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Effects on Students of a 4 X 4 Junior High School Block Scheduling Program

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Abstract

The effects of a 4 X 4 block scheduling program in a middle school on a variety of student measures were investigated. These measures included standardized achievement tests in mathematics, reading, and writing, cumulative and semester grades in middle school and high school, attendance rates, and enrollment rates in advanced high school courses (in mathematics only). The block scheduling program had been in effect for four years allowing analyses of current middle and high school students who had experienced a minimum of one and one-half years of block scheduling while in middle school. The primary research design was a post-test only, matched pairs design. Students were matched on school characteristics, gender, ethnicity, grade level, and 5th grade standardized reading scores. Results were relatively consistent with the extant literature and generally positive.

Introduction

With the advent of the public school reform movement in the 1980s, schools and school districts were barraged with criticisms and demands for educational reforms. Murphy (1990) categorized the variety of these criticisms driving the educational reform agendas into three major groups: (a) Macro-level conditions, such as the failure of the United States to maintain its competitive edge in a global marketplace, (b) school outcomes, such as declining student achievement or increasing dropout rates, and (c) school conditions, such as lack of adequate standards for students or poor quality or commitment by staff.

Responses to these various criticisms also have been clustered, for example, in federal initiatives, state mandates and policies, and local efforts as school improvements (Firestone, 1990). Often, reform initiatives are the result of interactions between two or more sources of these initiatives (c.f. Wills & Peterson, 1992; Odden & Marsh, 1990), particularly if those reforms originate at state or federal levels. The systemic reform initiatives of the 1990s, for example the school-to-work initiative (Agency for Educational Development, 1995), originated with federal legislation but impacts both state-level and ultimately local-level schooling (Fuhrman & Massell, 1992; Goertz, Floden, & O'Day, 1995). Reforms that originate at the local level, however, can be driven by levels higher up or stand- alone efforts. Block scheduling and school-based management, for example, are two such stand-alone reform initiatives whose locus has been strictly from grass roots level. While school-based management has had a relatively robust examination in the literature in recent years (Wohlstetter, Smyer, & Mohrman, 1994; Center on Educational Governance, 1995), the literature on block scheduling remains relatively scant and underpowered.

Although the variations of block scheduling are endless and idiosyncratic to the schools that implement them, all forms of block scheduling carry one common feature--extended classroom periods of time beyond the traditional 50-minute class period. Although block scheduling has been in existence and reported in the contemporary literature since the late 1960s, it gained momentum in the late 1980s as a viable scheduling model in response to the literature on cognition supporting deeper learning by students through sustained and uninterrupted interactions with their subject matter. Recently Cawelti (1994) estimated that nearly 40% of American high schools had implemented or intended to implement some form of block scheduling, attesting to its popularity as a flexible scheduling option.

The purpose of this research was to add to the literature base on block scheduling by combining several advantageous features of research on educational innovations in general which are not typical of the block scheduling empirical literature base. These were the use of multiple measures of student effects, the use of a high-quality matched control group sampling design, and the use of a school in which block scheduling had been in place for several years.

Models of Block Scheduling

Although idiosyncratic modifications to any block scheduling model are typically implemented at any school using block scheduling, there are five general models of block scheduling that appear in the literature. One of these -- parallel block scheduling -- is used exclusively at the elementary school level and thus will not be further mentioned in this article. The other four models are used exclusively at the middle school, high school, and postsecondary levels. These are the 4 X 4 Semester Plan, the Alternative Day Plan, the Trimester Plan, and the Extended-Time Plan. Table 1 gives a brief description of these models and includes any alternative names for these models that have appeared in the recent literature.

