickson County ten years. She is employed as a school counselor at Dickson County High School.