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teven L. Kramer

Factors That May Have Contributed to Decreased Test Performance in British Columbia's Block Scheduled Schools

As noted on the section about test scores in Part I, Bateson (1990) and Marshall et al. (1995) reported that British Columbia students in semestered schools produced significantly worse test scores than did those in traditional schools. Although the research for this article focused on evaluating the effects of block scheduling in fairly broad terms, it seemed worthwhile to make some attempt to identify factors that may have caused problems in British Columbia. To do this, the author interviewed researchers, administrators, and ministry officials in British Columbia, and reviewed articles identified by the people interviewed. As a result, the following factors that may have contributed to reduced test scores have been identified.

Irregular planning time. When a semestered block schedule is implemented in a British Columbia high school, teachers are frequently allotted planning time for only half the year. That is, they plan for one of the four periods during one semester, and have no planning time the other semester. Thus, there may be insufficient planning time to support instructional modifications appropriate to a block schedule.

Little opportunity to modify curriculum. In British Columbia, it is difficult to make the kinds of curriculum adjustments that are needed in math when switching to a block schedule. Within each individual course, content is mandated province-wide. In addition, high stakes provincial examinations at the end of high school help keep courses throughout high school to fixed content (Anderson et al., 1990).

It is also difficult to add more courses within a content area. Instead of being broken down by topic (e.g., algebra I, geometry, probability),

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courses in British Columbia are organized around grade level (e.g., math 9, math 10, math 11), with topics to be covered yearly mandated for each grade. Thus, it would be difficult for a school in British Columbia to modify the math curriculum by developing an additional math course while restructuring the content within existing courses, as many successful block scheduled schools in the United States have done. Presumably, similar problems occur in science and other subject areas.

Provincial exams may encourage lecture and memorization. British Columbia's provincial exams tend to encourage precisely the types of teaching methods that adapt least well to a block schedule. As described by Anderson et al. (1990, p. 80), they "tend to force a focus on memorization of knowledge—recall of course content information—as opposed to critical thinking and problem solving types of processing." This appears to have encouraged the widespread use of lecture modes to ensure teachers have "covered" the material needed for future years, and for the exam (Wideen et al., 1991).

British Columbia's provincial exams tend to encourage precisely the types of teaching methods that adapt least well to a block schedule.

Furthermore, people interviewed in British Columbia indicated that block scheduled teachers on average were allocated about 10 fewer hours per course. Some interviewees felt this had resulted in a rush to cover the curriculum in block scheduled schools. Observations of math and science teachers in block scheduled schools in British Columbia (Stevens, 1976) indicate they were if anything *more* likely to rely exclusively on lectures than were teachers in traditional schools, and *less* likely to take time for participatory modes of instruction or to emphasize higher order thinking. In short, the kind of instructional modifications made in the block scheduled schools appear to have been the opposite of those needed for success in longer time blocks.

Conclusion: Switching to a Block Schedule Can Endanger Academic Performance

The results reported in Bateson (1990) and Marshall et al. (1995), which show strong drawbacks to the block schedule, indicate that schools switching to longer time blocks should proceed with caution. An analysis indicates that longer time blocks may have been implemented in British Columbia without adequate planning time, without restructuring the curriculum, and without support for modified teaching methods. Interviews with math teachers in the United States support the conclusion that, under these conditions, implementing a block schedule is likely to have a negative impact on student achievement.

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In contrast, results from North Carolina (Averett, 1994) appear to indicate it is possible to adopt a semestered block schedule without any negative effect on achievement, even when allocated classroom time is reduced. One key factor that may account for the apparent success in North Carolina is that allocated teacher planning time was nearly doubled under the block schedule, from 50 to 90 minutes daily.

It is still undetermined what impact a block schedule will have on student achievement when it is implemented with appropriate support, while holding allocated classroom time constant. In situations with sufficient staff development, planning time, and curriculum modification, switching to a block schedule could lead to achievement gains—especially in studies that control for allocated teaching time. To date, however, such a situation has not been investigated.

Schoolwide Structural Issues: Tentative Findings from Research

1. Which of the two major types of block scheduling (intensive or alternating-day) works best?

Two authors evaluated various block scheduling models. Sessoms (1995) compared three block scheduled schools. One used an alternating-day schedule, one a semester plan, and one a trimester plan. He found the semester plan to be superior, but his reasons for preferring it are unclear.

