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The Effects Of Various High School Scheduling Models On Student Achievement In Michigan

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**THE EFFECTS OF VARIOUS HIGH SCHOOL
SCHEDULING MODELS ON STUDENT ACHIEVEMENT IN MICHIGAN**

by

RUSSELL E. PICKELL

DISSERTATION

Submitted to the Graduate School

of Wayne State University,

Detroit, Michigan

in partial fulfillment of the requirements

for the degree of

DOCTOR OF EDUCATION

2017

**MAJOR: EDUCATIONAL LEADERSHIP AND
POLICY STUDIES**

Approved By:

Advisor

Date

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DEDICATION

To my wife Kristy, one of the most inspirational and passionate educators I have ever known. Thank you for our life together, our beautiful family, and for supporting me personally, professionally, and educationally. I know it hasn't always been easy, but I am always stronger when you are by my side.

To my sons Ryan and Alex and Eric. I could not ask for three better men to be my sons. You are a constant source of joy and happiness. Thank you for your encouragement and love and for giving me the inspiration to excel. Together, you three give me the inspiration to be a better father and more importantly a better person. I have loved every minute of watching you grow and look forward to many years to come. Thank you for being who you are. The world is yours to discover and explore.

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TABLE OF CONTENTS

DEDICATION.....ii

ACKNOWLEDGEMENTS.....iii

LIST OF TABLES.....vi

LIST OF FIGURESvii

CHAPTER 1 - INTRODUCTION

 Introduction.....1

 Statement of the Problem.....2

 Statement of the Method.....4

 Research Questions.....5

 Background6

 Conceptual Framework.....19

 Relevance of the Study.....22

CHAPTER 2 – LITERATURE REVIEW

 Introduction.....24

 Institutionalism.....26

 “Loose Coupling,” “Policy Coherence,” and “Bridging and Buffering”.....28

 Effect of Trimesters Schedules on a School.....31

 Academic Performance Differences Traditional and Block.....33

CHAPTER 3 - METHODS

 Research Question.....48

 Target Population and Sample.....48

 Survey Instrument49

 Independent Variables.....50

Scheduling Models and Student Achievement

Dependent Variables.....	52
Research Design.....	52
Data Collection.....	52
Analysis/Model.....	53
Statistical Hypotheses.....	54
CHAPTER 4 - RESULTS	
Variance between Scheduling Model and Student Achievement.....	56
Variance in Student Achievement due to Change in Scheduling Model.....	59
Variance in Student Achievement due to Specific Change in Scheduling Model.....	61
CHAPTER 5 - SUMMARY	
Summary.....	65
The Association between Scheduling Model and Student Achievement.....	66
The Association between Change in Scheduling Model and Student Achievement.....	68
The Change in Scheduling Model with the Greatest Association to Student Achievement.....	69
Reexamination of the Literature.....	70
Limitations and Future Research.....	71
Conclusion.....	73
APPENDIX – SURVEY INSTRUMENT.....	74
REFERENCES.....	76
ABSTRACT.....	83
AUTOBIOGRAPHICAL STATEMENT.....	84

LIST OF TABLES

Table 1 Michigan Merit Curriculum- High School Graduation Requirements.....15

Table 2 Current Model in any Year50

Table 3 Type of Model Change.....51

Table 4 Dependent Variable Descriptives.....53

Table 5 Estimated Effects of Current Model Type on ACT Scores.....56

Table 6 Estimated Effect of Changing Model on ACT Scores.....60

Table 7 Estimated Effect of Model Change Type on ACT Scores.....62

LIST OF FIGURES

Figure 1- Ideal Conceptual Framework from Policy to Impact21

Figure 2 - Conceptual Framework from Policy to Impact with Influence of “Bridging
and Buffering” in School Systems.22

CHAPTER 1: INTRODUCTION

The core responsibility of administration in a school or school district is to provide for maximum student learning, achievement, and preparation, while maintaining the most efficient use of district resources. Student learning, achievement and preparation are measured in many ways, including successfully achieving a minimum cut score on standardized assessments such as the ACT, Advanced Placement Exams, and SAT, along with successful completion of local assessments and district courses, and, of course, appropriate preparation for college and career readiness as deemed by the local community and governing board.

District resources come in many forms, including human resources, instructional resources, and time. Human resources include teachers in the classroom, interventionists, support personnel, specialists, and administration. Instructional resources include technology, curriculum materials, resources, manipulatives, and classroom supplies. Time is measured both by the quality and the quantity of the time spent on the academic task. The quality of time is controlled by many factors including teacher quality, time on task, and the instructional strategy being used. Quantity of time includes not only the total amount of time on academic endeavors, but also the way time is allocated throughout the school day. Educational leaders navigate the complex challenge of allocating all of these resources on a daily basis.

Educational leaders consider several factors when structuring the daily and yearly model for allocating time. Factors include the quantity of courses required for graduation, the demands of career technical education programs, the costs associated with implementation of the various scheduling models, and the degree to which the model promotes student learning and growth. This study specifically focused on the relationship between time allocation and scheduling model at the high school level and the corresponding relationship to student achievement, as measured by the ACT Composite, ACT Mathematics, and ACT English Language Arts components.

Statement of the Problem

District resources come in many forms, including human resources, instructional resources, and time resources. This study was centered on the resource of time. There are two methods of measuring the quantity of time in an educational setting. The two methods are the quantity of time assigned to academic endeavors, and the structure or schedule in which time is allocated throughout the school day. In the State of Michigan, the minimum total quantity of time on instruction is mandated in accordance with the State School Aid Act of 1979, Section 388.1701. This statute directs that each district shall provide at least 1,098 hours and 180 days of pupil instruction. In addition, the Revised School Code Act 451 of 1976 directs the board of a school district or board of directors of a public school academy to ensure that the district's or public school academy's school year does not begin before Labor Day. The combination of these statutes, accompanied by limited financial resources, makes it difficult for districts to exceed the minimum requirements and creates the reality that public school districts and academies in Michigan operate under the same number of instructional days, hours per day, and calendar start date. Thus, for all practical purposes the quantity of time spent on instruction is constant and consistent throughout the state for all public schools. This study was centered on the only remaining measured quantity of time left with any flexibility: namely, the time allocation structure or schedule during the day.

School administrators spend a considerable amount of time exploring and discussing the way time is distributed and spent in the instructional classroom. Educational leaders consider several factors when structuring the daily and yearly model for allocating time, such as the quantity of courses required for graduation, the demands of career technical education programs, the costs associated with implementation of the various scheduling models, and the degree to which the model promotes student learning and growth. There are many ways to distribute classroom time,

Scheduling Models and Student Achievement

but at the secondary level the most widely accepted scheduling models are six period semesters (SPS), five period trimesters (FPT), seven period semesters (VPS), standard 4x4 block (SB), and alternate day block (ADB) schedules. Time distribution is an important topic of discussion because the way time is distributed influences the classroom instruction, strategies and methodologies, and should therefore have an impact on student learning.

Canady and Rettig (1995) reviewed several non-traditional scheduling models that some elementary, middle, and high schools have used to redesign their schedules to reduce curriculum fragmentation, discipline problems, and student failure. They found that a well-crafted schedule can: a) result in more effective use of time, space, and resources (human as well as material), b) improve instructional climate, c) help solve problems related to the delivery of instruction, and d) assist in establishing desired programs and instructional practices. These are all worthwhile endeavors, but what are the effects on student learning?

Student learning is measured in many ways including, but not limited to, standardized assessment scores, local assessment grades, course completion, graduation rates, student motivation, and student attendance. In addition to student learning measures, various scheduling models also are associated with varying costs of their implementation. In the present age of accountability and efficiency, the factors that are of most concern to school administrators are costs of implementation and standardized assessment scores. When choosing a scheduling model, school administration must select a model that can meet all of the following requirements: a) accommodate the number of courses required for graduation, b) accommodate the career technical requirements as well as the requirements for graduation for career technical students, c) promote student learning and achievement, and d) be cost effective in implementation. Of these four traits,

Scheduling Models and Student Achievement

this study focused on the relationship between the various scheduling models and the effect of the models on student achievement.

This study specifically focused on the relationship between specific models of time allocation at the high school level and the corresponding relationship to student achievement. The specific scheduling models included in this study were six period semesters (SPS), five period trimesters (FPT), seven period semesters (VPS), standard 4x4 block (SB), and alternate day block (ADB) schedules. The specific measures of student achievement in this study were the ACT Composite, ACT Mathematics, and ACT English Language Arts components. This study added to the existing body of knowledge demonstrating the effects of various scheduling models on standardized assessment scores, and will assist school administrators in determining whether a higher level of student achievement on standardized assessment is among the justifications for selecting a scheduling model for their school. The costs of implementation for the stated models vary, with block schedules being more costly to operate than the six or seven period schedules. For example, in comparing a six period semester day to a five period trimester day, 24 teachers are needed for the six period day for 500 students compared to 25 teachers needed for the five period day. With financial resources being limited in most districts, it is essential for district leaders to have the proper data and information to determine if the academic results justify the cost for their scheduling model.

Statement of the Method

This study compared student performance of Michigan High School juniors (eleventh grade students) in districts with various scheduling models, including districts where a scheduling change occurred between 2007 and 2014 during the implementation of the Michigan Merit Curriculum. District personnel were surveyed to determine the current scheduling model and the

Scheduling Models and Student Achievement

identification of any scheduling model changes that occurred during the given time period. Statistical analysis, including a series of ordinary least squares (OLS) regression models were conducted to determine if there was any significant variance in average district ACT Composite, ACT English Language Arts, and ACT Mathematics scores between the various scheduling models that remained constant over the time period. Segmented regression analysis was used to identify the extent to which a change in scheduling model was associated with ACT scores. Finally, a series of regressions were estimated to identify the association between specific model type change and ACT score. The high school scheduling models included in this study were; six period semester (SPS), five period trimester (FPT), seven period semester (VPS), standard 4x4 block (SB), and alternate day block (ADB).

