Impact of a Ninety Minute Math Block Schedule on Math Achievement of Middle School Students

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Abstract

The purpose of this study was to examine the difference in the Texas Assessment of Knowledge and Skill benchmark test scores between students in a 90-minute consecutive math block and the 90-minute split math block model. Significant differences were found in mean scores for TAKS Math benchmark scores between all students in a 90-minute consecutive math block schedule and a 90-minute split math block schedule. It also found significant differences in mean scores for TAKS Math benchmark scores between ELL students in a 90-minute consecutive math block schedule and a 90-minute split math block schedule. Conclusions were that schedule type had a significant effect on the scores for all students and ELL students. The results of the study provide school administrators with necessary data to determine the type of block model most beneficial for students.

Key Words: block scheduling, middle school, academic achievement, mathematics

Introduction

American educators face the monumental task of reinventing the public school system and creating a new design that would close the achievement gap between the high and low-performing students and improving United States' ranking in international education while maintaining one of the shortest school years in the world (National Association of Elementary School Principals, 2008; Walberg, 2001). To make schools more efficient and effective, many American schools replaced traditional schedules with some form of block schedule (Canady, Michael, & Rettig, 1996). Blocked scheduling may provide schools the additional time needed to improve school climate, maximize learning, improve discipline, increase time on task, increase student achievement and remain competitive internationally (Queen, 2000). The block scheduling design was expected to improve the performance of low achieving students such as the special education, English Language Learners (E.L.L.), migrant, economically disadvantaged, and gifted and talented students (Quint, 2006). In 1983, the National Commission on Excellence in Education and in 1994 the National Commission on Time and Learning reported the negative effects of the short school year in the United States.

The student achievement gap between American students and students from other industrialized countries could be accounted for by the difference in number of instructional days in the school year and private tutorial services. In addition to a 50 day extended school year, almost 50% of Japanese students in the ninth grade attended juku, privately paid tutorial services (Barrett, 1990). In contrast, American students were expected to learn in 180 days a year what European students learn in 190 to 210 days, and Japanese students learn 240 days. In spite of the reports from decades past stipulating the concern, international surveys showed that American students made the least progress and had the shortest school year (Walberg, 2001). When compared to the Japanese school year, in a span of 12 American school years, Japanese students received 720 more instructional days or the equivalent of four additional years of instruction than American students. At the eighth grade level, student achievement is lower than many other countries in mathematics (Silver, 1998). According to the American Institute for Research (2003), "American school reform efforts should not be limited to strengthen mathematics instruction at the higher grade levels but should also encompass improving mathematics instruction at the early elementary levels grades" (p. 1). Compounding the problem of a short academic year is a short school day.

While students attended classes for eight hours a day, only four to five hours a day were spent on core area classes; the rest of the time was spent on electives and exchanging classes (Northeast and Islands Regional Educational Laboratory, 1998). Throughout the years, there has been no solid support for increasing days to the American school year. In 1959, 67% of Americans were opposed to increasing the number of days per year and 26% were in favor. In 1984, a year after the Nation at Risk Report, 50% of Americans were opposed to increasing the number of days per year and 44% were in favor. By 1989, 44% opposed increasing the school year, 48% said they were in favor, and 8% were undecided. Proponent of extending the school years has never obtained a clear support for a mandate (Barrett, 1990). Since Americans are unwilling or unable to add additional days to the school calendar or extend the school day, schools must develop creative ways to add instructional time to the school days. Block scheduling may provide the avenue to add instructional time without extending the school day or year. The block scheduling models presented in this study double the amount of instructional time allocated for middle school students in the area of mathematics by making small modifications in the school day, while still maintaining most of the traditional schedule.

This model was based on the original idea of J. Lloyd Trump (Queen, 2000). By taking away five minutes from an eight period 55 minute schedule and adding ten minutes to the instructional day, a nine period schedule was created. The extra period gained was used to make a two period 90 to 100 minute math block schedule. The time gain may provide schools with the time allocation structure that may allow more in-depth teaching and learning to improve student performance (Center for Education Reform, 1996). The biggest constraint that American schools face when trying to extend the school year to equal the same number of days as Japan and other industrialized nations is the cost (Aronson, Zimmerman, & Carlos, 1999). "Additional days and hours are expensive, and changing the school schedule affects not only students and teachers, but parents, employers, and a wide range of industries that are dependent on the traditional school day and year" (Silva, 2007, p. 3). American schools must develop creative ways to maximize student learning and add instructional time to improve student performance without adding additional days to the school calendar, extending the school day, or increasing cost. Block scheduling may add instructional time to the school day, provide more time for in-depth instruction and address the students' needs (Education World, Inc., 1997).