Similarly, Carroll (1994a) claimed that more intensive block schedules (as measured by students taking fewer classes and teachers teaching fewer classes at one time) are superior to less intensive ones. He compared seven block scheduled schools on attendance, suspensions, dropouts, student grades, and the number of credits completed, and found that the ones with more intensive block schedules did better overall.

The research to date on how a block schedule affects at-risk students provides some corroborating evidence for Carroll's theory. At-risk students seem to benefit from increased concentration on only a few classes at a time, and from the opportunity to retake a failed class either in the same year or at the beginning of the next year. Neither of these benefits is available in an alternating-day block schedule. Research to date indicates that both failure and dropout rates are likely to decrease in an intensive block schedule; there are few data on whether alternating-day schedules produce the same effect, but the above analysis provides theoretical reasons that they may not.

In addition, math teachers in a block scheduled school are likely to want students to take a larger number of math courses over their high

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school career. This is particularly true in schools that allocate fewer hours to each math class after switching to a block schedule. Since math classes are often sequential, it will be easier for students to take two math classes in the same year in a intensive block schedule than it will be for them to take two math classes in a school where they take eight classes at a time and each class lasts all year.

2. How well have extra-help or tutorial periods worked in block scheduled schools?

Among schools that have adopted a block schedule with a tutorial or seminar period, many have based their design on a Copernican model, as first implemented in the Renaissance Program at Masconomet (Mass.) High School. A team from Harvard University who evaluated the Renaissance program singled out the seminar periods as one of the few parts of the program that did *not* work well (Carroll, 1994a).

Reid (1995a) described five schools in British Columbia with block schedules modeled after the one at Masconomet High School. All five had tutorial periods; in four of the five cases, the principal noted that the period was not successful.

King et al. (1975) noted that allowing students unassigned time under a block schedule put a great strain on some schools because of students conspicuously misusing the time, but that in other schools staff support and supervision of unassigned time made it educationally viable. Evans (1971) surveyed teachers at a Fort Worth, Tex., block scheduled school about independent study time: Only 32 percent felt it was "somewhat beneficial" or "beneficial," while 5 percent felt it was a "necessary evil" and 46 percent felt independent study time was an "unnecessary evil."

Some authors have attributed the demise of modular scheduling, a 1960s innovation similar to the block schedule, to problems with tutorials and similar unstructured student time. Goldman (Canady and Rettig, 1995) made this observation about modular schedules in the United States. King et al. (1978) made a similar observation about modular schedules in Manitoba, Canada.

A few schools have reported successfully incorporating seminar or tutorial periods into a block schedule (Hottenstein and Malatesta, 1993; Hillcrest HS, 1995). Overall, however, it seems that such a period is more likely to fail than to succeed.

3. How important is it for the faculty to achieve consensus before switching to a block schedule?

Results to date indicate that the degree of faculty consensus sometimes, but not always, affects the success of a block schedule. Some schools

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have been very successful in adopting a block schedule, even though part of the faculty initially opposed the switch. When Hatboro-Horsham (1995) adopted an intensive block schedule, the staff was evenly divided between preferring the block schedule and preferring a traditional schedule. Two years later, 83.6 percent of the faculty supported the new schedule, and only 6.3 percent thought it was a bad idea.

Several of the teachers interviewed for this study reported similar experiences. At the MCTM conference, three math teachers presented workshops on block scheduling. All three were strong advocates of the schedule; two had initially opposed the change.

On the other hand, others interviewed felt that lack of initial consensus could doom a block schedule to failure. In addition, King et al. (1978) found that long-term support for a block schedule was higher when the staff was involved in the decision to switch. Salvaterra and Adams (1985) described a school that had persistent difficulties implementing a block schedule, partly because of initial ambivalence on the part of the staff.

Use of Instructional Time

Math teachers have been concerned that they may not be able to cover the content as effectively under a block schedule. This concern splits into two issues: How much time is allocated for math instruction, and how efficiently the allocated time can be used.

Math teachers have been concerned that they may not be able to cover the content as effectively under a block schedule.

In some schools students spend fewer hours in each math course under a block schedule than they did under a traditional schedule, but this situation is often balanced by students taking a larger number of math classes during the four years of high school. Overall, whether most students spend the same, fewer, or more hours in math class after switching to a block schedule varies from school to school.

It is legitimate, however, to ask whether the time spent in math class is time *well* spent. Math teachers have been worried, for example, that under a block schedule student attentiveness might be reduced, that gaps in sequential instruction might harm student learning, and that students may complete less homework. How legitimate are these concerns?