Research Questions

This study built on existing literature on the effects of various scheduling models on measures of student achievement on standardized assessments. Specifically, this study was conducted to do the following:

- 1) Identify the extent to which there was an association between scheduling model and student achievement.
- 2) Identify the extent to which there was an association between change in scheduling model and student achievement.
- 3) Identify the change in scheduling model with the greatest association to student achievement.

This study will assist school administrators in determining if student achievement on standardized tests should have any influence in determining the appropriate scheduling model for a school.

Background

In the United States, the individual states hold the responsibility of child education. This responsibility is outlined in state constitutions and is a fundamental revenue expense for most state budgets. Historically, the states left the responsibility of the funding, operation, and evaluation of a school or a school district to the local school system and the associated governing board. If the local school system needed revision or improvement, said revisions and improvements would be initiated and implemented at the local level. As populations, educational demands, and expenses increased, so did the organizational structures into counties and regions. This growth did not occur consistently across an individual state. As a result, educational gaps became apparent in revenues and resources allocated per child from district to district. Performance gaps also became apparent with the introduction of standardized testing. These assessments demonstrated a much lower academic performance for students in poverty and for minority students. As these gaps grew and became more apparent, state government became more involved in academic programming requirements and funding. As a result, educational operations became more standardized and less localized over time.

The federal government first became involved in education with the passing of an education act called the Elementary and Secondary Education Act (ESEA) of 1965. This act provided funding to offset additional cost for the education of students in poverty. Through this act, the federal government enshrined an equity rationale at the heart of federal education policy—the national government provided states with supplemental funding and programs in the hope of equalizing educational opportunity for poor and minority students. The intent of the funds was to provide a higher quality education to low income students with relatively few strings attached. These funds, known as Title funds, had no strings or stipulations beyond the fact that they could

Scheduling Models and Student Achievement

only be used to supplement existing programming to place students in poverty on an even playing field. These funds were used for capacity building as defined by McDonnell and Elmore (1987).

This early consensus around federal education policy began to unravel in the 1980s and 1990s. The seeds of change were sown with the publication of *A Nation at Risk* by the National Commission on Excellence in Education in 1983. *A Nation at Risk* challenged the legitimacy of the old equity approach to school improvement (Gardner, 1983). The report highlighted increasing concern across the country among state leaders, business and trade groups, and voters in general, about student achievement and its impact on economic development.

In addition to questioning the funding philosophy of ESEA, *A Nation at Risk* challenged other aspects of our educational system, including scheduling. Noting that educational achievement declines in the United States were partially attributable to the manner in which the educational process was conducted, the National Commission on Excellence in Education recommended a more effective use of the traditional school day. In 1994, the National Education Commission on Time and Learning (NECTL) stated that the degree to which today's American schools are controlled by the dynamics of clock and calendar, as opposed to student learning processes, was surprising. Recognizing that the school schedule governs how curriculum content is presented to students, and therefore affects students' abilities to master it, the NECTL advocated for more flexible time scheduling and the creation of extended blocks of time for learning.

For many years, the predominant high school scheduling format consisted of six to eight uniform periods ranging from 45-55 minutes in duration (Hackman, 2001). Following the National Commission on Excellence in Education recommendation, districts and schools began implementing more flexible time schedules utilizing extended blocks of time to facilitate a learner-centered approach to instruction. Constructivist theory, a social concept of teaching and learning,

Scheduling Models and Student Achievement

began to gain momentum alongside the reform movement in the late 1980s, further challenging the pedagogical wisdom of allocating short timeframes for instruction (Hackman, 2001). In contrast to behaviorist theory, which traditionally has focused on the instructor's role in the process of teaching, constructivism promotes the student's role in the learning process. Constructivist theory is based on the principles of actively engaging the learner in constructing meaning, permitting learners to interact with one another, applying knowledge through context-based problem-solving, and learner reflection throughout the process (Glatthorn, 1995). The constructivist movement underscored the need for larger blocks of time to facilitate a learner-centered approach to instruction, which theoretically would lead to improved achievement (Elmore, 1995).

School administrators began to explore alternative scheduling models to promote student learning, and many secondary schools began experimenting with alternative scheduling approaches that extended learning time beyond the traditional 45-55 minute period. These approaches were commonly referenced as block-of-time scheduling, or the more generic term of "block scheduling" (Canady and Rettig, 1995). According to the glossary of education reform, block scheduling allowed classes to be organized in larger blocks of time, and gave teachers and students more flexibility when participating in instructional activities. School-by-school variations in block-scheduling systems were numerous, but the most common formulations included:

- A "4 x 4" block schedule in which students took four 90-minute classes daily and finished a course in one semester rather than a full school year.
- An "A/B" or "alternating-day" block schedule in which students took eight 90-minute classes that met every other day for a full school year.

Scheduling Models and Student Achievement

- A “trimester” schedule in which students took two or three core courses at a time, with each class meeting daily, over three 60-day trimesters.
- A “75-15-75-15” schedule in which students took four 75-minute classes every day and finished courses in a semester, with each semester followed by an intensive 15-day learning-enrichment course or remedial program. Another variation was the “75-75-30” schedule, which used only a single 30-day intersession rather than two 15-day intersessions.
- A “Copernican” schedule in which students had longer classes for core academic subjects during one half of the school day and shorter daily periods for electives such as physical education or music during the second half of the day. (Block, 2013)

The most common block scheduling models are the 4x4 block, alternating day block, and the trimester. Only these three models of block scheduling were part of this study.

A representative argument made by advocates of longer instructional periods and block scheduling claimed that fewer class periods and interruptions during a school day reduced the amount of time that teachers spent on routine administrative or classroom management tasks—such as taking attendance, handing out and collecting materials, or preparing for and wrapping up activities—which increased the total amount of time that students were engaged in more meaningful and productive learning activities. Some studies have found that significant amounts of class time were commonly devoted to non-instructional tasks—in some cases, leaving only 15 or 20 minutes (out of 45 or 50) for instruction and learning (Kane, 1994). In a traditional eight-period school day, students also spent more time in the hallways and moving between classes, which further reduced the total amount of the school day that could be devoted to learning and may have also increased disciplinary issues.

Scheduling Models and Student Achievement

Another representative argument made by advocates of longer instructional periods and block scheduling claimed that teachers were able to utilize more varied or innovative instructional techniques when class periods were longer—they could cover more content with fewer interruptions, provide students with more attention and one-on-one support, and they could engage students in more sustained, in-depth learning activities, including more sophisticated projects, teamwork-based exercises, or other activities that could not be easily completed in 40 or 50 minutes (Canady and Rettig, 1995). Also, the more students that teachers had to see each day, the less time and attention they could devote to each student. Consequently, student-teacher relationships may not have been as strong, and students, particularly those with significant learning needs or disabilities, may not have gotten the personal attention and support they may have needed to succeed in a course.

A third representative argument made by advocates of longer instructional periods and block scheduling claimed that scheduling fewer classes per day reduced burdens on both teachers and students (Canady and Rettig, 1995). In a traditional eight-period day for example, teachers needed to prepare for up to eight courses and possibly double the number of students. Consequently, teachers may have been forced to rush the grading of work, provide less substantive feedback to students, or hastily plan and organize lessons. Students also needed to prepare for more courses, which could be overwhelming and have an adverse impact on learning. For example, homework assignments may have needed to be more superficial since teachers had to take into consideration the time it would take students to complete homework for six or more classes on a given night, rather than four.

Critics of block schedules tended to claim that students (particularly at certain developmental stages) could not stay focused for longer periods of time, that knowledge retention

Scheduling Models and Student Achievement

would be diminished if classes did not meet every day, or that students would fall behind more readily or quickly if they missed a day of school (Bowman, 1998). The “4 x 4 block schedule” had been more heavily criticized since students could end up with a half-year or even yearlong gap between courses. For example, students taking French I during the first semester of their freshman year, but their French II course would not be scheduled until the second semester of their sophomore year, resulting in a twelve-month gap in language instruction. Critics also questioned whether teachers actually taught differently when classes were longer or whether teachers had received enough professional development to modify their teaching strategies or lessons in ways that would make the most effective use of longer periods. In some cases, negative perceptions of block schedules stemmed not from the strategy itself, but from failed attempts to implement such a schedule in a school, or from educators who had negative experience with a poorly organized or executed block-scheduling strategy (Bowman 1998). Since block scheduling often requires significant changes in the ways lessons are structured and taught, teachers may also have resisted or disliked the system because they felt less confident with the new format or they were emotionally attached to more familiar scheduling systems. In addition to these criticisms, block scheduling models are more expensive to implement than the traditional models.

An extensive body of literature related to the effectiveness of secondary scheduling models is in existence, and the number of publications increased dramatically during the 1990's. Most reports tend to be anecdotal, consisting of individual school case studies and focused primarily on climate variables. Few studies have empirically investigated the relationship between scheduling types and student achievement in order to determine the model's' effectiveness in facilitating improved student learning. The literature can be classified into three broad types: a) summaries of teacher and student perceptions of scheduling models (e.g., Thayer & Shortt, 1999; Wilson,1995),

Scheduling Models and Student Achievement

b) theoretical and descriptive reports (e.g., Bowman, 1998; Howard, 1998; Schroth & Dixon, 1996), and c) empirically based studies (e.g., Bateson, 1990; Cheng, Dhanota, & Wright, 1981). Additionally, a number of publications address implementation issues when transitioning to new scheduling models.

