

Chapter 4

Cross Case Analysis and Findings

Review of the Purpose

The responsibilities that accompany teaching high school students are many. The algebra teacher faces the task of presenting required curriculum objectives while assisting students to construct an understanding of the concepts and language of algebra. Time is the canvas that bounds the creative acts of teaching and learning as teacher variables interact with student variables.

Teacher variables (content knowledge, skill, and disposition) combine during the lesson as the teacher's selection of instructional strategies (daily and over time) places the content and concepts of algebra before students with varying individual talents and abilities in an effort to appeal, to motivate, to engage, to challenge, and to build knowledge. The intent is to produce understanding that may be reflected in student achievement.

Time is perhaps the most important variable at the teacher's disposal. The block schedule is a manipulation of time that presents the teacher with multiple opportunities. The purpose of this study is to provide a view into the algebra classroom in order to capture the story of algebra instruction in an alternate day extended (hundred minute) block of time and to convey that story to the reader. Teachers take the available time and initiate instruction by selecting strategies designed to maximize student learning. Success is measured by the number of students who are engaged participants and by student achievement (grades earned.) Another reflection of success is captured in the teacher's personal view or satisfaction with the events that unfold during the instructional block.

Review of the Methodology

Individual case studies produced using qualitative research methods form the body of this research. Initial data for this study were collected through observations in high school algebra classrooms of six participating teachers (cases.) Detailed scripts and field notes of the observations along with notes from contact summary sheets were combined with additional data gleaned from a survey instrument and transcripts from interviews with each teacher. Six separate case reports were prepared, each offering rich descriptions of the real world of algebra instruction set within the context of the alternate day extended block (hundred minute) schedule. The case reports provide the

reader with vicarious experiences that answer the guiding research question, "What kind of learning experiences are evident in algebra classes in an alternate day hundred-minute block schedule?" The answer to this question appears to be that there are common themes as well as variations. Individual teacher qualities (pedagogical skill, knowledge of content, understanding of adolescents, creativity, and satisfaction with the block framework) combine to produce lessons that deliver similar content in highly divergent ways. It does not appear that the extended block of time guarantees excellent instruction, although effective lessons were observed. It also does not appear that the extended block of time ensures a wide variety of instructional strategies in any one case although various strategies were observed across cases. Certain common themes did emerge across cases during the analysis.

Each case was examined and a case matrix developed to include the major concepts of the research questions. Those concepts were teacher disposition or satisfaction, feelings and beliefs, teacher preparation or readiness, instructional design reflected by the strategies chosen, the levels of student engagement and achievement, and advice to others. The individual case reports supply evidence to answer the secondary questions from the teacher's point of view.

The case reports portray teacher satisfaction with the block as well as the teacher's sense of readiness or advance preparation for designing algebra lessons appropriate to an extended time frame. The typical instructional design used by the teacher is communicated through the thick descriptions in the classroom scenarios and the types of student responses and levels of student engagement are clarified in those same descriptive scenarios. Distinctive features of the case appear in the case report, including the teacher's individual perspective and advice to other mathematics teachers who might be assigned to teach algebra in the block. Following the development of individual case reports, the individual matrices plus the reports themselves were reviewed and examined in order to analyze findings across cases.

A cross-case matrix display was developed for each of five critical issues underlying the related research questions (teacher preparation/readiness, teacher satisfaction, instructional design/strategies, student engagement/student achievement, and advice to others.) These matrices (located in Appendix F) allowed "a quick analysis down rows and across columns to see what jumps out" (Miles and Huberman, 1994, p.

242). In this way, it was possible to compare data from the six cases and to discern patterns or themes. Careful reexamination, rechecking, and triangulating results from a review of initial data sources and case reports led to verification, revision, and discarding of impressions. The initial cross-case matrices were modified to cluster data within matrices by related themes for the purpose of better understanding.

The intent of the study was neither comparative nor evaluative, but rather to describe the reality of the algebra classrooms using a block schedule in order to inform others. My intent was to capture the teaching and learning experience in a vivid way. The process led me to a point where I was able to piece together information to produce aggregate impressions (Stake, 1995). The following findings summarize those aggregate impressions. They are organized around the five related research questions.

How prepared was the teacher to teach algebra in the block schedule?