How efficient is math instruction under a block schedule? For every hour a student spends in math class, does he or she spend more or fewer hours learning mathematics?

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The subsections below provide detailed discussion of areas that might affect how well time is used in a block scheduled math class. The following table summarizes their findings.

TABLE 1

The Effects of Block Scheduling on the Efficient Use of Math Classroom Time

Findings applicable to both major types of Block Schedule	Findings applicable only to Intensive Block Schedules	Findings applicable only to Alternating Day Block
Positive: Less time is allocated to administrative tasks. ***Negative:*** Absences may be more disruptive to student learning than they are under a traditional schedule.	***Positive:*** — ***Negative:*** Students may forget some material during gaps in sequential instruction, but this forgetting probably has little practical impact on performance in the next sequential math course. ***Neutral:*** Weak evidence suggests that students may have a higher engagement rate than under a traditional schedule.	***Positive:*** — ***Negative:*** Students may complete less homework .

Instructional vs. administrative time. Several authors (Averett, 1994; Canady and Rettig, 1995) have pointed out that under a block schedule, less time per day is spent taking roll, settling into the class, dismissing class, etc. There are, however, some exceptions: Bateson (1995) indicated that British Columbia and Ontario schools had traditionally allocated two weeks at the end of each school year to testing, parent conferences, etc., and that under a semestered block schedule they allocated two weeks at the end of each *semester* to these non-instructional activities. This doubled the amount of such non-instructional time yearly.

Research from Ontario may corroborate this observation: Raphael, Wahlstrom, and McLean (1986) found that semestered math classes in Ontario had available 10 fewer useful instructional hours on average.

Overall, it seems likely that switching to a block schedule will gain some instructional time by reducing administrative time. The evidence from Canada cautions that schools need to be careful not to introduce administrative policies that will negate this advantage.

Engagement rate. Student attentiveness could affect the amount of useful instructional time available. Some teachers interviewed feared that student time-on-task would decrease during longer time blocks.

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The literature review did not find any studies that investigated this issue in schools with alternating-day block schedules. One study uses teacher opinions to address the issue at semestered schools. In a survey of teachers at four block scheduled schools in Frederick County, Md., Meadows (1995) found that only 2 percent indicated they were having more problems with student attentiveness and interest under a block schedule; 25 percent indicated they were having the same amount of problems; and 49.5 percent indicated they were having fewer problems.

In addition, one as-yet-unfinished study directly observed engagement rates under a block schedule. Muruyama et. al. (1995) described a report in preparation that will observe engaged time in classrooms at two semestered schools in Minnesota and compare it to engaged time at two matched traditional schools. Preliminary results indicate that, surprisingly, students in the longer block scheduled classes had a higher engagement rate than did students in the shorter traditional classes. This appeared to be true for all subject areas, including math.

Thus, the evidence to date does not appear to support the hypothesis that engagement rates will be lower under a block schedule; rather, it provides weak support for the opposite conclusion. A more definitive answer about block scheduling's effects on useful instructional time will have to wait until Muruyama et al.'s study is completed and supplemented by similar studies observing a wider variety of block scheduling models and using a larger data base.

Home study time. Only two authors addressed home study habits at schools with alternating-day block schedules. Both Sturgis (1995) and Usiskin (1995) reported anecdotes that some teachers have problems getting students to complete an amount of homework appropriate to the longer time block.

Other studies addressed the homework issue at schools with intensive block schedules. Their results were inconsistent.

Some contained weak evidence that students may do less homework under an intensive block schedule than under a traditional schedule. Meadows' (1995) survey of students at four semestered block scheduled schools in Maryland found that only 40.3 percent agreed or strongly agreed with the statement that they were doing more homework under the new schedule, whereas 57.3 percent disagreed or strongly disagreed. Averett (1994) reported that 16 percent of students surveyed from North Carolina's block scheduled schools indicated that one of the best things about the schedule was "less homework and/or (the opportunity to do) homework in class." Although this was one of the most frequently mentioned advantages of a block schedule reported to Averett, it is unclear from the low 16 percent number whether less homework is a common phenomenon that is par-

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ticularly popular with a minority of students, or an uncommon phenomenon that, when encountered, is popular with students.

In contrast to recent results in the United States, an earlier Canadian study indicated that a semestered block schedule did not reduce the amount of homework students completed. In fact, Ross (1977) reported results from a systematic survey of schools in Ontario indicating that students in semestered schools actually completed more homework than students in all-year schools.