A number of developments came together in the 1990s to fundamentally challenge the old politics of education and transform the national education policy arena. First, several important groups became disenchanted with the slow pace of state education reforms and began to doubt whether all states would be able to generate meaningful change in the absence of federal pressure. Reform-minded governors sought to “borrow strength” by leveraging federal authority to advance their own school reform agendas. Although states in the past had often resisted federal mandates in education, some state groups (e.g., the National Governors Association [NGA]) now began to actively lobby for them. They were joined in this effort by business groups, which in the past had favored states’ rights in education (DeBray-Pelot, 2009). Thus, an advocacy coalition was formed as a result of these groups collaborating with one another in an attempt to translate their goals into policy (Henry, 2011), and No Child Left Behind was passed.

The No Child Left Behind Act (NCLB) of 2001 required states to set proficiency standards in mathematics and reading, collect and publicly report data on achievement in these subjects, and implement strong “corrective” actions for districts and schools failing to meet the ultimate goal of all students being proficient by 2014 (including the provision of supplemental educational services (SES) and parent choice to transfer to a higher performing school) (Marsh & Wohlstetter, 2013).

NCLB changed the federal government's role in the educational landscape. With No Child Left Behind, the role of the federal government changed from capacity building to regulatory and used mandates (McDonnell, 1987). In order to promote changes in the educational system,

Scheduling Models and Student Achievement

mandates regarding student achievement on standardized tests and teacher certification were introduced. Failure to fulfill the obligations associated with NCLB resulted in sanctions in the form of reductions or limitation of the Title funds on which schools with high risk and poverty populations had grown to depend. With the implementation of NCLB, it became clear that the federal funds that previously contained relatively few strings with ESEA, and on which states had grown increasingly dependent over the years, were riddled with compliance criteria. NCLB required that all students in core classes be taught by a highly qualified teacher. NCLB further defined the parameters for meeting this highly qualified designation. As a result, colleges, universities and states no longer controlled the standards for teacher competence, and some educators found themselves in assignments that they were no longer qualified to occupy.

Student achievement accountability was also a major focus of NCLB. Student achievement, as measured and defined by approved standardized tests, were now used to evaluate districts, schools, administrators, and teachers. Districts that did not follow the policies, or that did not live up to the assessment standards, were deprived of federal funding. To the states and the local districts, repeals of previous inducements were viewed as sanctions, or at least as unfunded mandates. For secondary principals, the accountability for math and ELA associated with NCLB caused a greater focus, and in many instances, created a scheduling issue to accommodate additional time spent on these testable subjects.

In 2005 and 2006, state-level leaders had emerged as an opposing coalition of NCLB. For instance, state leaders in Connecticut had sued the federal government over NCLB's testing demands, and numerous state legislatures, including those of Virginia and Utah, had passed resolutions opposing NCLB's regulations. Hawaii's legislature passed a resolution urging local administrators to give up their federal funding. Governors, many of whom initially supported the

Scheduling Models and Student Achievement

law, by 2005 had begun to argue that they should have greater flexibility in its administration than United States Secretary of Education Rod Paige had allowed. Many termed NCLB an unfunded mandate (DeBray-Pelot, 2009). At the July 2005 National Governors' Conference in Des Moines, Iowa, the governors of 45 states, including Michigan, agreed to develop common measures for establishing high school graduation rates. This was viewed as a step toward achieving their larger goal of making high schools more academically rigorous, better preparing students for an increasingly competitive global economy, and improving performance on assessments.

A number of recent educational studies indicate that a key predictor of whether students will graduate from college is not race, gender, ethnicity or economic conditions, but whether they completed a rigorous course of study in high school (Shakrani, 2006). State governors believed that global competitiveness had left the U.S. students in an increasingly precarious position, with an economy that was demanding greater skills in mathematics, science, technology and engineering, but a high school system still aligned to the old economy. Michigan Governor Jennifer M. Granholm stated that Michigan was an example of how the success of the old economy no longer was sufficient in a world changed by technological innovations and implementations. She noted that Michigan, a manufacturing giant when General Motors, Ford and Chrysler dominated the world's automobile industry, was now in the bottom tier of states with the percentage of adults with college diplomas. Michigan policy-makers' goal was to double the number of college graduates in the state in order to make Michigan fertile ground for the jobs of the new economy (Shakrani, 2006).

The Michigan Merit Curriculum (MMC) was developed through an unusual collaboration and extraordinary partnership between school administrators, teacher unions, educational and business organizations, legislators from both parties, with active support from the State Board of

Scheduling Models and Student Achievement

Education and state superintendent of public instruction, an indication of the recognized urgency of this education issue to the future economic well-being of the state (Shakrani, 2006). It was through the combination of this advocacy coalition and the growing discontent towards NCLB that Governor Granholm was able to pass the MMC.

In June of 2006, High Schools in Michigan began implementing the MMC as defined by legislative policies MCL 380.1278a and MCL 380.1278b. The assessment adopted for this curriculum was the Michigan Merit Exam (MME) of which the ACT college readiness assessment was a central component. The Michigan Merit Curriculum required students entering 8th grade in 2006 to obtain a minimum of 16 credits for graduation. In addition, students entering the 3rd grade in 2006 (Class of 2016) would be required to complete two credits of a language other than English in grades 9-12; or an equivalent learning experience in grades K-12 prior to graduation. The credit requirements are provided by the Michigan Department of Education (MDE) and are summarized in Table 1 below.

Table 1

Michigan Merit Curriculum

High School Graduation Requirements

MATHEMATICS - 4 Credits	
Algebra I	Geometry
Algebra II	One math course in final year of high school

ENGLISH LANGUAGE ARTS - 4 Credits	
English Language Arts 9	English Language Arts 11
English Language Arts 10	English Language Arts 12

SCIENCE - 3 Credits

Scheduling Models and Student Achievement

Biology One additional science credit

Physics or Chemistry

SOCIAL STUDIES - 3 Credits

.5 credit in Civics .5 credit in Economics

U.S. History and Geography World History and Geography

PHYSICAL EDUCATION & HEALTH - 1 Credit

VISUAL, PERFORMING AND APPLIED ARTS - 1 Credit

ONLINE LEARNING EXPERIENCE

Course, Learning or Integrated Learning Experience

LANGUAGE OTHER THAN ENGLISH - 2 Credits

In grades 9-12; OR an equivalent learning experience in grades K-12 effective for students entering third grade in 2006 (Class 2016)

Michigan's new high school graduation requirements represented a tremendous shift in the state. Michigan went from having only one state-level mandated graduation requirement, which was one course in civics, to having some of the most rigorous graduation requirements in the United States. Michigan joined many other states in requiring four years of mathematics including algebra II, but became the only state that specifies that each pupil complete one math course successfully during his or her final year of high school (Shakrani, 2006).

The new state graduation requirements moved significantly beyond current requirements set up by most school districts in the state. In 2006, less than one-third of the state's 770 districts required algebra I to earn a high school diploma; a little more than a third required students to pass a biology course. ACT data for the class of 2006 in Michigan showed that only about half of the students met college readiness benchmarks in mathematics and reading (Shakrani, 2006). The

Scheduling Models and Student Achievement

corresponding rates for disadvantaged minority students in Michigan's urban areas were significantly lower. By mandating a more rigorous course of study, the state of Michigan hoped to ensure that all students had the opportunity to prepare for college and possess the knowledge and skills needed for the jobs in the 21st Century, and to assure that high school diplomas earned in Detroit, East Lansing or Ironwood would signify the same accomplishment and rigor. An unintended consequence of these requirements was that districts and administrators needed to review and provide scheduling models that could accommodate the increased number of required courses, but could also address the need for intervention due to the increased level of competence required in math and science.

The scheduling challenges resulting from the implementation of NCLB were minor in comparison to the challenges facing school administrators in Michigan with the implementation of the MMC. The problem of implementation was twofold. First, how could school administrators provide adequate time to appropriately educate all students in math and ELA as required by NCLB, and second, how could school administrators provide a schedule with enough opportunities to make all the requirements of the Michigan Merit Curriculum fit within the existing scheduling model, while still accommodating the career technical education offerings to students? For most district administrators the answer was, we cannot.

Despite the constructivists' push following *A Nation at Risk*, the majority of secondary schools were still implementing a traditional six period, two semester system when the MMC was first initiated. This system provided 24 credit opportunities for the typical high school student over the four years of high school. Many high schools had already added additional math and ELA courses for students to receive additional instruction in these highly accountable core areas, so the additional requirements of the Michigan merit curriculum proceeded to squeeze out a multiplicity

Scheduling Models and Student Achievement

of enrichment and career technical education classes. The courses being eliminated were all important aspects of the students' independent college and career pathways. As a result, school administrators began exploring and moving toward alternative scheduling models. These models included the block and trimester schedules previously discussed, along with the seven period two semester schedule. All of these scheduling models provided additional credit opportunities for the students compared to the six credits per year of the six hour, two semester model. The block and alternating-day block schedules provided eight credit opportunities per year, the trimester model provided seven and one half credit opportunities per year, and the seven period, two semester model provided seven credit opportunities per year. During the implementation of the Michigan Merit Curriculum, there was considerable study and activity concerning scheduling models choices and changes. Districts needed to discover and implement a scheduling model that had the capacity to offer additional classes, but still provided for a rigorous course of study. The implementation of the Michigan Merit Curriculum turned what was once a trickle of experimentation among districts around the state into a torrent of change out of necessity. In regard to changes in scheduling models this circumstance provides a fascinating, large-scale, punctuated event in which to study and compare various scheduling models. With the change in scheduling model, students had a better chance to fit the requirements and electives into the provided time frame,- but what effect did this have on student achievement?