Effects of Block Scheduling

Interest in extended periods of classroom time beyond the traditional 50-minute period first appeared in the contemporary literature under the concept of "modular scheduling", "flexible scheduling", or "modular flexible scheduling" (Polos, 1969; Stewart & Shank, 1971; Thomson, 1971; Wood, 1970). These descriptive articles arguably derived from what is considered the progenitor of block scheduling -- Carroll's (1963) seminal treatise on the theoretical advantages of extended time in school classroom periods based upon early learning theory. Presently, some 35 years later, the descriptive literature still abounds both supporting and decrying the merits of block scheduling. Fortunately the empirical literature has gradually evolved as well, and it is this literature that will be summarized briefly below.

Within this empirical literature base it is most common to encounter research on student effects and opinions of block scheduling, teacher effects and perceptions of effects of block scheduling, and parent opinions of block scheduling. Since this study focused exclusively on student effects and opinions of block scheduling, only that literature will be reported below.

Table 1

Four General Models of Block Scheduling

Model	Alternative Names	Features	Unique Advantages and Disadvantages
4 X 4 Semester Plan	Accelerated Schedule Copernican Plan	Students enroll in four 90-minute courses that meet every day of the week for a semester, allowing completion of four year-long eq uivalent courses in a semester. Teachers typically teach three courses e ach semester.	Advantages are that teachers work with fewer students, ha ve fewer preps, and a fresh start with new students in the middle of the year. Students have only four courses to concentrate on at any one time; they have greater opportunities for acceleration. Disadvantages are less opportunity to give homework. There seems to b e less time to complete the curriculum coverage. Courses taken in the Fa ll semester may not be followed by a course in the same discipline for 9 months. Year-long programs/courses such as band, orchestra, and choir ca n be cut short.
Alternative Day Plan	A/B Odd/Even Day1/Day2	Students and teachers meet in three-four 90-120 minute cl asses on alternating days for the entire year.	Advantages are that teachers have the entire year for eac h course, with a class intensity of 90-120 minutes per course; greater op portunity to give homework due to alternating schedule; no extended laten cy period between courses. Disadvantages are the unevenness of scheduling with classes alternatin g each week as to which are on Mondays and which

			are on Tuesdays can be c onfusing.
Trimester Plan	None	Students take two-three 120 minute classes for 60 days, a long with two-three traditional-length classes for the entire year.	Advantages are that it accommodates those programs/course s such as band, choir, and orchestra that need year-long contact with stu dents, while maintaining weekly intensity of 4 X 4 Semester Plan Disadvantages are similar to 4 X 4 Semester Plan
Extended- Time Plan	Reconfiguring the Year	Schools usually partition their school year into three se gments, generally including two 75-day blocks, and one 30-day block (some times between the 75-day blocks, sometimes at the end of the year). Then during the 75-day blocks, students enroll in three-four 90-120 minute co urses daily. During the 30-day segment, students work in concentrated re mediation or enrichment activities.	Advantages are that there is more flexibility inherent in the model. Disadvantages are similar to the 4 X 4 Semester Plan

The earliest empirical studies published under any of the model names described in Table 1 appeared in the late 1960s and early 1970s. The first (Steagall, 1968) compared outcomes in high school business education programs across the state of Ohio for students enrolled in 18 "block-in- time" schools with students enrolled in 18 "conventional" demographically matched schools. After adjusting for I. Q. differences in the students from both groups, results showed no significant main-effect differences in both knowledge and performance test scores as measured by the National Business Entrance Tests. When adding a three-level ability factor and a three-level urbanicity factor, only two significant results emerged -- one favoring block scheduling for urban students and one favoring conventional scheduling for suburban students.

Slightly more negative effects of block scheduling were found by Van Mondfrans, Schott, & French (1972) in an experimental study of block scheduling on performance on English tests and student attitudes toward school. Overall, conventional format students performed significantly better on the English tests and no significant differences were found on student attitudes. One consistent interaction effect was found favoring block scheduling with senior-level students over freshman, sophomores, and juniors. The design of this study seems somewhat flawed, however, since all 12 teachers participating in this study taught both traditional format and block scheduling classes on an alternating basis each day.