An early literature review by King et al. (1975) also reported inconsistent results. Teachers in double-length periods reported they gave less than twice the amount of homework they would in single-length periods, and often allowed 10–20 minutes' homework time in a class period. However, the authors cited a survey by Moodie of four semestered schools in which students at all four schools reported having more homework under the block schedule than before. King et al. concluded that the amount of homework under a semestered block schedule was related to instructional methods: Group work and individual projects tended to lead to more work for students both in and outside class.

Retention of learning after a gap in sequential instruction. In semestered and other intensive schedules, do students forget more after a gap of a summer vacation plus one or more semesters between courses than they do in traditional schools after only the summer vacation? The most detailed look at this question was in an early series of articles by Rachar, Rice, and Stennett (1973), Stennett and Rachar (1973) and Smythe, Stennett, and Rachar (1974). They conducted a three-year longitudinal study involving 214 students in London, Ontario, who completed a year-long grade 9 math course in 1972. Of these students, 107 studied grade 10 math in all-year schools, 63 studied grade 10 math in the first semester (fall of 1972), and 44 studied grade 10 math in the second semester (spring of 1973). At the end of their grade 9 year, all students were given a 28-item test, consisting of a 10-item numerical skills subtest and an 18-item algebraic skills subtest. The three groups scored nearly identically on both subtests.

Each group was given the same test at the beginning of their grade 10 math course. Thus, the 44 second-semester students had a longer gap (summer plus fall) before beginning instruction than did students in the other two groups (summer only). Although there were no differences among the three groups on the basic skills subtest, the second semester group (i.e., the group with the longer time gap) scored lower than the other two groups on the algebraic skills subtest.

The test was administered again at the end of grade 10 instruction. By the end of grade 10 instruction, the second semester group had caught up with the other two, so there were again no differences in test scores on

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either subtest. Finally, all three groups were administered the test at the beginning of grade 11, and all three maintained their scores, with the groups receiving nearly identical results on both subtests.

Thus, when tested, students with an extra semester time gap did have more difficulty recalling recently learned concepts, but they recovered quickly during the subsequent math course. Over the longer term, there were no negative effects.

More recent studies (Bateson, 1990; Carroll, 1994; Marshall et al., 1995) confirm that recall of recently learned material is less accurate after a longer time gap. However, opinions remain split about whether this makes any practical difference. Students and teachers at six Ontario schools with semestered block schedules indicated on a questionnaire administered by King et al. (1978) that students encountered difficulty in returning to a subject after a break of a semester.

In contrast, Canady and Rettig (1995) provided anecdotal evidence that teachers could discern very little difference between the retention of students who had recently completed a prerequisite course and that of other students with greater time lapses between courses. Furthermore, none of the math teachers interviewed for this article indicated that gaps in sequential instruction had required them to spend extra class time on review.

Overall, it seems safest to conclude that a gap in instruction may reduce recall of recently learned material, but this will probably have no long-term negative effects on student learning. However, this conclusion is very tentative. The longitudinal studies conducted in London, Ontario, need to be replicated with data that are both more recent and conducted in a wider variety of settings.

Impact of student absences. A student who misses a day under a block schedule misses nearly twice as much lesson time. Thus, teachers have indicated that absences are more disruptive to student learning under both semestered and alternating-day block schedules than they are under traditional schedules.

A majority of North Carolina teachers responding to Averett's (1994) survey indicated that, under a semestered block schedule, their students had difficulty in recovering from absences. This was one of the two major weak points they noted. (The other was difficulty in accommodating transfer students.)

Usiskin (1995) reported similar opinions among teachers using materials from the University of Chicago School Mathematics Project in an alternating-day block schedule. Further, Sturgis (1995) reported that an alternating-day block schedule made it more difficult for teachers to ensure students made up missed homework after an absence.

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Summary and Conclusions

There are many reasons a principal may want to consider adopting a block schedule. Research indicates that both major forms of block scheduling may have important nonacademic advantages, including a calmer school atmosphere, better discipline, and improved student attitudes toward school. In addition, intensive block schedules may be particularly helpful to at-risk students, reducing both failure and dropout rates.

However, teaching effectively under a block schedule can require a change in instructional methods. In particular, lecture/direct instruction appear to be less effective under a block schedule than under a traditional schedule. After switching to a block schedule, the required changes are sufficiently dramatic that having more experienced teachers, which traditionally correlates with better student performance, may no longer be an advantage (Raphael, Wahlstrom, and McLean, 1986).