Presently, school administrators are reevaluating the scheduling changes made following the implementation of the Michigan Merit Curriculum. This reevaluation is driven by the cost factor involved in various scheduling models. The purpose of this study is to provide clear empirical information on the effects of the scheduling models and scheduling model changes on student achievement in Michigan. It was the hypothesis of this study that there will be no

Scheduling Models and Student Achievement

statistically significant variance in the student assessment scores across the varying scheduling models. This study will assist school administrators in scheduling model selection by allowing them to compare and focus on other factors besides student achievement in their decision.

Conceptual Framework:

The conceptual framework for this study is “Bridging and Buffering” of school systems as presented by Hoing and Hatch (2004) and refined by Rutledge, Harris, and Ingle (2010). Local school districts are open, independently governed systems that are greatly influenced by external authorities such as federal, state, and local governments, in regards to expectations, curriculum, and accountability, due to the financial dependence on these same authorities. Ideally local school districts are created to provide efficient and high performing academic programming for the attending students, and to reflect the desired outcomes of these outside agencies.

The “Bridging and Buffering” framework views local school districts as loosely coupled systems of human interactions at multiple levels, including outside agency to local administrative bodies, local administrators to principals, principals to teachers, teachers to teachers, teachers to parents, and eventually teachers to students. The series of interactions that occur during the implementation of a change of practice or policy causes disconnections from the intended outcome or result to the actual outcome or result. In essence, school systems are formally structured to adhere to the institutionalized concept of what a school should look like rather than an efficiency of production, and as a result, school systems are resistant to change and will default to the status quo whenever possible.

The daily interactions between groups and individuals within a school system more appropriately reflect the culture, politics and practices within the organization. This means the external influence of resources and policy from outside entities is greatly mediated by the school’s

Scheduling Models and Student Achievement

complex elements of organizational culture and climate. These elements of organizational culture and climate not only influence administrative decisions but also influence how those decisions are perceived and implemented by other members of the school.

The Michigan policy change of implementing the Michigan Merit Curriculum was an example of an outside influence of change, and had significant impact on the number of required courses for high schools in the state of Michigan. This impact, in almost every case, increased not only the number of courses required for high school graduation, but the types of courses as well. This change also caused a shift in the allocation of resources for educating students in the high schools. Schools now needed additional math and English language arts teachers to account for, not only the increase in the number of required courses, but the more rigorous level of coursework required for graduation. This resulted in the need for additional math teachers and reading specialists to compensate and provide intervention services so that all students could achieve and complete these core subjects at a higher level of mastery.

The implementation of the Michigan Merit Curriculum also caused a shift in the amount of time allocated for required courses. Districts around the state spent a great deal of time exploring and reviewing additional scheduling models in order to fulfill all of the requirements within the regularly scheduled school day and school calendar year. The changes in required coursework, as well as shifting of resources and adjusting of time spent per subject had an impact on the instructional delivery of the content, which would directly impact the student's content knowledge of each subject, and would therefore impact the assessment scores as recorded statewide on the ACT Composite, Math and English Language Arts scores. This conceptual framework is presented below in Figure 1 and reflects the desired impact that the change has from the mission onset of the Michigan Merit Curriculum through the impact on the individual ACT scores.

Scheduling Models and Student Achievement

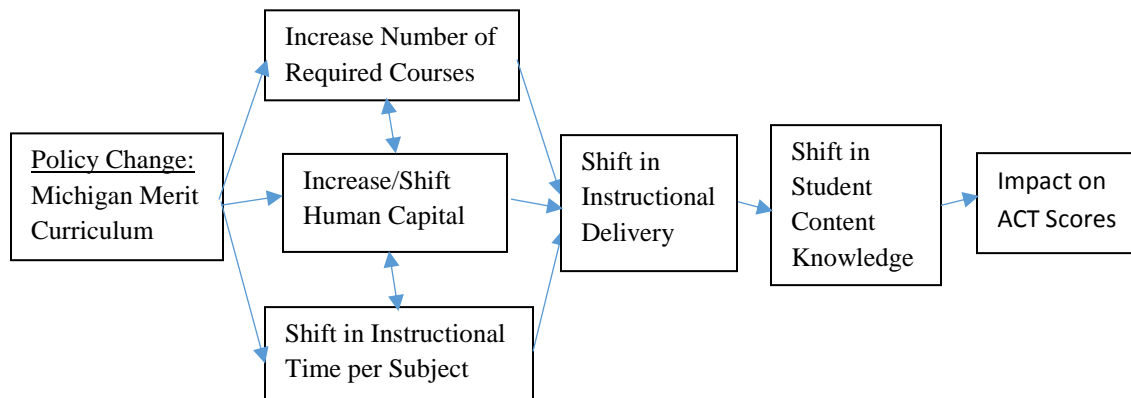


Figure 1. Ideal Conceptual Framework from Policy to Impact. This figure shows the idealized conceptual framework interactions for the implementation of a policy change onto the student assessment scores.

In applying the framework and concepts of “Bridging and Buffering” of school systems as described, the implementation of the Michigan Merit Curriculum caused a shift in the amount of time allocated for required courses, the changes in required coursework, the shifting of resources and shifting of time spent per subject; but the multiple human interactions within and across the classrooms including; administration to administration, administration to teacher, teacher to teacher, teacher to student and student to student, had a dampening impact on the intended changes’ influence on the instructional delivery of the content, which should directly impact the student’s content knowledge of each subject, and will therefore have no impact the assessment scores as recorded statewide on the ACT Composite, Math and English Language Arts scores. Figure 2 below reflects the hypothesized impact that the Michigan Merit Curriculum has on the individual ACT scores.

Scheduling Models and Student Achievement

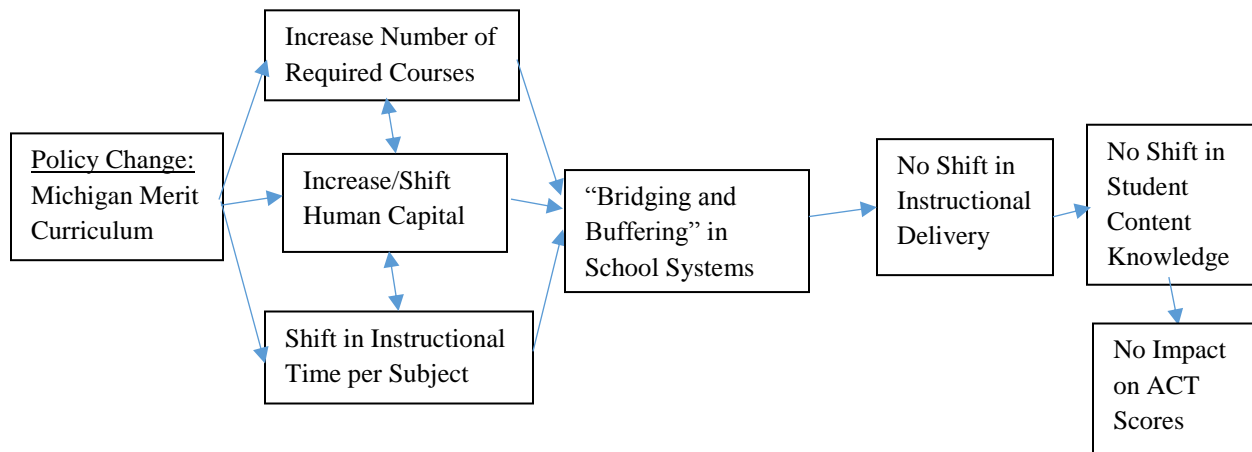


Figure 2: Conceptual Framework from Policy to Impact with Influence of “Bridging and Buffering” in School Systems. This figure shows the conceptual framework interactions influenced by the “Bridging and Buffering” of school systems for the implementation of a policy change onto the student assessment scores.

Relevance of the Study:

The core responsibility of administration in a school or school district is to provide the maximum student learning, achievement, and preparation while maintaining the most efficient use of district resources. Student learning, achievement and preparation are measured in many ways, including successfully achieving a minimum cut score on standardized assessments such as the ACT, Advanced Placement Exams, and SAT, along with successful completion of local assessments and district courses, and of course appropriate preparation for college and career readiness as deemed by the local community and governing board.

District resources come in many forms, including human resources, instructional resources, and time. The quantity of time includes not only the total amount of time on academic endeavors, but also the way time is allocated throughout the school day. School administrators spend a considerable amount of time exploring and discussing the way time is distributed and spent in the

Scheduling Models and Student Achievement

instructional classroom. Educational leaders consider several factors when structuring the daily and yearly model for allocating time, such as the quantity of courses required for graduation, the demands of career technical education programs, the costs associated with implementation of the various scheduling models, and the degree to which the model promotes student learning and growth.

Time distribution is an important topic of discussion because the way time is distributed influences the classroom instruction, strategies and methodologies, and should therefore have an impact on student learning. This study provided evidence as to the effect that the scheduling model has on student achievement. This information will be useful to school administrators considering scheduling model changes or evaluation of the current system. The costs of implementation for the stated models vary, with block schedules being more costly to operate than the six or seven period schedules. With financial resources being limited in most districts, it is essential for district leaders to have the proper data and information to determine if the academic results justify the cost for their scheduling model.