A decade later Sigurdson (1981; 1982) conducted two studies of the same junior high school in Canada. While his 1981 study showed little differences between block student’s achievement compared to traditionally-schooled students, his second year study (Sigurdson, 1982) showed dramatically more positive results in favor of block scheduling. One conclusion that has been echoed repeatedly in subsequent studies pointed to the necessity of waiting at least a year or more. For example, Schroth and

Dixon (1995) and Meadows (1995) both advocated strongly that at least three to five years of experience with block scheduling should occur in schools before valid and justifiable judgments should be drawn about effects on students.

It was not until the mid-1990s that a resurgence of empirical studies were published on block scheduling -- probably due at least in part to the exponential increase in interest -- what Shortt and Thayer (1997) call a rediscovery and redefinition. Again, many of these studies focused on teacher, administrator, and/or parent effects or opinions (i.e. Davis-Wiley, George, & Cozart; Hurley, 1997). Our interest in this review is to focus on only student effects, however, so those studies will be omitted from this review.

A number of studies have been published recently which focused on both generalized student effects (Cox, 1994; Guskey, & Kifer, 1995; Hurley, 1997; Mistretta & Polansky, 1997; Queen, Algozzine, & Eaddy, 1997; Meadows, 1995) and discipline-specific effects (Queen, Algozzine, & Eaddy, 1996; Reid, 1995; Schroth & Dixon, 1995; Wronkovich, Hess, & Robinson, 1997) of block scheduling. The results, on balance, were generally positive, but the negative findings which were reported cannot be overlooked. On the positive side, the most consistent findings that were reported were students' favorable opinions of block scheduling, particularly with teachers who found it easy to mix lecture and group-work instruction. Students also liked the fact that block scheduling seemed to reduce homework loads, although this finding would be construed as negative from other perspectives.

Beyond these kinds of qualitative student opinion effects, the findings on student achievement, attendance, and behavior/disruptions/suspensions were more equivocal. Reductions in behavior problems appeared to be relatively consistent, as were increases in attendance rates, yet if a student missed a sequence of classes for any reason, it appeared more difficult to catch up with the content and make-up assignments. At-risk students in block scheduling appeared to benefit the most consistently across the curriculum, but standardized scores on mathematics examinations were consistently lower with block scheduling.

This study adds to the literature base in several important ways. First, the great majority of empirical studies focused on the high school level, while this study reports effects on junior high school students. Second, most studies reported effects from one to two years of operating block scheduling, while the present study was implemented after four years of operation. Finally, many studies used non-probability sampling designs -- typically convenience or cluster sampling processes, while this study used a matched sampling design. None of the currently reported studies at the junior high or middle school levels used both a high quality sampling design and analysis after multiple years of operation.

Method

To implement this research, a between-groups (matched control group) design was used, with some variations depending on the particular hypothesis to be addressed. Below, each of the research hypotheses is elaborated followed by a specification of the dependent variable(s) and the specific sampling procedures for the hypothesis.

Hypotheses

This evaluation looked at effects of block scheduling on two groups of students -- junior high school students and beginning senior high school students -- along four major dependent variables -- grade point average, standardized achievement scores, attendance rates, and preparation for advanced coursework. The major research question guiding the study was: "What are the effects of block scheduling on a variety of student outcome variables?" The six hypotheses associated with this research question were:

1. Hypothesis 1 (H1): Junior high school students who experience block scheduling will evidence significantly higher grade point averages than their matched control group counterparts.
2. Hypothesis 2 (H2): Senior high school students who experienced block scheduling in junior high school will evidence significantly higher grade point averages than their matched control group counterparts.
3. Hypothesis 3 (H3): Junior high school students who experience block scheduling will evidence significantly higher standardized test scores than their matched control group counterparts.
4. Hypothesis 4 (H4): Senior high school students who experienced block scheduling in junior high school will evidence significantly higher standardized test scores than their matched control group counterparts.
5. Hypothesis 5 (H5): Attendance rates at Block Junior High School during the years in which they experienced block scheduling will not differ significantly from their attendance rates prior to block scheduling and will not differ significantly from same-year attendance rates at matched control junior high schools.
6. Hypothesis 6 (H6): Senior high school students who experienced block scheduling in junior high school will enroll in advanced coursework at significantly higher rates than their matched control group counterparts.