Theoretical Framework

This study was based on the guiding principle that giving students more time to learn would result in greater academic achievement. Time allocation and period length should be allotted according to the individual needs of the students (Canady & Rettig, 1995). Blocking classes gave the students, as well as teachers, more time to dedicate to each subject. Having only a few classes per day reduced the work load for students, preparation time for teachers, and permitted better interaction between teacher and student which led to the development of interpersonal relationship, a key component of J. Lloyd Trump's theoretical framework (The Center for Education Reform, 1996). When properly scheduled to address the needs of individual students, block scheduling provided the teachers the necessary time for in-depth learning by allowing the teachers extended instructional time via elongated classes. These extended classes offered students and teachers opportunities to get involved in a variety of activities such as project based learning, hands on activities, thematic unites, and interdisciplinary activities that enhanced comprehension, higher order thinking skills, and that engaged the long term memory and retention (The Center for Education Reform, 1996).

Depending on the level of complexity, subject matter, and abstract concepts, some classes required the use of labs, computers, hands-on activities, manipulatives, and instructional models that required the use of more time. Block scheduling allowed teachers the time to develop background, build solid foundations, and scaffold lessons. One of the major advantages of block scheduling was that it allowed for a variety of methods and innovations which could be brought into the lesson making it more conducive for team teaching, thematic units, experiments, and field work (The Center for Education Reform, 1996). The longer periods permitted lesson flexibility, enrichment, and teaching for mastery. It enabled teachers to advance and abandon the old lecture style that depended on delivering large amounts of information on a short period of time without developing deep understanding of content matter (Learning Spark, 2009). Block scheduling was expected to produce higher morale, better attendance, higher grades, and lower failure and dropout rates. "The Commission is convinced that if American students are to meet world class standards all children will need more academic time" (The National Education Commission on Time and Learning, 1994, p. 10). Some major concerns about block scheduling were that it would exceed the students' attention span and less frequent meeting periods would result in lower retention rate.

On the other hand, block scheduling vowed to provide teachers and students the time for more in-depth teaching and learning to develop strong emotional connections that engaged the long-term memory making the material learned more permanent. In addition, block scheduling provided teachers time for more one to one instruction, which benefited at-risk students (The Center for Education Reform, 1996; Gregory & Chapman, 2006). The review of literature does not support either claim.

Choosing a Model

Choosing a model that fits the needs of the district, campus, or school may be as important as the implementation of block scheduling. The goals of the school should be well thought out before implementing block scheduling. A 4X4 block schedule model may work well in a high school that wants to target credit accrual problems. "Students have only four courses to concentrate on at any one time; they have greater opportunities for acceleration" (Cobb, Abate, & Baker, 1999, p. 7). On the other hand, an alternating A/B block schedule model may provide a middle school more time for in-depth or extended learning for writing classes to do essays, long planning periods and reading classes to read novels (Queen, 2002). A Split Block Model is a variation of the modified block and was developed to address scheduling issue, brought about by consecutive block schedules. In Split Block Schedule Model, a class met once a day in the morning and again in the afternoon for a total of 90-minutes.

There were several potential benefits to this type of schedule. One benefit was that it allowed students with short attention span to take a break, and then return later to the same teacher to review the same lesson the same day. Another advantage was that it eliminated a lot of the problems associated with scheduling block periods. A modified block which blocks only selected classes may be used to target specific areas of instruction or specific student populations (Northwest Regional Educational Laboratory, 2001). When making some classes shorter to gain instructional time to create longer classes, it was important to meet the minimum state time requirement. Rather than implementing block scheduling for all students and for all classes, data should be analyzed to assess the needs of the students and/or campus. Based on the data evaluated, a master schedule should be developed to address problems based on the needs of the students. New curriculum and instructional strategies should be developed to meet the new challenges and benchmarks should be scheduled to valuate progress.