CHAPTER 2: LITERATURE REVIEW

Introduction

Prior to the implementation of the Michigan Merit Curriculum, there was considerable research and movement away from the traditional assembly-line method of scheduling the student instructional day and year into larger blocks of time with fewer classes per day. This movement resulted in many schools of all levels changing from traditional scheduling to block scheduling. According to Geismar and Pullease (1996), the traditional assembly-line method of scheduling students into six or seven 50-60 minute classes every school day imposes hardships on students and teachers alike. Students must prepare for six or seven daily classes, and must adapt to six or seven different teaching styles, expectations, and classroom environments. Teachers are responsible for 150-170 students every day for the 180-day school year. Management procedures such as taking attendance and collecting homework reduce the amount of instructional time for students. As a result, teachers are often forced into lecture and worksheet-oriented instruction since time limits inhibit group and hands-on activities.

Block scheduling, which allows classes to be organized within larger blocks of time, gives teachers and students more flexibility when participating in instructional activities. If the benefits to students weren't enough of an incentive to explore and adapt scheduling models, the implementation of the Michigan Merit Curriculum, characterized with the additional required courses and increased rigor for all students, brought the necessity for restructuring instructional time in high schools and the concept of block scheduling back to the attention of school district personnel. Models of block schedules include the Alternate Day Block Schedule, 4/4 Semester Block Schedule, Copernican Plan, and Trimester Plan (Carroll, 1994; Canady and Rettig, 1995). Only the Alternate Day Block Schedule, 4/4 Semester Block Schedule, and Trimester Plan were discussed in this study.

Scheduling Models and Student Achievement

Canady and Rettig (1995) reviewed several non-traditional scheduling models that some elementary, middle, and high schools have used to redesign their schedules to reduce curriculum fragmentation, discipline problems, and student failure. According to Canady and Rettig (1995), a well-crafted schedule can result in more effective use of time, space, and resources (human as well as material); improve instructional climate; help solve problems related to the delivery of instruction; and assist in establishing desired programs and instructional practices.

Adams and Salvaterra (2014), explored teacher perceptions of schedule changes. They observed the experiences of teachers in two high schools in northeastern Pennsylvania which both shifted from the traditional eight-period schedule to a two- to three-period day. According to Adams and Salvaterra (2014), teachers' perceptions are important in instituting changes in school administration. Teachers who saw the change as an imposition and as a temporary situation were more frustrated than those who accepted the change and tried to adapt to it through collaboration with fellow teachers. During any change, stakeholders need to feel that their basic needs are being recognized. They need clear expectations, some control over their work environment, and certainty about future goals and methods for achieving those goals. The introduction of an intensive school schedule caused some teachers to feel that their basic needs were being violated.

This literature review is divided into four major sections. The first two sections center on the conceptual framework of this study and include research on Institutionalism, “Loose Coupling,” “Policy Coherence,” and “Bridging and buffering.” The remaining sections center on the quantitative effects of various scheduling models on student achievement and assessments. The first student achievement section illustrates the effect of trimester schedules on schools, and the second summarizes the academic performance differences associated with traditional versus block schedules.

Institutionalism

The conceptual framework for this study is “Bridging and Buffering” as defined by Hoing and Hatch (2004). “Bridging and Buffering” is derived from institutionalism, or more specifically, it is derived from new institutionalism. Several articles were reviewed in regards to the conceptual framework for this study including works from Scott, March, and Dimaggio to define institutionalism, and from Hoing and Hatch, Weick, Meyer and Rutledge to define “Bridging and Buffering.”

Institutional theory is a theory regarding the deeper and more resilient aspects of social structure. It considers the processes by which structures, including schemes, rules, norms, and routines, become established as authoritative guidelines for social behavior (Scott, 2004). Institutionalism highlights the difference between the ideal and the real in regards to the operations of organizations and institutions. In the ideal setting these organized bodies would strictly operate based on the policies rituals and routines associated with their primary function. Institutionalism highlights the human interaction in regards to politics and socialization of the interaction of the workers themselves that are part of the organization at multiple levels.

Institutionalism was first observed and studied in regards to the effect of politics on governmental organizations. Institutionalism emphasizes the relative autonomy of political institutions, possibilities for inefficiency in history, and the importance of symbolic action to an understanding of politics (March, 1983). Institutionalism assumes a general approach to the study of political institutions, a set of theoretical ideas and hypotheses concerning the relations between institutional characteristics and political agency, performance, and change. Institutionalism emphasizes the endogenous nature and social construction of political institutions. Institutions are

Scheduling Models and Student Achievement

collections of structures, rules, and standard operating procedures that have a partly autonomous role in political life (March, 2011).

Institutionalism has since branched off into other organizations including businesses, corporations, and local schools and discusses the social interaction of the manager, workers, and clients, or other such “actors” within that organization. Institutionalism considers the processes by which structures, including schemas, rules, norms, and routines, become established as authoritative guidelines for social behavior. It inquires into how these elements are created, diffused, adopted, and adapted over space and time; and how they fall into decline and disuse. Although the ostensible subject is stability and order in social life, students of institutions must adhere not just to consensus and conformity but to conflict and change in social structures (Scott, 2004). Once these cultural elements are created, they form a relatively enduring collection of rules and organized practices, embedded in structures of meaning and resources that are relatively invariant in the face of turnover of individuals and relatively resilient to the idiosyncratic preferences and expectations of individuals and changing external circumstances (March & Olsen, 1989, 1995).

The basic building blocks of institutions are rules, and rules are connected and sustained through identities, through senses of membership in groups and recognition of roles. Rules and practices embody experience and stabilize norms, expectations, and resources; they provide explanations and justifications for rules and standard ways of doing things (March & Olsen, 2011). There are rules and practices prescribing appropriate behavior for specific actors in specific situations. These rules and practices are reinforced daily by the actors involved in that aspect of the organization. There are structures of meaning, embedded in identities and belongings. Common purposes and accounts give direction and meaning to behavior, and explain, justify, and

legitimize behavioral codes. Institutions empower and constrain actors differently and make them more or less capable of acting according to prescriptive rules of appropriateness. Institutions are also reinforced by third parties in enforcing rules and sanctioning non-compliance (March, 2011).

Finally, in regards to institutionalism, organizations tend to model themselves after similar organizations in their field that they perceive to be more legitimate or successful. As a result, certain kinds of structural arrangements can more likely be credited to replicating and mimicking processes rather than to any concrete evidence that the adopted models enhance efficiency (DiMaggio, 1983). This modeling of the highest organizations provide a context and guideline for similar organizations. Highly structured organizational fields provide a context in which individual efforts to deal rationally with uncertainty and constraint often lead, in the aggregate, to homogeneity in structure, culture, and output (DiMaggio, 1983). As change is initiated or implemented organizations become more and more similar based on the tendency to imitate and emulate the highest, most successful organizations. Organizations are still becoming more homogeneous, and bureaucracy remains the common organizational form. Structural change in organizations seems less and less driven by competition or by the need for efficiency. Instead bureaucratization and other forms of organizational change occur as the result of processes that make organizations more similar without necessarily making them more efficient (DiMaggio, 1983).

“Loose Coupling,” “Policy Coherence,” and “Bridging and Buffering”

The concept of “loose coupling” is an extension and refinement to the institutionalism discussion. “Loose coupling” states that the interconnecting components in a system or network depend on each other in the least extent practicable. Weick (1976) defines loose coupling to convey the image that coupled events are responsive, but that each event also preserves its own

Scheduling Models and Student Achievement

identity and some evidence of its physical or logical separateness. In the case of an educational organization, it may be the case that the counselor's office is loosely coupled to the principal's office. The image is that the principal and the counselor are somehow attached, but that each retains some identity and separateness and that their attachment may be circumscribed, infrequent, weak in its mutual affects, unimportant, and/or slow to respond. Loose coupling also carries connotations of impermanence, dissolvability, and tacitness all of which are potentially crucial properties of the "glue" that holds organizations together (Weick, 1976).

Weick (1976) provides seven advantages to loose coupling in an organization. Loose coupling; a) lowers the probability that the organization will have to--or be able to--respond to each little change in the environment that occurs, b) may provide a sensitive sensing mechanism, c) may be a good system for localized adaptation, d) fosters systems where the identity, uniqueness, and separateness of elements is preserved, potentially retaining a greater number of mutations and novel solutions than would be the case with a tightly coupled system, e) seals off a breakdown in one portion of a loosely coupled system so this breakdown is does not affect other portions of the organization, f) may provide more room available for self-determination by the actors, and g) should be relatively inexpensive to run because it takes time and money to coordinate people.

"Policy coherence" is another concept that aids in the formation and understanding of "Bridging and Buffering." "Policy coherence" is an often cited but seldom achieved education policy goal. According to Hoing and Hatch (2004), this policy-practice gap requires a reconceptualization of coherence not as the objective alignment of external requirements but as a dynamic process. Coherence is a process which involves schools and school district central offices working together to craft or continually negotiate the fit between external demands and the schools' own goals and strategies. Crafting coherence includes: schools setting school-wide goals

Scheduling Models and Student Achievement

and strategies that have particular features; schools using those goals and strategies to decide whether to bridge themselves to or buffer themselves from external demands; and school district central offices supporting these school-level processes (Honig & Hatch, 2004). Policy coherence takes into account its contingent nature—that the convergence of multiple external demands on schools may or may not contribute to damaging student performance outcomes—and that accordingly policy coherence is not an inherently positive or negative state of affairs (Honig & Hatch, 2004).

From institutionalism, loose coupling and policy coherence, Honig and Hatch (2004) conceptualized the framework “bridging and buffering.” This framework, rooted in organizational and institutional theory, explains how organizations respond to external regulation and control. In this framework, districts and schools are understood as organizations in which members collectively negotiate external policies with their own internal goals and strategies. Bridging entails accommodating policy demands through initiatives and structures directly aimed at meeting policy goals. Buffering, in contrast, represents resistance to policy goals by focusing on local objectives and priorities. Along the continuum between bridging and buffering, schools shape “the terms of compliance,” a process that can include selective and symbolic implementation (Honig & Hatch 2004, Rutledge et al, 2010).