For a variety of reasons, all but one of the teachers were unprepared to redesign their algebra instruction to fit an extended block of time or to meet on alternating days. The teacher whose prior experiences included teaching summer school and teaching middle school expressed more initial comfort with the new schedule although he, too, experienced ups and downs. Although teachers may have participated in limited staff development training designed to provide an overview for all teachers in the school, they lacked specific training in alternative ways to use their available time. This was unnerving for several of the algebra teachers and they specifically recalled how difficult the first year was for them. The workshops they attended reviewed strategies such as cooperative learning, but failed to answer specific and practical needs such as writing algebra lesson plans for the extended block of time.

Some teachers mentioned benefits to be gained by visiting other schools and talking with other teachers. However, one teacher noted that it is not always necessary to look to outsiders. With unencumbered time in the summer prior to implementation of the new schedule, it would be possible to spend staff development time as a local team of professionals--examining the available materials, the required curriculum, and sharing ideas for ways to use the time. The opportunity for unencumbered "think time" spent discussing and planning with local colleagues prior to the opening of school would be time well spent.

Three teachers expressed feeling great responsibility to account for every minute of instructional time so they planned every detail of the lesson to the minute. In some cases, that made for a rough first year in the block schedule. Four of the teachers feel more comfortable with the block today than they did at first; however, at least one teacher said the block does not fit her teaching style and she still feels unprepared. Another teacher noted that he likes the block less well today than he did at first.

What is the level of teacher satisfaction with the block schedule?

Each individual teacher is responsible for only two or three classes per day in the alternate day block schedule. Teachers appreciate interacting with fewer students on a daily basis and indicate that the block provides more time to get to know students and to work with students on a one-to-one basis. The extended block provides more time for reinforcement of ideas and allows activities to come to closure rather than being carried over to another instructional day. Teachers feel more relaxed and less rushed in presentations. They are able to work more often as facilitators and some teachers use the time to allow student exploration and investigation. All teachers cite the opportunity to provide time for discovery, group work, and in-class problem solving (including time to get started on homework.) Some teachers attempt to use more application-based or real-world problems as a way of helping students apply the concepts of algebra in a meaningful way. Several teachers indicate a lack of personal training or expertise in providing application problems or discovery-type activities for students.

All teachers indicated they do not prefer the current block schedule. It may be significant to note that no teacher felt a part of the initial decision to change to the block schedule. Although three teachers said they enjoy teaching algebra in the block, only one indicated that he feels successful with the assignment. Five teachers view the hundred minute block as too long for the typical algebra student.

Teachers cite previous training and lack of experience as reasons for disliking or being uncomfortable with the length of class time in the block schedule. Two veteran teachers cited education courses and student teaching experiences that were bounded by time frames less than one hour. As a result, teaching algebra in the block became a matter of adapting familiar strategies to "make them fit the longer time." For teachers who took that approach, the algebra lessons may not

look or feel different from lessons before the block. Other teachers, perhaps newer to the profession or veterans whose experiences included a range of assignments across middle and high school as well as summer school, felt less uncomfortable with the extended block of time.

All teachers agreed that the block has challenged them to try new instructional strategies and all believe that their algebra lessons are more varied since teaching in the block. Three teachers noted that access to support materials was limited. All teachers have access to computers as needed and their students use graphing calculators on a regular basis. However, materials for hands-on activities in algebra were limited or unavailable and access to algebra software was a problem. Software for simulations or drill and practice of algebra concepts was not known or available. Teachers did make use of generic software (such as spreadsheets) but felt they were limited in their use of technology in algebra instruction because of software issues.

However, each teacher indicated at least one benefit to the block. One teacher mentioned that both she and her students are more relaxed and less rushed during class. The block of time allows activities to unfold naturally and provides an opportunity for more individual attention to each student. Another teacher finds that the block provides more time to reinforce concepts during the lesson; yet another sees an advantage in having more time for questions and answers. The advantage of the block for two other teachers derives from time to apply the concepts (taking the idea from paper to practice) in order to answer "why do I need this?" Still another teacher uses the time for discovery activities.

Planning remains an important part of the recipe for success. Several teachers noted that planning for an extended block of time means more than simply doubling the lesson or fitting two days into one. Two teachers like the long planning time; another notes the need for teachers to use good time management skills when planning as well as when teaching. In a similar vein to the student experience, teachers themselves experience planning on an every-other-day schedule. One teacher described a sense of insight when comparing students' use of time and the teacher's own personal use of planning time. One day the teacher is required to go from class to class with no measurable time out, a situation that several teachers described as exhausting. The next day, an extended block of time is available for planning. Two teachers noted a particular

preference for the long planning block. However, the teacher must focus on using that planning time efficiently because it will be another two days before the opportunity to prepare materials presents itself again. One teacher characterized the block as much easier for teachers than for students.