Statement of the Problem

This study examined the results of a middle school in south Texas that was experimenting with block scheduling. The school's TAKS scores indicated that the school was doing well in the areas of Reading, Writing, and Social Studies in comparison to the state average in the Texas Academic Indicator System. The area of math has been a major concern for the past three years and many strategies and techniques such as double dosing, giving the same subject two periods, tutorials, and student workshops have been used to address the problem. The problem was chronic, and the current solutions had proven to be temporary. The scores went down as soon as the school resumed its regular schedule. The school was looking for a permanent solution to address the problem in the area of mathematics. The purpose of this study was to determine whether split block scheduling or consecutive block scheduling had the greater impact on student academic achievement as measured by Texas Assessment of Knowledge and Skills benchmark test (2004 TAKS release) scores.

Method

This quantitative study examined the difference between scores of students in split block scheduled group and scores of students in consecutive block scheduled group in the Texas Assessment of Knowledge and Skills benchmark test scores. This study ensured randomness by dividing the students into two groups according to academic achievement using TAKS data from the previous year. Additionally, the ANCOVA procedure controlled for preexisting differences among the groups. This research analyzed and compared the data the impact that a 90-minute consecutive block schedule and a 90-minute split block schedule model had on students' academic achievement during the 2009-2010 school in one South Texas Middle School. "This is an effective method of analysis because it allows one to compare the effect of the independent variable…on the dependent variable" (Walker, 2000, p. 11). This study was conducted in a span of three months and included a pre and a posttest TAKS benchmark.

Population and Sample

The school involved in the study was composed of 660 students: 220 sixth graders, 220 seventh graders, and 220 eighth graders. While all students participated in the experimental research project, only data from students who participated in the pretest and the posttest were aggregated to the study.

Due to the high migrant population and high mobility rate, some students came into school after the pretest and others left before the posttest. The student population was divided into two groups within each grade level. The 2008-2009 TAKS scores were used to rank students from lowest to highest. One team was composed of even numbered students, and the other team was composed of odd numbered students. This gave each team an equal number of high, medium, and low scoring students, and students were academically distributed evenly. The sample distribution model used for this study was based on the Keenan, (2000) population sample distribution model. The first quartile represented the top 25% of academically achieving students based on TAKS scores for the 2008-2009 school year. The second quartile represented the second 25% of academically achieving students based on TAKS scores for the 2008-2009 school year. The third quartile represented the third 25% of academically achieving students based on TAKS scores for the 2008-2009 school year. The fourth quartile represented the lowest 25% of academically achieving students TAKS scores for the 2008-2009 school year (Keenan, 2000, p. 40).

Instrumentation

The 2004 Texas Education Agency TAKS Release Tests was used as a pretest and posttest instrument to determine which type of block schedule had the greatest impact on the students' TAKS benchmark scores. The data collected for this study consisted of TAKS benchmark scores. Microsoft Excel was used to collect and maintain students' TAKS benchmark scores. The data were housed in a secure area in the principal's office. Tango is a benchmark data collection and analysis program and was used to collect the TAKS benchmark data used in this study. Tango is an automated assessment program that uses handheld computers to collect and desegregate assessment data. The program ensured accurate collection and desegregating of data beyond simple scores by providing a clearer picture of students' gains and losses though individual and group analysis by TAKS objectives and student expectations (TEKS). Data from Tango and Microsoft Excel was extracted and placed into the Statistical Package for the Social Sciences (SPSS) software for statistical analysis. The variables included student instructional group, pretest scores, and posttest scores.

Procedures

The researcher sent a letter to the superintendent of the school district to request permission to conduct the study at the middle school, and then requested approval from the principal of the middle school. Students in each grade level were assigned into one of two teams, Team A or Team B. The teams were composed of 100 to 130 students per team in each grade level totaling 300 to 350 students per team. The 2008-2009 TAKS scores were used to rank the students. Students were assigned equally to each cluster according to academic quartile, top, middle top, middle bottom, and bottom. The student population was divided into two groups within each grade level. This gave each team an equal number of high, medium, and low scoring students and academically evenly distributed. Parents of the students were asked to sign a consent form for the students' participation in the study. In September all students were administered the 2004 math TAKS release test, which was used as a pretest. In November, all students were administered the 2004 math TAKS release test which was used as a posttest. Data were collected via the Tango program.