Table 2 presents a matrix delineating these dependent variables along with the hypotheses that were examined for each of the two groups of students.

Table 2

Dependent Variables and Associated Research Hypotheses for Each Grade Level

Dependent Variable	**Junior High**	**Senior High**
Grade Point Average	H_1	H_2
Standardized Achievement Test Scores	H_3	H_4
Attendance Rates	H_5	*
Preparation for Advanced Coursework	*	H_6

Dependent Variables and Sampling Procedures

Hypotheses 1 and 3. The grade point average dependent variable for the Block Junior High School students and their matched controls was their Fall 1996 cumulative grade point average as maintained in the school district student data system. The standardized achievement test dependent variable was represented by three scores from the Iowa Test of Basic Skills (TAP version). These scores were the reading, mathematics, and written expression raw scores.

These two research hypotheses involved the use of a matched control group sampling design. Block Junior High School students who were in the 8th and 9th grades in the Spring of 1997, and who had experienced a minimum of three semesters of block scheduling by January 1997, were designated as the experimental group. Each of these students was then matched with students from two other junior high schools in the same geographic quadrant of the city whose school size, ethnic, and socio-economic make-up were comparable. The matching process was conducted in two stages. First, each experimental group student was matched on three demographic attributes, each with two levels: grade level (8th or 9th), gender (female or male), and ethnicity (white [non-Hispanic] or other). Once a pool of potential matched control students were identified based on these criteria, a second level of matching occurred using 5th grade Iowa Test of Basic Skills (Reading) scores. Matches were thus made with the control student whose ITBS Reading score was the closest to the experimental group student. Hypotheses 2 and 4. For Senior High School students and their matched controls, the grade point average dependent variable was their first (Fall) term grade point average in high school. Thus, for 10th graders, it was their Fall 1996 grade point average; for 11th graders, it was their Fall 1995 grade point average. The standardized achievement test dependent variable was represented by three scores from the Iowa Test of Basic Skills (TAP version). These scores are the reading, mathematics, and written expression raw scores.

The sampling design (matched control group) and matching criteria that was used for the second and fourth hypotheses was essentially the same as was used for the first and third hypotheses above, with one key difference -- experimental group participants were 10th and 11th grade Senior High School students who had earlier experienced at least three semesters of block scheduling while attending Block Junior High School. Their respective matched controls could have attended junior high school at any of the districts' six junior high schools which were not under block scheduling.

Hypothesis 5. The dependent variable of attendance rates was the annual school-reported average daily attendance rates as reported to the Colorado Department of Education. Block Junior High School began its block scheduling in the Fall of 1993. Annual school-reported rates for attendance were obtained from the previous four years (1989-90 to 1992-93) without block scheduling and the first three active years of block scheduling (1993-94 to 1995-96). Similar rates for attendance of three comparable junior high schools were also sampled for comparison purposes.

Hypothesis 6. The dependent variable for this hypothesis was a ranking of the relative difficulty level of the mathematics course for which entering 10th graders had registered upon entry into high school. Registration rate for mathematics coursework was selected to represent the construct of "registration for advanced coursework" for two reasons. First, mathematics is a curricular area where almost every student registers during their first semester in senior high school. Second, while other areas such as science, English, social studies, and foreign languages are also high frequency registration areas, it is far more difficult to judge consistently what is advanced and what is not in these curricular areas. In mathematics, it is relatively easy to rank order the difficulty of classes in order to determine consistently advanced registration rates. Table 3 delineates the names of the various mathematics course options for which entering 10th grade students could enroll and the rankings for those course options as verified by mathematics teachers and counselors in the high school. The sampling design for this hypothesis was the same sampling design as that for H2 and H4 with one additional step. From the experimental group roster of students, those participants who did not sign up for a mathematics course (and their matched control counterparts) were eliminated from the sample.