Using “bridging and buffering,” Rutledge et al (2010) examined the degree to which district- and building-level administrators accommodated teacher-quality and test-based accountability policies in their hiring practices. They observed, as a practice, administrators negotiated local hiring goals with characteristics emphasized by federal and state teacher-quality policies, such as knowledge of the subject and teaching skills. While district administrators and principals largely “bridged” to external certification requirements, some principals “buffered” their

hiring decisions from the pressures of test-based accountability. Principals who bridged to test-based accountability gave greater weight to subject knowledge and teaching skills. It is apparent that bridging and buffering differs by policy and cannot be easily applied to accountability policies (Rutledge et al, 2010).

In the context of schools and policy implementation, bridging consists of activities in which schools respond to external policy demands by instituting programs and initiatives to achieve policy goals. Buffering activities occur when schools choose not to enact policy demands but rather to orient themselves around their own priorities and goals (Rutledge et al, 2010). Here, buffering is “not the blind dismissal of external demands but strategically deciding to engage external demands in limited ways” (Honig & Hatch, 2004). Honig and Hatch (2004) argue that implementation should be understood not as an objective alignment of internal and external goals but rather as a process of “crafting coherence,” in which district and school actors negotiate multiple external demands in their efforts to achieve internal goals. (Rutledge et al, 2010). As administrators and teachers, through their interactions, manage external demands, they simplify the external influences by assimilating the new information into their familiar rules and decision frames to help place the new into old forms and formats. Adding peripheral structures, such as committees and programs to target specific external demands, and buffering by symbolically adopting external demands, such as aligning the mission statement or using reform language without changing actual practices, represent more moderate manifestations of bridging and buffering (Honig & Hatch 2004).

Effect of Trimesters Schedules on a School

Bair and Bair (2011) asked how the increase in graduation requirements by the implementation of the Michigan Merit Curriculum has affected classroom organization within

Scheduling Models and Student Achievement

schools. They used a sociocultural approach to policy analysis to explore this question. The sociocultural approach focuses on how people make sense of a policy, and then appropriate it, or make it their own during the process of implementation.

A single school, Reform High School (RHS) (a pseudonym) was studied. Bair and Bair obtained a holistic picture of (a) the knowledge people had of the Michigan Merit Curriculum; (b) how they made sense of the policy; (c) factors that shaped their decisions; and (d) how the daily, taken-for-granted routines of schooling manifested their understandings.

Data analyses occurred in two modes. The first mode concurrently occurred with data collection. The first group of data consisted of teacher and administrator interviews. The second source of data came from observations.

Bair and Bair's findings reveal how administrators and teachers, in responding to the policy, created structures that unintentionally hurt the struggling students they were trying to help. School administrators created organizational structures, such as de-tracked classes and a trimester schedule. Teachers who translated the policy into classroom practice had to operate within the confines of these structures. As a result, the mathematics and science curricula were narrowed to the bare minimum in content, and classroom instruction became geared toward test preparation. The mathematics department eliminated all lower-track classes (e.g., mathematics essentials) and created a single sequence of courses: algebra 1, geometry, algebra 2, pre-calculus, calculus, and AP calculus. The science department, too, eliminated all lower-level science classes (e.g., science concepts).

Trimester schedule was implemented. The school improvement team carefully listened to the teachers' complaints about the difficulty of covering all the state-mandated standards in a short trimester term. However, rather than reconsider the trimester schedule, the administrators decided

Scheduling Models and Student Achievement

to reconsider the content standards. The principal, feeling the pressure to make sure the school made AYP, instructed teachers to align classroom instruction with content that would be assessed on the MME.

Academic Performance Differences Traditional and Block

Some high school faculties have been reticent to consider changing their scheduling models in view of the limited and inconclusive data related to student achievement and high school organizational structures. The need exists to conduct large-scale studies beyond case studies of individual schools that examine the interrelationships between scheduling types and standardized test scores. Are there significant differences in student achievement among block-scheduled schools and those with traditional daily-period schedules? Strategies and structures in schools are implemented to enhance teaching and learning. As a result, student achievement will be impacted based on variances in structure. One such structure concerns the manner in which time is allocated towards various subject areas during the school day. The purpose of Zhang's research is to study the differences in academic performance between 4x4 block scheduled and traditional scheduled high school (9-12) students.

Zhang performed an ex post facto study to determine performance differences on end of course tests for five core subjects (Algebra I, English I, Biology, Economic, Legal, and Political Systems, and U.S. History) across several years between students in the 4x4 block and traditionally scheduled high schools.

Zhang found that the 4x4 schedule had a positive effect on student performance in Algebra I, and may have some effect on student performance in English I, Biology, ELP and US History after the schedule has been implemented for three years. No matter what kind of scheduling was

Scheduling Models and Student Achievement

used, what happened between individual teachers and students in classrooms was still most important for teaching and learning.

According to Bowman (1998) there is great diversity in the block-scheduling approaches being adopted today. In theory, instructional purpose determines both the number and the length of the block-scheduled classes. The literature does report that because block teachers work with fewer classes and are responsible for fewer students, they have increased time for planning, participating in school-based decision making, coaching students, and conferring with parents.

Proponents also contend that block scheduling (a) promotes individualized instruction and independent study, (b) increases instructional flexibility, (c) enhances responsiveness to students' needs, (d) yields more efficient instruction, (e) ensures uninterrupted instruction and in-depth teaching in critical subject areas, (f) invites a collaborative approach by allowing students more time to learn from each other, and (g) promotes more efficient use of school facilities and greater use of community resources.

In truth, empirical verification for the alleged effectiveness of block scheduling is meager and conflicting; block scheduling does not appear to rest on any meaningful research base. Few published data, and none from well-designed research, have surfaced to validate the ascribed benefits of block scheduling.

Bonner (2012), compared the number of students who were proficient when taught biology on a block schedule to the number of students who were proficient when taught biology on a traditional schedule. The students were represented by three groups: the general population of students, African-American students, and students with disabilities. All students took the end-of-course biology test in a North Carolina public high school.

Scheduling Models and Student Achievement

Bonner (2012) obtained the number of students who were proficient for all of the schools in the state of North Carolina that operated on a 4 x 4 block schedule or a traditional schedule on the Biology End of Course (EOC) test. The study was then limited to the results of forty schools, because of the limited number of schools that were identified as running a traditional six or seven period day schedule.

Bonner (2012) found that there was not enough evidence that students were learning or achieving higher on standardized tests because of the specific type of schedule. This ex post facto study revealed results that were consistent overall to what previous literature had revealed: that block scheduling versus six or seven period traditional scheduling produced mixed data, concluding, that there is no significant relationship found between the number of students overall who are proficient on the NC biology end-of-course test and were taught on a 4 x 4 block schedule and proficient students who were taught on a six or seven period traditional schedule.

According to Geismar and Pullease (1996), a comparison of scores earned by students on the Scholastic Assessment Test (SAT) and the American College Test (ACT) indicates there is no significant difference between student academic performance under the traditional schedule and the trimester schedule (Figures 11 and 12). Although Boyd Anderson High School does not offer Advanced Placement courses, students were given the opportunity to take Advanced Placement exams. A comparison of Advanced Placement scores indicates that there was no significant difference between scores earned by students in 1994 (traditional schedule) and 1995 (trimester schedule). A comparison of scores earned on International Baccalaureate exams indicates a slight increase of higher scores in the year the trimester was implemented.

According to Gruber and Onwuegbuzie, (2001), although block scheduling has become increasingly popular in the past decade, only a few researchers have investigated its effect on

Scheduling Models and Student Achievement

academic achievement. Gruber and Onwuegbuzie, (2001) conducted a study to determine the effects of block scheduling on academic achievement between 115 high school students who received instruction via a 4X4 block schedule and 146 students who received instruction via a traditional schedule. A series of independent t-tests, utilizing the Bonferroni adjustment was conducted to compare grade point averages and scores on the Georgia High School Graduation Test (GHSGT) between the two groups.

Findings revealed no statistically significant difference in grade point averages or in scores on the Writing portion of the GHSGT between the two groups. However, statistically significant differences were found for Language Arts (Cohen's $d = .34$, moderate), Mathematics ($d = .52$, large), Social Studies ($d = .51$, large), and Science ($d = .46$, large) scores. For each of the statistically significant differences, students who received instruction via a traditional schedule received the higher GHSGT scores.

The body of contradictory findings in this area suggests that what works best for one school system does not necessarily work best for another. Thus, block scheduling may be the answer to raising test scores and grade point averages for one school, whereas a traditional scheduling method may work best for another school. It is only by continuing research in this area utilizing both quantitative and qualitative techniques that educators can decide whether to retain, modify, or discard this method of scheduling.

Gullatt (2007) performed an article review on pertinent research literature that documents the efficacy of alternative scheduling formats in U.S. secondary schools since the late 1990s. Gullatt (2007) found that in the area of mathematics, the old style of lecture, model, assign did not work in a block schedule. Students found it difficult, if not impossible, to sit through two lectures in a row and math teachers agreed with this research and tried to have at least three different

activities during a 90-minute period. Adopting new teaching modes was an important requirement for success in the block schedule.

In the area of science, Gullatt (2007) found that science teachers were moving toward a more hands-on approach to science, through which there was a reduction in lecture and increased hands-on activities. The kids were working on the board, watching demonstrations, or doing demonstrations themselves--more physical activities and fewer mental activities, requiring students to move their bodies in order to conduct that activity. Overall, the researchers concluded that the results indicated that block-scheduling plans did not appear to provide an advantage to students in terms of college preparation in science.