Data Analysis

Students' progress was tracked over a period of three months, September to November data for this study were collected though Tango and Microsoft Excel. The data were imported into SPPS software. The SPSS software was used to analyze the data. The data analysis yielded the means and standard deviations for the two groups for both test times and a histogram was used to examine the variable distributions for normality. The independent variable, measured on a nominal scale, was group membership. The independent variable had two levels: split block schedule model or consecutive block schedule model. "Because parametric tests are used to examine for significant difference, between mean, that required the dependent variable be measured on an interval scale" (Kerr, Hall, & Kozub, 2002, p. 53). The dependent variable was the TAKS benchmark scores on the November exams and the covariate was the benchmark test scores from September TAKS benchmark exams. Controlling for preexisting differences between the groups, an analysis of covariance (ANCOVA) was used to determine if there was a significantly statistical difference between split block schedule and consecutive block schedule in students' TAKS benchmark scores. The ANCOVA procedure was repeated a second, time but did not include 130 Special Education students in the same groups, Team A and Team B. The ANCOVA procedure was repeated a third time but included only 180 English Language Learner students in the same groups, Team A and Team B.

The dependent variable, measured on the interval scale, was students' academic posttest performance in the math TAKS benchmark scores. The covariate, pretest scores, was used to control preexisting differences between the groups.

Reliability and Validity

Reliability is the ability of an instrument, experiment, or test to measure uniformly and consistently when used under the same conditions with the same subjects (Howell et al., 2005). The 2004 TAKS benchmark test used to assess the students' participation in this study had gone though a thorough evaluation process to ensure the reliability of each item in the test. According to Technical Digest (2007): Test reliability was an indication of the consistency of the assessment, SDAA II, RPTE, EOC, and TAAS exit level test reliability data are based on internal consistency measures. These include, in particular on the Kuder Richardson Formula 20 (KR20) for tests involving dichotomously scored (multiple choice) items and the stratified coefficient alpha for TAKS tests involving a combination of dichotomous and polytomous (short-answer and extended response) items. Most internal consistency reliabilities were in the high .80's to low .90's range (1.0 being perfectly reliable), with reliabilities for TAKS assessments ranging from .83 to .93, for SDAA II assessments ranging from .71 to .86, and for RPTE assessments ranging from .93 to .94. The reliability for the Algebra I EOC Assessment was .92. (p. 167) The 2004 TAKS benchmark test used to assess the students' participation in this study had gone though a thorough evaluation process to ensure the validity of each item in the test. The validity of the items in the TAKS test was reviewed by experts at TEA, Educational Testing Service, Pearson Educational Measurement, and Questar, Inc.

Results

Demographic Data Analysis

The data were collected from two campus benchmark tests and consisted of the 2004 Math TAKS release pretest and posttest. The ANCOVA procedure from the Statistical Package for Social Sciences (SPSS) was used to determine if there were statistically significant differences in students' posttest math test scores from a 90-minute consecutive math block schedule model to scores from a 90-minute split math block schedule model, when controlling for preexisting differences using the pretest math scores. The pretest and posttest data were recorded as percents. The raw score, which is simply the number of questions answered correctly on the 2004 TAKS release test, was converted into a percentage. The number of problems was divided by 100 and each question was given an equal value. Because a scale score was not used, the study was unable to interpret differences across sets of test questions and did not take into account the complexity level of the individual questions. The two block scheduling models were implemented at three grade levels: sixth, seventh, and eighth grade between September 1, 2009 and November 30, 2009. The 2009-10 middle school class was composed of a population of 228 sixth grade students, 231 seventh grade students, and 203 eighth grade students, for a total 662 students. Students were divided into two groups in each grade level. See Table 1.