Regardless of preference, all teachers saw some limitations in the schedule from the standpoint of teaching and learning algebra. Four teachers expressed concern that even with the block, there is not enough time to cover the required curriculum objectives. Four teachers believe that the current block is not contributing to improved achievement in algebra.

What is the typical instructional design of the algebra lesson?

There were similarities across cases with respect to the general structure and framework of algebra lessons. These similarities may result from generally accepted models of effective instruction that include such features as an initial focus, a period of explanation and modeling, and a time for summarization and practice activities. In any event, each case demonstrated the need to use a fast start for each lesson. Teachers used a variety of activities during the opening minutes, but without exception, they were concerned with getting algebra students engaged immediately.

Each lesson allocated time to discuss homework problems, a consistent ingredient in all classes. Another common feature across cases was the presentation of new material using a variety of methods (including lecture, demonstrations, and discovery.)

Every lesson provided time for practice and problem solving, sometimes independently, sometimes with a partner or group, and often in conjunction with teacher monitoring and assistance. Most teachers attempted to use multiple representations of concepts during the lesson. All spent some instructional time presenting algebra as a set of rules to follow. Some attempted to illustrate that learning algebra is based upon generalizations from arithmetic. All teachers used student questioning and teacher-directed dialogue as a primary instructional strategy and all allowed calculators to be used as a tool. Some sort of homework was routinely assigned by each teacher.

Other strategies were observed occurring on a less-than-daily basis but were seen in at least half of the teachers' classes. These strategies included reading assignments from the text,

evaluation activities (sometimes scored by students; other times scored by teacher), note-taking, modeling of work on the board or overhead projector (by the teacher or by students), assignment of long-term projects, and group activities requiring communication, collaboration, and problem-solving. Several teachers attempted to bring the real world into the lesson either by using an application or by using real data within the problem.

Still other strategies were observed, although less frequently, in one or two teachers' classrooms. These strategies included student discovery or investigation with minimal teacher intervention and computer-based activities. Other strategies such as using journals, guest speakers, field trips, portfolios, or computer labs were not observed at all. Teachers indicated they never use these strategies (or only rarely, in the case of computer labs.)

What is the student response (engagement and achievement?)

Engagement

During the classroom observations, most students were engaged during the algebra lessons and teachers uniformly expressed being conscious of the need to use every minute of time. All teachers see the hundred-minute block as too long for the typical algebra student, citing a belief that students either cannot pay attention for 100 minutes or are unwilling to do so. Although they accept responsibility for making algebra meaningful and for holding student attention by using various strategies, teachers generally would like to shorten class time by ten to fifteen minutes. Occasionally students were off-task, and certain teachers became visibly frustrated if the lesson plan failed to capture student attention. Two teachers appeared indecisive about what action to take when students were off-task and engagement wavered. These two teachers offered quite different lesson designs to motivate student interest (one was much more application-oriented than the other), but in both cases, more than one or two students were often off-task. There was no clear pattern to indicate that off-task behavior occurred more frequently at certain times during the block (such as the beginning, middle, or ending of class.)

Algebra is a gateway course (viewed as a key to both college admission and job entry) taken by many students. Some students are math-motivated and others are less interested in that field. Several of the teachers in the study seemed more sensitive to student response and body language. They were also the teachers who expressed a sense of responsibility to make every minute

count. The conflict between the teacher's desire to maximize student engagement combined with feedback indicating disengagement leads to a level of teacher anxiety that was mentioned frequently.

Teachers who seldom used group activities indicated that it was harder to keep students' attention. Several teachers indicated that freshmen seem less able to concentrate than older students and often seem unable to absorb all that is presented, even when activities vary. The long class seems to be a bigger dilemma for math-anxious students and students whose major area of interest is not mathematics. Teachers admitted that some students do not like mathematics and others appear unmotivated. The extended class time may be good for the motivated algebra student but hard on the struggling student. Several teachers indicated that it is their perception that neither class attendance nor student achievement has improved in the block schedule.

Another limitation of the current schedule for student engagement arises from the every-other-day meeting schedule. All teachers expressed conviction that algebra students would benefit from meeting on a daily basis and three teachers indicated serious concerns about the alternate-day arrangement. In fact, problems arising from class length were seen by teachers as less frustrating than those arising from the alternating schedule.