Table 3

Name and Ranking of Mathematics Courses

Ranking	Math Course(s) Title(s)
1	Math Concepts
2	PTC Math - (remedial math for alternative placement students)
3	Algebraic Concepts
4	Applied Math 1
5	Integrated Algebra IA
6	PTC Algebra
7	Accounting I
8	Algebra I Saxon Algebra I - (taught in a different manner than traditionally) Integrated Algebra I - (taught in a different manner than traditionally)
9	Geometry Saxon Algebra II Integrated Geometry - (taught in a different manner than traditionally)
10	Algebra II Pre-International Baccalaureate Math
11	Pre-Calculus International Baccalaureate Math

Results

The results of this program evaluation are given in two major sections. First, a demographic profile for each of the samples is provided, to the extent that demographic data were collected on them. Second, the six research hypotheses are examined with statistical tables and charts provided as appropriate.

Demographic Profiles

Table 4 presents demographic and sampling data for those students who were included in the analyses associated with grade point averages and standardized achievement scores.

Table 4

Demographic Information on student samples for Grade Point Averages and Standardized

Achievement Scores

				Gender		Ethnicity				
Grade Level	n	Mean 5^{th} Gr Read.-Block	Mean 5^{th} Gr Read.-Trad	# Girls	# Boys	#[a] As-Am	#[b] Lat.	#[c] Af-Am	#[d] Na-Am	#[e] Cauc
Eighth	96	59.34	59.38	38	58	1	5	1	-	89
Ninth	109	61.03	61.11	56	53	2	6	-	2	99
Tenth	88	59.73	59.82	50	38	2	5	-	-	81
Eleventh	62	62.11	62.19	30	32	1	2	-	-	59
TOTALS	355	60.55	60.63	174	181	6	18	1	2	328

Note.
a - Asian-American or Pacific Islander
b - Latino/Hispanic/Mexican American
c - African-American
d - Native American or Alaskan
e - Caucasian

For each of the 355 block scheduling students, a perfect match was located relative to grade level, gender, and ethnicity. For the final matching criterion, 5th grade standardized test score in reading, it was not possible in all cases to locate a matched control with exactly the same score. However, no experimental/control matched pair differed by more than 0.09 points. In addition, boys and girls were relatively equally distributed across the grades. The samples were overwhelmingly made up of Caucasian students, which is reflective both of the community and the neighborhoods in which the schools were located.

Research Hypotheses

The analyses for Hypotheses 1-4, which examined the effects of block scheduling on student grade point average (both semester and cumulative) and standardized test scores (mathematics, reading, and writing), were completed using five ANOVA's with repeated measures on the matching variable. Student gender (two levels) and student grade level (four levels) represented the between groups variables, and the block schedule students scores compared with the matched control group students scores represented the third within subjects variable. Table 5 presents the results of these five ANOVA's in abbreviated form.

As can be seen in Table 5, significant main effects for the matching variable (at $p < .10$) existed for both Experimental/Control contrasts and for the mathematics achievement test scores. Significant first order interactions (at $p < .05$) existed for the semester GPA contrast. All other effects were not significant.

Table 5

ANOVA Results for GPA and Achievement Test Contrasts

Criterion Variablep. value			
Semester GPA	Exp/Cont*	2.75	.098
	Exp/Cont x Gender ***	7.51	.006
	Exp/Cont x Grade Level ***	4.26	.006
	Exp/Cont x Gender x Grade Level	0.67	.568
Cumulative GPA	Exp/Cont **	5.36	.022
	Exp/Cont x Gender	0.59	.441
	Exp/Cont x Grade Level	0.06	.804
	Exp/Cont x Gender x Grade Level	1.28	.259
Standardized Math	Test *	3.47	.064
	Test x Gender	0.27	.761
	Test x Grade Level	0.03	.873
	Test x Gender x Grade Level	1.70	.184
Standardized Reading	Test	0.01	.915
	Test x Gender	1.36	.246
	Test x Grade Level	0.37	.545
	Test x Gender x Grade Level	0.15	.697
Standardized Writing	Test	0.49	.483
	Test x Gender	1.68	.197
	Test x Grade Level	0.65	.422
	Test x Gender x Grade Level	0.03	.863