Insert Table (1) about here

From the target population of 226 sixth grade eligible participants, 125 participants, 55%, were assigned to the 90-minute consecutive math block and 101, 45%, were assigned to the 90-minute split math block model. The special education populations for each grade level were proportionally assigned. The sixth grade population was composed of 34 special education students. Fifteen, 44%, were placed in the 90-minute consecutive math block schedule model, and nineteen students, 56%, were placed in the 90-minute split math block schedule model. The sixth grade population included 197 English Language Learners (ELLs). One hundred eleven students, 56%, of sixth grade ELLs, were placed in the 90-minute consecutive math block schedule model, and 86 students, 44%, of the sixth grade ELLs, were placed in the 90-minute split math block schedule model.

The seventh grade target population consisted of 230 participants. One hundred students, 41%, were assigned to the 90-minute consecutive math block, and 130 students, 59%, were assigned to the 90-minute split math block model. The seventh grade special education population was composed of 27 special education students. Eleven students, 41%, were placed in the 90-minute consecutive math block schedule model. Sixteen, 59%, were placed in the 90-minute split math block schedule model. The seventh grade population included 97 English Language Learners (ELLs). Forty-five students, 46%, were placed in the 90-minute consecutive math block schedule model. Fifty-two, 54%, of the seventh grade ELLs were placed in the 90-minute split math block schedule model. The eighth grade group was comprised of 205 eligible participants.

One hundred four participants, 51%, were assigned to the 90-minute consecutive math block and 104 students, 49%, were assigned to the 90-minute split math block schedule. The eighth grade special education population was composed of 25 special education students. Thirteen students, 52%, were placed in the 90-minute consecutive math block schedule model. Twelve students, 48%, were placed in the 90-minute split math block schedule model. The eighth grade population included 66 English Language Learners (ELLs). Twenty-nine students, 44% of eighth grade ELLs, were placed in the 90-minute consecutive math block schedule model. Thirty-seven, 28%, were placed in the 90-minute split math block schedule model. A total of 323 participants were assigned to the 90-minute consecutive math block and 337 participants were assigned to the 90-minute split math block model. From the total sample population of 85 Special Education students, 40 were assigned to the 90-minute consecutive math block and 45 special education students were assigned to the 90-minute split math block model. Of a total sample population of 359 English Language Learners, 188 were assigned to the 90-minute consecutive math block and 172 English Language Learners were assigned to the 90-minute split math block model.

Students were instructed by 12 math teachers. Four math teachers were assigned to each grade level, and each grade level had two teams. Each team consisted of one Science teacher, one Language Arts teacher, one History teacher, one Reading teacher, and two Math teachers. One team in each grade level instructed the students using the consecutive block schedule and the other team used a split block schedule. Because students attended two math periods with the same teacher, each teacher serviced only 50 to 65 students, rather than its equivalent of 100 to 130 students on a traditional schedule. Several elective subjects were eliminated, and teaching slots were allocated for additional math teachers. Math teachers on the same team were given a common planning period to coordinate instructional activities. Weekly department meetings were scheduled to articulate the math curriculum in the sixth, seventh, and eighth grade levels. The average class size was 17 students per teacher, and the range was 12-18. The TAKS 2004 Release Test was administered as a pretest on September 1 and as a posttest on November 20.

Data Analysis

Three hypotheses were developed to determine the difference in academic achievement as measured by the Texas Assessment of Knowledge and Skills benchmark test (2004 TAKS release) scores between students in the 90-minute consecutive math block and the 90-minute split math block model. The first hypothesis encompassed all students in grades sixth, seventh, and eighth. The second hypothesis included students in the special education program. The third hypothesis took into account students in the English Language Learning program. Test scores were calculated and entered into SPSS as percentages.

Null Hypothesis 1

There was no statistically significant difference in the Texas Assessment of Knowledge and Skills benchmark test (2004 TAKS release) scores between students in the 90-minute consecutive math block and the 90-minute split math block model. An ANCOVA test was conducted to determine if there was a statistically significant difference in the TAKS benchmark test (2004 TAKS release) scores between students in the 90-minute consecutive math block and the 90-minute split math block model. The analysis indicated that there were statistically significant differences in student achievement between students in the 90-minute consecutive math block and the 90-minute split math block model.