In the area of English, Gullatt found that English teachers were somewhat split in their decision about converting to the block schedule. One English teacher reported having more time for hands-on activities with the students, which meant dividing the class period into three or four different sections. Negative concerns for English teachers were associated with a loss of class time, because the reality is that there are fewer minutes under the block schedule. Little evidence supports the hypothesis that conversion to block scheduling formats would significantly affect student achievement in specific English-content areas.

Hackmann, and Waters, in *Breaking Away from Tradition: The Farmington High School Restructuring Experience* (1998) studied one school's experience with implementing career pathways, initiating a student advisement program, developing an interdisciplinary curriculum, blocking classes, and detracking courses which resulted from the school faculty's involvement in purposeful school reform. In order to determine the effectiveness of the interdisciplinary studies program, the elimination of tracking, and the block schedule, baseline data were collected during the 1994-95 year and compared to 1995-96 data. Average daily attendance during 1995-96 was

Scheduling Models and Student Achievement

92.2 percent, a 0.2 percent increase over the previous year. Student grades remained stable-and actually increased incrementally, even though tracked classes were eliminated.

The researchers recommended that schools considering alternative schedules should be aware that the schedule is not an end in itself, but should instead, be developed as part of an overall plan to address a school's identified goals. Flexible scheduling was only one of more than 80 sweeping recommendations in the areas of curriculum, instruction, school environment, technology, organization and time, and leadership contained in *Breaking Ranks* (Licklider, 1997).

Hackmann et al (2001) examined the relationship between school scheduling format and average composite scores on the ACT Assessment, after controlling for lifestyle factors, gender, school enrollment levels, number of examinees, and years under the scheduling model. The participants were 38,089 high schools seniors in 568 public high schools in Iowa and Illinois who completed the ACT Assessment in 1999. The focus was on data at the school level, and individual schools were represented by mean ACT composite scores for the school. The three scheduling models considered were:(1) traditional eight period (351 schools);(2) eight block alternating day (161 schools);and (3) 4x4 semester (56 schools). In general, findings showed that the scheduling type used at a school did not predict the ACT composite scores when examined at the school level.

The current study adds to the limited knowledge base regarding "what we know" about scheduling models and their relationship to student performance. The research literature suggests that the block scheduling restructuring initiative may not be the panacea that some advocates believe it to be. Since scheduling models do not exist in a vacuum, the mere adoption of a new scheduling approach, absent the concurrent implementation of additional reforms, likely will have a marginal effect, if any, on student achievement. Scheduling reforms are interrelated with other organizational components that promote teaching and learning, such as a commitment to

Scheduling Models and Student Achievement

constructivist practices and the informed selection of instructional methods that reflect a learner-centered approach to instruction. Simply stated, a scheduling change, in and of itself, is not enough. It is possible that the planned and deliberate adoption of a scheduling model, when implemented in combination with other instructional and organizational changes, may result in improved student achievement over time for specific schools, and perhaps for specific individuals within schools.

The College Board investigated the relationship between block scheduling models and student performance on AP examinations, finding that students enrolled in blocked courses earned lower scores on AP examinations, when compared with students enrolled in traditional year-long courses (Wronkovich et al, 1997).

Schott (2008), examined the impact of school schedule on student achievement and attendance of ninth and tenth grade students in metropolitan area Texas high schools ($n = 22$) and on campus dropout rates. High schools that were analyzed in this study made a transition from A/B block scheduling in the 2003-04 school year to a traditional school schedule in the 2004-05 school year. Academic achievement, attendance rates and dropout rates were gathered through the archived files of the Texas Agency through the Academic Indicator of Excellence System (AEIS).

This study compared student performance of Texas high school students, from the major populated metropolitan areas in the state of Texas, who were educated in an A/B block schedule to student performance of students educated in a traditional seven periods a day school schedule. Student performance in reading and mathematics from the Texas Assessment of Knowledge and Skills (TAKS) test, student dropout rates, and student attendance rates from the school years 2003-2004 and 2004-2005 were examined and compared. The study looked at students who had been on a form of a block schedule for several years and then during the school year 2004-2005, who were placed back into a traditional school schedule due to either budgetary constraints or to

Scheduling Models and Student Achievement

dissatisfaction with block scheduling. The purpose of this study was to determine any significant differences in student performances after students entered the traditional seven period schedule, compared with students who remained on the block schedule. This study revealed the following findings in the areas of Reading/ELA TAKS, and Math TAKS.

In the area of Reading/ELA TAKS, the research revealed a decrease in reading achievement when schools moved from an alternative day block schedule to a traditional school day schedule. This decrease in mean reading achievement scores was a statistically significant decrease. Bush (2003) did a study comparing student reading comprehension scores and the use of alternate day block scheduling. The results proved to be significant, in that student achievement did increase with the implementation of alternate day scheduling. Bush's study supports the findings of this present study, that students' achievement in reading is better under alternative day block scheduling. Evans, Tokavceyk, Rice, and McCroy (2002) examined high school student achievement and their outcomes demonstrated a significant increase in reading averages of SAT scores when students were instructed under the block scheduling format. Their research also revealed that the students in the study achieved higher grade averages in subject areas such as reading, than those students educated under a more traditional schedule. Another study supporting block scheduling's influence on reading achievement was by DiRocco (1997) through which middle school students were assessed in several academic subjects. The result was a statistically significant increase in scores for students instructed under alternative day scheduling.

In the area of Mathematics TAKS, the research revealed varying results. In another study comparing the impact on high school students who participated in a traditional schedule, as compared to those in secondary schools using block scheduling, Drummond (2001) found no statistically significant differences in reading or math scores. Yet another study showing no

Scheduling Models and Student Achievement

significant differences in student achievement scores was conducted by Hachmann, Hecht, Harmston, Pliska & Ziomeck (2001), who studied over 38,000 student ACT scores. Their study compared student scores to determine the effect manifested through various types of school scheduling and they found no effect or differences. Findings from McCreary and Hausman (2001) revealed evidence that 2400 students instructed under a traditional school schedule performed significantly higher in the area of math on the SAT 9 than an equal number of students instructed under a block schedule. In this present study, the campus group and the subgroups for minority students and low socioeconomic status (SES) students showed a slight increase in mean math TAKS achievement scores, but not a significant increase. For the samples in this study, schedule type had no statistical effect on school performance in the area of percent pass on the math TAKS. However, Hodges (2003) assessed rural middle school student achievement scores from schools on block scheduling and compared them to similar students on traditional schedule and found that there was a significant difference in mathematics scores favoring block scheduling.

Kramer (1997a) evaluated the effects that block scheduling had on math instruction. The study was a literature review, supplemented with published articles from a mix of sources. Kramer found that math teachers are often less than supportive of the move to a block schedule, fearing that the math curriculum will not fit well into longer time blocks. Math teachers are often concerned about covering two lessons' worth of material during a double-length time block, and perhaps reducing the amount of material students learn under a block schedule. The problem can be exacerbated at schools that offer more courses per year with the opportunity cost of allocating fewer minutes per course.

A second concern centers on gaps in sequential math instruction. A student might, for example, take algebra I in the fall of ninth grade, take no math at all for the next two semesters,

Scheduling Models and Student Achievement

and then take geometry or algebra II in the spring of tenth grade. This could result in the teacher's needing to devote additional class time to review. There is a clear consensus that maintaining a pure direct instruction/lecture mode of instruction does not work as well in a longer time block. Students find it difficult to sit through two lectures in a row.

In part II, Kramer stated that 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 (Kramer, 1997B).

McCreary and Hausman (2001) compared the outcomes of achievement attained by high school students educated in block, semester, and trimester schedules in one urban district throughout four years. Student level data for this investigation were drawn from the district's database maintained during four consecutive years, 1995-96 through 1998-99. The data set contained 28,526 individual records of students enrolled in any one of the three high schools during the 1995-99 school years. The study examined student annual grade-point averages, scores on the Stanford Achievement Test 9, credits attempted and earned, and absentee rates. Descriptive and inferential statistics were utilized. Analysis of covariance was the primary tool to test for mean differences between student outcomes.

McCreary and Hausman (2001) found students in a semester schedule had higher grade-point averages (adjusted mean 2.35) than those in block schedules (2.29) or trimester (2.22). Furthermore, the adjusted mean GPA within the block schedule was significantly higher than adjusted mean GPA within the trimester schedule.

Scheduling Models and Student Achievement

McCreary and Hausman (2001) found students within the semester schedule (Adj. $M=717.82$) had higher SAT Total Math scores than students in the trimester (Adj. $M=711.2$) and A/B block (Adj. $M=714.3$), ($F=11.9, p<.000, R^2=.17, \eta^2=.005$). There was no significant difference between trimester and A/B block students' SAT Total Math scores. Students' SAT Science scores were found to be significantly higher within both the trimester (Adj. $M=692.7$) and A/B block schedules (Adj. $M=694.2$) compared to the semester (Adj. $M=689.4$), ($F=8.6, p<.000, R^2=.17, \eta^2=.003$). No significant difference was present between the trimester and A/B block.

McCreary and Hausman (2001) found that the percent of total days absent within the semester (Mean=6.0%) and A/B block (Mean=5.6%) was significantly lower than students within the trimester (Mean=7.8%), ($F=65.8, p<.000, R^2=.06, \eta^2=.005$). Further exploration is necessary to determine what factors were accounting for the average of fifty more students absent each day under the trimester schedule.

Although the differences in this study were significant, questions regarding their practical significance should be raised. Weick's social-psychological model of organizing suggests that a school's normative structure is only loosely coupled with its behavioral structure. In short, structure may change without affecting behavior, and vice versa. This study reaffirms the importance of educators' thinking beyond structural changes. While structural changes may be necessary for student improvements, they are not sufficient. Educators must also consider the necessity of curriculum and policy alignment, professional development, changes in power relationships, and normative changes regarding schooling.