p < .10
**p < .05
***p < .01

Table 6 presents the sample sizes, means and standard deviations (for the significant within or between group contrasts only), and corresponding effect sizes for those contrasts in Table 5 that proved statistically significant at the $p < .10$ level. As can be seen from Table 6, the four significant Experimental/Control group contrasts all favored block scheduling, whereas the single significant standardized test contrast (in math) favored traditional scheduling. It is also evident that the magnitude of the significant effects, particularly those with $p < .05$, ranges relatively consistently between one quarter to one third of a standard deviation.

Table 6

Descriptive Results for GPA and Achievement Test Effects

Criterion Variable	Effects	n pairs	Mean (s.d.) Block Schedule	Mean (s.d.) Trad. Schedule	ES
Semester GPA	Exp/Cont* Exp/Cont x Gender*** (males) Exp/Cont x Grade Level*** (10th graders) (11th graders)	346 177 87 61	2.91(.87) 2.80(.92) 2.82(.95) 2.82(.82)	2.82(1.00) 2.56(1.04) 2.50(1.06) 2.57(0.96)	0.09 0.22 0.30 0.25
Cumulative GPA	Exp/Cont**	150	2.98(.76)	2.80(0.74)	0.24
Achievement Test	Math*	236	61.63(26.18)	65.36(25.24)	-0.15

Finally, Table 7 gives all of the directions of the mean differences for each of the five sets of contrasts regardless of their statistical significance. As can be seen in Table 7, the totals are exactly equal in terms of the number of instances where the block scheduling means were greater than and less than the traditional scheduling means. It should be remembered, however, that only three of the contrasts were statistically different from each other at the $p < .05$ level, and all three favored the block scheduling students.

Table 7

Numbers of Contrasts in which the Mean of the Block Sch eduling Students is Greater than and Less than the Mean of the Traditiona l Scheduling Students

Criterion Variable	Effects (# of possible contrasts)	# contrasts when	# contrasts when

		mean block > trad.	mean trad. > block
Semester GPA	Exp/Cont (1) Exp/Cont x Gender (2) Exp/Cont x Grade Level (4)	1 1 3	0 1 1
Cumulative GPA	Exp/Cont (1) Exp/Cont x Gender (2) Exp/Cont x Grade Level (2)	1 2 2	0 0 0
Standardized Math	Test (1) Test x Gender (2) Test x Grade Level (3)	0 0 0	.1 2 3
Standardized Reading	Test (1) Test x Gender (2) Test x Grade Level (2)	1 0 1	0 2 1
Standardized Writing	Test (1) Test x Gender (2) Test x Grade Level (2)	0 1 1	1 1 1
TOTALS	28 possible contrasts	14	14

Hypothesis 5 focused on an examination of comparative attendance rates at Block Junior High School before and after initiating block scheduling, and with three comparable schools. Figure 1 displays the average daily attendance rates of all four schools for the four years prior and three years after initiating block scheduling. As can be seen in Figure 1, Block Junior High School's ADA rate had been declining slightly each year (from a 94.5 attendance rate in 1989-90 to a 93.7 rate in 1992-93) prior to implementing block scheduling. Attendance rates reversed this trend beginning in the Fall of 1993 and climbed consistently about 0.1 percentage point each of the three years of block scheduling. Figure 1 does not show any clear patterns of attendance rates for the other three junior high schools during the four pre-block scheduling and three post-block scheduling years.