A one-way ANCOVA was conducted on the first hypotheses to determine if there was a statistically significant difference in the TAKS benchmark test (2004 TAKS release) scores between students in the 90-minute consecutive math block and the 90-minute split math block model. The factor, the type of block schedule, included two levels: consecutive block and split block. The dependent variable was students' TAKS benchmark scores on a posttest and the covariate was students' TAKS benchmark scores on a pretest. Before conducting a one-way analysis of covariance (ANCOVA), a pretest was conducted to check if the data met the homogeneity-of-slopes assumption. The test evaluated the interaction between the covariate and the factors in the predictor of the dependent variable. The preliminary analysis evaluating the homogeneity-of-slopes assumption indicated that the relationship between the covariate and the dependent variables did not differ significantly as a function of the independent variable, $F(1, 656) = .18$, $p = .647$, partial $\eta^2 = .00$, therefore, the assumption for homogeneity of the slopes was met. See Table 2/

Insert Table (2) about here

Results of the main effect and the covariate for a one-way ANCOVA indicated that the one-way ANCOVA was significant; the group source evaluated the null hypothesis that the population adjusted means were equal. The results of the analysis indicated that the hypothesis should be rejected. Table 4.2 summarizes the results of the analysis for all sixth, seventh, and eighth grade students who took the Math TAKS benchmark test (2004 TAKS release) as a pretest on September 1 and as a posttest on November 30. There were statistically significant differences in academic achievement as measured by the 2004 TAKS test between students in the 90-minute consecutive math block and the 90-minute split math block model. The ANCOVA was significant, $F(1, 657) = 10.84$, $MSE = 177.08$ $p < .01$. The strength of the relationship between the type of block schedule, factor and the dependent variable was small as assessed by the partial η^2, with the block schedule group accounting for 2% of the variance of the dependent variable, holding constant the pretest TAKS benchmark score.

The mean of TAKS benchmark scores adjusted for the initial differences suggested a small effect size between the factor, type of block schedule, and the dependent variable, academic achievement as measured by the 2004 TAKS scores. The test adjusted means for the two groups were reported in the Estimated Marginal Mean box as 61.11 for the split block schedule group and 64.53 for the consecutive block schedule group. The mean of the consecutive block schedule students, adjusted for the initial differences, had the largest adjusted mean ($M = 64.53$), and the mean of the split block schedule students, adjusted for the initial differences, had a smaller adjusted mean (M=61.11)

Null Hypothesis 2

There was no statistically significant difference in the TAKS benchmark test (2004 TAKS release) scores between special education students in the 90-minute consecutive math block and the 90-minute split math block model.An ANCOVA test was conducted to determine if there was a statistically significant difference in the TAKS benchmark test (2004 TAKS release) scores between special education students in the 90-minute consecutive math block and the 90-minute split math block model. Hypothesis 2 was to reveal if there were no statistically significant differences in special education student achievement between students in the 90-minute consecutive math block and the 90-minute split math block model. A one-way ANCOVA was conducted on the second hypotheses to determine if there was a statistically significant difference in the TAKS benchmark test (2004 TAKS release) scores between special education students in the 90-minute consecutive math block and the 90-minute split math block model. The factor, type of block schedule included two levels: consecutive block and split block. The dependent variable was students' TAKS benchmark scores on a posttest and the covariate was students' TAKS benchmark scores on a pretest.

Before conducting a one-way ANCOVA, a pretest was conducted to check if the data met the homogeneity-of-slopes assumption. The test evaluated the interaction between the covariate and the factors in the predictor of the dependent variable. The preliminary analysis evaluating the homogeneity-of-slopes assumption indicated that the relationship between the covariate and the dependent variables did not differ significantly as a function of the independent variable, $F(1, 81) = 7.45$, $p = .008$, partial $\eta^2 = .08$, therefore, the assumption for homogeneity of the slopes was not met. Because the assumption for homogeneity of the slopes was not met, a one-way ANCOVA was not appropriate for the special education group. Therefore, it was not conducted.

Null Hypothesis 3

There was no statistically significant difference in the TAKS benchmark test (2004 TAKS release) scores between ELL (English Language Learner) students in the 90-minute consecutive math block and the 90-minute split math block model.