Moreover, *research indicates that it is dangerous to assume that changing schedules will necessarily lead teachers to change their teaching methods.* Without support in the form of staff development, adequate planning time, and time allocated to making necessary curricular changes, it is unlikely they will be able to do so. Without such support, switching to a block schedule can actually decrease student achievement.

To date, the academic effects of switching to a block schedule while providing teachers with appropriate support has not been well studied. It is possible, but unproved, that such a change could improve student achievement.

Table 2 summarizes conclusions about the effects of block scheduling on achievement, as well as on students' behavior, instructional practice, and use of classroom time.

For principals who are planning a switch to a block schedule, the research reviewed for this paper identified some common experiences that may provide helpful tips. It is possible that more intensive block scheduling models provide advantages unavailable to alternating-day models. At-risk students might perform better under an intensive schedule. Also, course-taking changes possible under an intensive schedule may make it easier to adapt the math curriculum (and perhaps other curricula) to the longer time blocks.

A second tip is provided by the experience of schools that have tried to accommodate differential student learning by scheduling an extra help/free study period as part of their block schedule. By and large, such periods have not worked well.

A third and final tip concerns faculty consensus. Yes, it is possible to successfully implement a block schedule even if consensus support is not reached in advance—but it appears to be considerably more difficult.

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Finally, math teachers' fears that switching to a block schedule will lead to less efficient use of class time are neither supported nor disproved. Making such a switch leads to both advantages and disadvantages. Whether there is a net gain or loss will probably vary from classroom to classroom.

TABLE 2

The Effects of Block Scheduling on:

STUDENT BEHAVIOR	**Findings applicable to both major types of block schedule:**	**Positive:** School atmosphere may become calmer. Student behavior may improve. Students may have a more positive attitude toward school.	**Negative:** —	**Neutral:** It is unclear whether there will be any change in attendance.
	Findings applicable only to semestered or other intensive block schedules:	**Positive:** Dropout rates may decrease.	**Negative:** —	**Neutral:** —
	Findings applicable only to alternating-day block schedules:	**Positive:** —	**Negative:** —	**Neutral:** —
ACHIEVEMENT	**Findings applicable to both major types of block schedule:**	**Positive:** —	**Negative:** —	**Neutral:** —
	Findings applicable only to semestered or other intensive block schedules:	**Positive:** Some schools have maintained achievement while reducing allocated classroom time. Doing so may require extra planning time and staff development. Failure rates may decrease.	**Negative:** Achievement has decreased in some schools that implemented an intensive block schedule without increasing planning time or staff development.	**Neutral:** —
	Findings applicable only to alternating-day block schedules:	**Little information is available about student achievement under an alternating–day block schedule.**		

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TABLE 2 (cont.)

The Effects of Block Scheduling on:

INSTRUCTIONAL PRACTICES	**Findings applicable to both major types of block schedule:**	**Positive:** It may be possible to study topics in more depth. There may be more time for group work, investigations of complex problems, and other participatory activities.	**Negative:** It may take more instructional time to teach each topic. Lecturing may be less effective in holding student interest.	**Neutral:** Math faculty members may need to modify the curriculum to accommodate the new schedule.
	Findings applicable only to semestered or other intensive block schedules:	**Positive:** —	**Negative:** —	**Neutral:** —
	Findings applicable only to alternating-day block schedules:	**Positive:** —	**Negative:** —	**Neutral:** —
USE OF CLASSROOM TIME	**Findings applicable to both major types of block schedule:**	**Positive:** Less time is allocated to administrative tasks.	**Negative:** Absences may be more disruptive to student learning than they are under a traditional schedule.	**Neutral:** —
	Findings applicable only to semestered or other intensive block schedules:	**Positive:** Students may have a higher engagement rate than under a traditional schedule.	**Negative:** —	**Neutral:** Students may forget some material during gaps in sequential instruction, but this forgetting probably has little impact on performance in the next sequential math course. Weak evidence suggests that students may have a higher engagement rate than under a traditional schedule.
	Findings applicable only to alternating-day block schedules:	**Positive:** —	**Negative:** Students may complete less homework.	**Neutral:** —

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Overall, switching to a block schedule is likely to be difficult. To succeed, teachers will probably need to work as hard and learn as much as they did during their first year of teaching. They may well find that the change is worth the effort—but only if principals provide them with adequate support. ***~B***

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