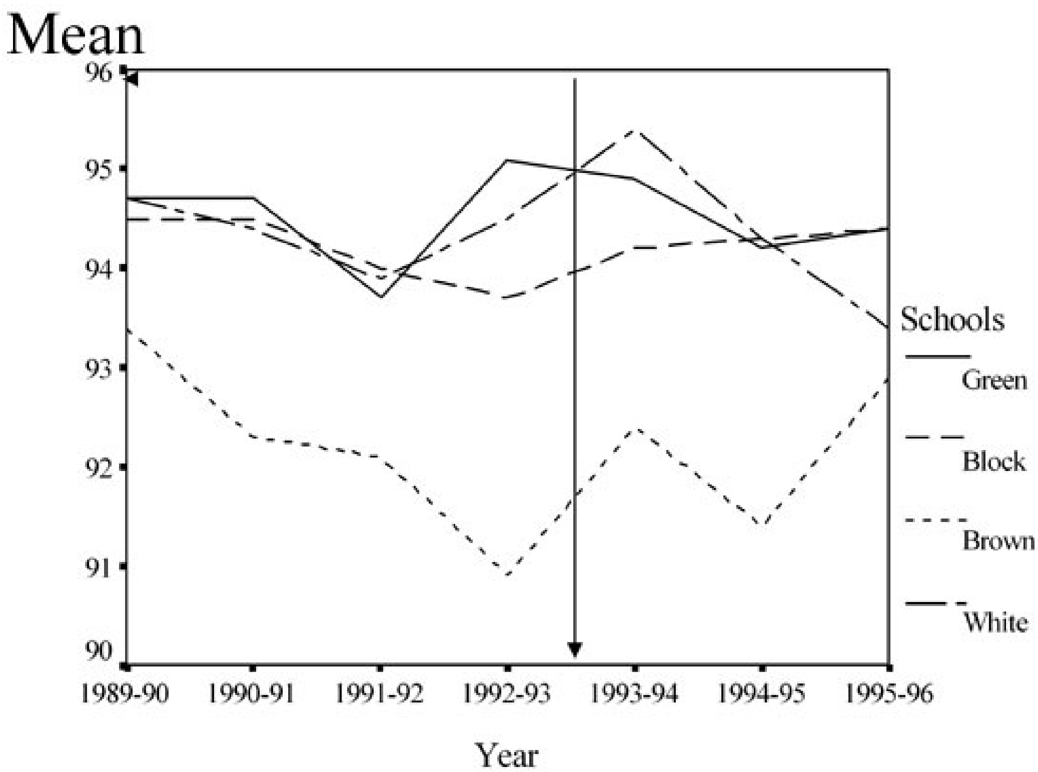

Figure 1. Comparison of average daily attendance rates of Block Junior High School with rates at three comparable junior high schools with traditional scheduling. (The vertical line in the center of the figure signifies the point at which block scheduling was implemented at Block Junior High School.)

Hypothesis 6 was concerned with comparing advanced coursework registration rates in 10th grade mathematics by students who had experienced block scheduling versus those who had not. Referring back to Table 3, it can be seen that there were eleven possible mathematics courses into which students could register at the high school to which they matriculated upon completion of their junior high school experience. Table 8 presents the results of a Wilcoxin signed ranks matched pairs test. As can be seen, the mean ranked mathematics course registration was virtually identical for both block scheduled and traditionally scheduled students.

Table 8

t-test of Advanced Mathematics Course Registration

	Descriptive Statistics			Inferential Statistics	
Comparison Group	Mean	N	Std. Dev.	T-Value	P-Value
Junior High School Students	8.57	238	2.12	0.189	.851
Comparison School Students	8.54	238	1.83		

Discussion

In prior literature, there were only three empirical studies examining student effects of block scheduling at the middle/junior high school level. Two of them were sequential examinations of a variety of student effects at the same junior high school (Sigurdson, 1981; Sigurdson, 1982) in Alberta, Canada; Schroth and Dixon (1995) looked strictly at mathematics achievement effects of block scheduling on students at two middle schools in Texas. In both locations, a 4 X 4 schedule was used; none of the three looked at effects past two years of implementation, and both sets of authors indicated that more time was necessary in order to ascertain true effects of this scheduling intervention.