An ANCOVA test was conducted to determine if there was a statistically significant difference in the TAKS benchmark test (2004 TAKS release) scores between ELL (English Language Learner) students in the 90-minute consecutive math block and the 90-minute split math block model. Hypothesis 3 was to reveal if there were statistically significant differences in student achievement between ELL (English Language Learner) students in the 90-minute consecutive math block schedule and the 90-minute split math block schedule. A one-way ANCOVA was conducted on the third hypotheses to determine if there was a statistically significant difference in the TAKS benchmark test (2004 TAKS release) scores between English Language Learning students in the 90-minute consecutive math block schedule and the 90-minute split math block schedule. The factor, type of block schedule included two levels: consecutive block and split block.

The dependent variable was English Language Leaning students' TAKS benchmark scores on a posttest and the covariate was students' TAKS benchmark scores on a pretest. Before conducting a one-way ANCOVA, a pretest was conducted to check if the data met the homogeneity-of-slopes assumption. The test evaluated the interaction between the covariate and the factors in the predictor of the dependent variable. The preliminary analysis evaluating the homogeneity-of-slopes assumption indicated that the relationship between the covariate and the dependent variables did not differ significantly as a function of the independent variable, $F(1, 354) = .02$, $p = .886$, partial $\eta^2 = .00$, therefore, the assumption for homogeneity of the slope was met. See Table 3.

Insert Table (3) about here

A one-way (ANCOVA test was conducted. Results of the main effect and the covariate for a one-way ANOVA indicated that the test was significant; the group source evaluated the null hypothesis that the population adjusted means were equal. The results of the analysis indicated that that the hypothesis should be rejected. Table 4.3 summarizes the results of the analysis for all sixth, seventh, and eighth grade students who took the Math TAKS benchmark test (2004 TAKS release) as a pretest on September 1and as a posttest on November 30. There were no statistically significant differences in academic achievement as measured by the 2004 TAKS test between English Language learning students in the 90-minute consecutive math block and the 90-minute split math block model. The ANCOVA was significant, $F(1, 355) = 16.98$, $MSE = 180.84$, $p < .01$.

The partial η^2 of 0.05 suggested a moderate relationship between the factor, type of block schedule, and the dependent variable, academic achievement. The test adjusted means for the two groups were reported in the estimated marginal mean box as 63.37 for the split block schedule group and 57.49 for the consecutive block schedule group. The strength of the relationship between academic achievement and dependent variables was moderate, as assessed by a partial η^2, with consecutive block scheduling accounting for 5% of the variance of the dependent variable. The mean of the consecutive block schedule students, adjusted for the initial differences, had the largest adjusted mean ($M = 63.37$), and the mean of the split block schedule students, adjusted for the initial differences, had a smaller adjusted mean ($M = 57.49$).

Discussion and Conclusions

The findings supported the theoretical framework designed by J. Lloyds Trump and the guiding principle that giving students more time to learn could result in greater academic achievement. In the first hypothesis, which included all students, students in the 90-minute consecutive math block had a higher adjusted mean. For the second hypothesis, which included all special education students, the assumption for homogeneity of the slopes was not met; therefore, a one-way ANCOVA was not conducted. For the third hypothesis, which included all English Language Learners, students in the 90-minute consecutive math block had a higher adjusted mean. All students and English Language Learners students in the 90-minute consecutive block schedule had greater math academic achievement than students in the 90-minute split block schedule. Schedule type had a significant effect on the scores for all students and ELL students in this study. All students and English Language Learners in the 90-minute consecutive block schedule had greater academic achievement in math than students in the 90-minute split schedule. These findings suggest that type of block scheduling for the all students group and for the English Language Learning students improves math academic achievement.

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Table 1 Eligible Study Participants

	Special Education	E.L.L.	All Students	Split Block	Consecutive Block
6th Grade	34	197	226	101	125
7th Grade	26	97	230	136	94
8th Grade	25	66	205	101	104
Total	85	360	661	337	323
Split	45	172	337		
Consecutive	40	188	323		

Table 2 One-Way Analysis of Covariance Summary for TAKS scores for All Students

Source	*Df*	*MS*	*F*	Partial η^2
Group	01	1920.166	10.84**	.016
Error	657	177.08		
Total	660			

**$p < .05$

Table 3 One-Way Analysis of Covariance Summary for TAKS scores for all English Language Learners

Source	*df*	*MS*	*F*	Partial η^2
Group	1	3.74	0.021**	.016
Error	355	181.34		
Total	358			

**$p < .05$