Achievement

A document review of final grades for the students in the case teachers' classrooms indicated that two teachers gave no As. The percentage of students receiving A, B, or C ranged from 21% to 67% across cases. Forty-three percent (43%) of the total enrollment in these teachers' algebra classes earned A, B, or C. The percentage of Ds varied from 8% to 48% with 26% of the total number of students earning a D. Across the six cases, the percentage of students failing ranged from 24% to 48%. Overall, 31% of the algebra students in these classes received an F as the final algebra grade. These numbers do not include students who failed algebra during the first semester and who were rescheduled to repeat the first semester. The failure rate of 31% represents the number of students in the case teachers' algebra classes who completed the one-year course with a grade of F. All teachers dislike the alternating aspect of the current schedule and point to the negative impact on student achievement in algebra. The need for continuity when learning

algebra was mentioned as a primary reason for preferring to meet algebra classes on a daily schedule.

Teachers mentioned homework as another important factor in student learning and achievement. Two teachers expressed difficulty determining the quantity of homework to assign in order to provide appropriate practice without overwhelming students. Teachers uniformly view practice as a key ingredient to student success in algebra and are torn in assigning manageable quantities of work when measured against the longer elapsed time between class sessions. The break from Thursday to Monday or Friday to Tuesday was problematic for algebra students and teachers. Student failure to study outside of class or to complete homework when assigned was frequently mentioned by teachers as reasons for poor student achievement as well as teacher dislike of the block.

Student attendance presents another concern that compounds the continuity issues presented by the alternate-day schedule. Teachers perceive that failure to recover from absences is a major reason for poor achievement. Some students' failing grades result from too many absences. All teachers believe that students find it difficult to catch up and become overwhelmed when they miss class activities and homework assignments. This was true even in cases where the teacher developed specific options to receive and make-up missed work (including Homework Hotlines, classroom calendars with notes and assignments posted, and teacher help after school.) At least one teacher mentioned the importance of time management for students.

What advice might the teachers offer to another teacher whose school was planning to implement the same type of block schedule?

Teachers mentioned planning as a critical first step to successful implementation of the block schedule. Five teachers indicated the need to start early and plan ahead if a change to block schedule is anticipated. Four teachers suggested unique but specific goals of planning. One recommended researching alternative strategies; a second suggested planning some projects for students; a third said to find some applications and plan labs for students; and the fourth suggested spending time redesigning homework assignments so that sufficient practice is encouraged without overwhelming the students with double assignments. One teacher noted the need to value planning time and to use it as creatively and judiciously as the classroom instructional time. When planning time is not used

effectively, the outcome can be exhausting for teacher and student.

Some teacher advice may be relevant to any teacher assigned to teach algebra in any type of schedule. (Examine your textbook and available materials. Think about the curriculum. Consider your personal enthusiasm for teaching the subject and give some thought to discipline issues. Develop a rough timeline while anticipating the need to adjust later. Select a variety of activities that will engage students in the content and concepts of algebra. Consider the attention span of students by building into each lesson a minimum of three different activities.)

The opportunity exists to utilize a variety of strategies including laboratories, projects, investigations, and computer simulations. Find out what materials are available to use in alternative types of activities. If teachers are anxious about their repertoire of strategies, training can be important. Five teachers believe guidance from others would be useful. Three suggest gathering advice from experienced teachers in practice. One teacher (who is unsure about her own creativity) suggesting finding a way to "see ideas in practice." These teachers recommend training in specific strategies for teaching algebra, including activities, pacing, and other questions unique to mathematics. Another teacher recommends unencumbered opportunities for algebra teachers to work together, to sit down and share ideas with colleagues.

Final advice from one teacher was to 'do the best you can for students when they are with you' and remember to anticipate the need for strategies to help students catch up following an absence. Teachers beginning a block assignment should be prepared to respond to the issue of student failure to complete homework assignments. Parent involvement is an important factor to student success in algebra. Parent awareness and support can contribute to success of the block schedule.

Teachers new to block schedules are reminded that 100 minutes are long; even longer without good planning. Ninth graders, in particular, may suffer as they make the transition from shorter daily classes in middle school to longer alternate day classes in the high school block. Two teachers remind others to remain sensitive to student body language and signs of flagging attention.

One teacher summarized her view of the block by advising "we've got to be willing to stick it out." The advice of these six

teachers is rich with ideas and suggestions for preparing to teach algebra in the block or for improving current instruction in the block. Given support and time to plan, there is reason to believe that teachers will improve their own practice. Without the opportunity to do so, all the long blocks in the world may not change things.