Schroth and Dixon (1995) did find, however, that mathematics achievement did not differ significantly between those students prepared using block scheduling compared with those prepared under traditional scheduling. Sigurdson (1982) also found no differences between block-scheduled and traditionally-scheduled students in their attitudes towards mathematics nor in their mathematics achievement scores. Similar "no differences" findings relative to mathematics effects were found by Lockwood (1995) and the North Carolina Department of Public Instruction (1995), although these studies were both conducted at the high school level.

The findings of this study confirm the "no differences" conclusion in registration for advanced mathematics courses, but conflict with the "no differences" finding on mathematics achievement. The block-scheduled students in this study performed significantly less well on standardized mathematics tests compared with their traditionally- scheduled peers. The "no differences" findings in this study in standardized reading and writing test scores also is consistent with the findings of Holmberg (1996). Again, Holmberg was studying standardized test scores of high school students rather than junior high school students.

On the positive side, this study found consistently higher grade point averages, both semester and cumulative, in favor of block scheduled students. These kinds of non-standardized achievement effects have been reported in the high school literature on block scheduling (Buckman, King, & Ryan, 1995; Reid, Hierck, & Veregin, 1994; Payne & Jordan, 1996), but have been contradicted by Parkinson and Parkinson (1995) at the postsecondary level.

At a more complex level this study found statistically significant interactions suggesting block scheduling has a more positive semester GPA effect on male students compared with female students and for 10th and 11th graders compared with 8th and 9th graders. These interactions did not hold for cumulative GPA. No other studies specifically examined differential effects by grade level, and Lockwood’s (1995) study was the only study reporting out gender effects, which were not found to be present.

Finally, this study examined attendance data. This variable was a popular one in the literature with positive findings at the high school level reported by Buckman et. al., (1995) and Reid et. al., (1994), and no differences reported by Guskey and Kifer (1995). This study did not test for statistically significant differences, but did provide a visual examination of attendance rates over time and across several schools. The findings here are consistent with those cited above.

Very little that is definitive can be inferred from this study. As mentioned earlier, its most positive contributions would be that it begins to fill a significant void in the middle/junior high school literature on effects of block scheduling. This contribution is made all the more important given the relatively high-quality matched group design, and given that block scheduling had been in effect for four years when the data for this study were collected.

As is usually the case, this study points to as many questions as answers, however. In addition to the necessity for more high-quality studies at the middle/junior high school level, two very fertile areas of follow-up research were suggested from this study. First, variables of gender and ethnicity need to be embedded in every design in future studies to clarify as much as possible differential effects. If the gender or effects found in this study, or other kinds of attributional effects hold up over time, these findings may present the most damaging or even fatal flaws in block scheduling reported to date.

Just as important is the need for researchers to ratchet up the "block versus traditional schedule" contrast variable to account for multiple ways of implementing block scheduling. There are sufficient schools, for example, which are implementing alternate day scheduling now to allow for multiple block scheduling contrasts to be made instead of the typical single contrast between block scheduling and traditional scheduling. Similarly, there are now enough modifications that have been reported to 4 X 4 semester block scheduling to allow for multiple contrasts even within this single model of block scheduling.

This research venue may ultimately provide the most illuminating information about the potential for block scheduling in the schools. Many 4 X 4 semester block scheduled schools are currently leaving room in the schedule for year-long, 50-minute classes which can accommodate the needs for year-long attention to mathematics, band, chorus, and advanced placement classes. These kinds of modifications probably hold the key in the long run to establishing the flexibility in scheduling to make the best use of the characteristics educators like of both traditional and block scheduling.

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