Nichols (2000) focused on the collection and analysis of longitudinal student data generated by six high schools from a large urban school system in the Midwest. Two of the schools recently converted to a 4 X4 scheduling structure, while three additional schools have used a block-

Scheduling Models and Student Achievement

8scheduling structure for a number of years. One school maintains a traditional 6-period/55-minute class structure. Graduation, dropout, attendance, and retention rates were gathered several years before and after the schools' block conversions. In addition, student achievement data based on grade point averages and failure rates were also explored for this same time period. Matching data from the traditional school site were also gathered for comparative purposes.

Results indicated several positive outcomes of the conversion to block scheduling structures. Despite the fact that a block scheduling format appears to offer several advantages to its students, the data from this report suggest that educators should remain concerned about the increases in the number of students who remain academically unsuccessful, despite their block conversion. In each block format school, significant increases can be seen in the number of students failing more than two classes in a single year and at several sites, increases in the number of students with grade point averages below 4.0 (or at or below a C- average) should be a concern to administrators and faculties at these sites. Although high achieving students remain successful regardless of the scheduling format that a school happens to offer, some scheduling structures may not provide the support that low achieving students may need to become more successful. In fact, some scheduling structures may actually be seen as harmful, particularly, for students who are already struggling academically. The results of this report do not allow one to suggest that block 8 is better than 4x4 or that 4x4 is better than block 8, or that block scheduling is a more effective structure than a traditional scheduling format. What the data do suggest is that proponents of educational reform and change should remain aware of the potential hazard of large-scale reform efforts without the proper planning and preparation that is needed to implement such changes. This project is by no means exhaustive in the conclusions that can be drawn from the data.

Scheduling Models and Student Achievement

Block scheduling can be an effective tool to allow students additional opportunities for course selection and successful achievement. At the same time, it may also allow teachers and staff unique experiences to provide extended creative instructional delivery and learning opportunities for their students. When adequate planning and preparation take place along with the clarification and documentation of student outcome goals, schools can experience successful transitions to a block scheduling format. When this planning and preparation does not occur and student outcome goals remain unclear, block scheduling transitions will continue to be difficult and seldom in the best interest of the school's staff and students. Proper planning along with documentation of school effectiveness and student success continue to be the key factors for successful implementation of block scheduling structures and school reform initiatives.

Nichols (2005) explored student data from five high schools in a large metropolitan area for several years before and after the schools converted to either a Block 4 x 4 or Block 8 scheduling format designed to influence student achievement and success. Nichols (2005) gathered data on measures of student success based on student grade point averages in English and language arts. Nichols (2005) found little evidence to support the hypothesis that conversion to block scheduling formats would significantly affect student achievement in the specific English-content area.

Wronkovich et al (1997) devised a method of measuring student achievement as it relates to the structure in which the subject is taught, in this case the effects of block scheduling on student performance in math. The design was ex post facto, so control of variables that could interfere with the outcomes is limited. The core data came from two groups of students. Group 1 was the control group which received traditional math instruction in algebra 1, geometry, and algebra 2, i.e., 135 clock hours of instruction over 180 school days. Group 2 was the experimental group

Scheduling Models and Student Achievement

which received 135 hours of mathematics instruction in algebra 1, geometry, and algebra 2 in an intensified semester block format.

Wronkovich et al (1997) used data from The Instruments The Ohio Colleges Early Math Placement Tool (EMPT) was initiated in 1978 in Columbus, Ohio. The test was designed to help high school math teachers and school counselors advise their students about math coursework for their senior year. It was an achievement test, designed to measure skills that directly relate to success in college level math classes.

The premise of the EMPT was that if students know their math achievement level as juniors, and if students and parents understood the negative consequences of misplacement in college math, appropriate steps could be taken to rectify deficiencies or expand opportunities.

By 1996, more than 500 Ohio high schools were participating in the program. The internal validity and test reliability were verified over the 19 years of norming the data with students in Ohio.

The Preliminary SAT/National Merit Scholarship Qualifying Test (PSAT/NMSQT) is given in October to high school juniors. It is an aptitude test from which inferences can be drawn regarding the ability of students to succeed in verbal and math tasks at the college level. For this study, the math aptitude score was used. The test is published and scored by the College Board, and co-sponsored by the National Merit Scholarship Corporation. In 1995, 1,827,971 students took the test at more than 20,000 different test centers. Several studies of the validity of the test have been conducted and are available through the College Board.

Student cumulative grade point average was the final variable used in the research design. High school GPA ranks high as a predictor of success at the collegiate level and is highly correlated with general ability levels of students. While motivation is an important mitigating factor, GPA is still closely related to general ability.

Scheduling Models and Student Achievement

This research study suggests that, while there are merits to intensified block scheduling in certain circumstances, there are grave questions about its effectiveness. The ability to accelerate in subject areas is the most compelling reason to continue to explore block scheduling. The caveat is that schools involved in intensified scheduling should address the need for more options in various subjects. The research indicates the need for more options. This study uncovered compelling evidence that block scheduling for all courses and all students may have unwarranted results. In addition, more coursework would be required. Instead of the traditional biology, chemistry, and physics, there would be an obligation to offer a second course in each of these subject areas to accommodate demand for increased profundity in science as students accelerate through the curriculum.

Therefore, it behooves the high school administrator to move carefully into the restructuring of the schedule. Wholesale block scheduling may have some immediate gains but long-term losses. Failure to plan ahead with adequate curriculum options is one of the most critical concerns that school administrators should address prior to restructuring. This is second only to the concern and acknowledgement that some students may lack the abstract skills to digest accelerated material in math and science.

There have not yet been sufficient controlled longitudinal studies to warrant enthusiastic support for block scheduling. There may be problems for students in comprehending larger quantities of math over a shorter period of time, with intervening lapses in math instruction. As indicated by the College Board, serious work remains before the supposed rewards of block scheduling can be assumed to be beneficial to all students.

CHAPTER 3: METHODS

Research Question

The purpose of this study was to build on the existing knowledge and corresponding literature associated with the effects of various scheduling models on standardized measures of student achievement. The scheduling models included in this study were six period semester (SPS), five period trimester (FPT), seven period semester (VPS), standard 4x4 block (SB), and alternate day block (ADB). The standardized measures of student achievement included in this study were the ACT Composite, the ACT English Language Arts and the ACT Math scores from 2007 to 2014. The benefits of using a standardized metric, such as the ACT Assessment, was that it was not as susceptible to the potential for grade inflation and subjective biases in grading procedures that may have occurred when utilizing less standardized measures. In addition, a standardized metric allowed for more meaningful comparisons across schools. This research was designed to do the following:

- 1) Identify the extent to which there was an association between scheduling model and student achievement.
- 2) Identify the extent to which there was an association between change in scheduling model and student achievement.
- 3) Identify the change in scheduling model with the greatest association to student achievement.

Target Population and Sample

The target population for this research was 11th grade students in a traditional public high school operating in a traditional public school district having taken the ACT in Michigan as part of the Michigan Merit Exam from 2007-2014. The scheduling model utilized by each high school was not readily available and needed to be collected via survey. During the 2013- 2014 school

Scheduling Models and Student Achievement

year, there were 545 public high schools operating within Local Educational Agencies (LEA) in addition to the 298 Public School Academies (PSA), and 114 private schools using the ACT assessment in the state of Michigan. This study focused on those traditional high schools operating in a school district with a governing school board. As a result, the 114 private schools were eliminated as were all PSA's, Alternative Education High Schools and all Virtual High Schools. This left 538 qualifying public high schools for this study.

The electronic survey was sent to the principal of each of the 538 qualifying high schools. Of the 538 schools, 121 had administrators respond to the survey providing a response rate of 22.5%. The participating high schools ranged from 4% to 90% for free and reduced-priced lunch percentage. For this study, free and reduced price lunch and economically disadvantaged (ED), were synonymous. The participating high schools ranged from 2% through 100% for the percentage of white students tested. The participating high schools also ranged in size from as small as 14 students tested through 597 tested in 2014. There was a wide demographic range represented in the study in these measured areas. In summary, this study included 121 different public high schools in Michigan over a seven year period (2008-2014) providing 847 different cohorts of students, and a total of 217,849 students tested.

Survey Instrument

To determine the scheduling model used by each high school in the state of Michigan and to identify any scheduling model changes occurring between 2007 and 2014, qualifying high school administrators in Michigan were emailed the scheduling model survey. Each qualifying high school administrator was contacted at least twice, but no more than four times, with the invitation to complete the survey and have his or her high school represented in this study.

Scheduling Models and Student Achievement

The survey asked for information in four key areas: a) current scheduling model, b) whether a change in scheduling model had occurred since 2007 and date of change, c) previous scheduling model(s), and d) whether the change was related to the implementation of the MMC (see Appendix A for the complete survey instrument).

Independent Variables

The independent variables for this study were: a) the scheduling model used by the high school with a consistent scheduling model for the 2007 – 2014 time period, b) the corresponding transition pair of scheduling models used by the school in which a change in scheduling model occurred during the 2007 – 2014 time period, c) the year the change occurred (the duration of time of the implementation), d) the number of students tested per school per year, e) the percentage of white students tested per school, per year, f) the percentage of white students tested per school, per year. Table 2 below represents the frequency and percentage of the types of scheduling models used. For the following table $N = 847$, where N represents each individual cohort identified by all of the following characteristics; a) school, b) year assessed, c) number tested, d) percent white, e) percent economically disadvantaged, and f) scheduling model used. It is evident, from the table below, that the six period semesters (SPS) is overwhelmingly the most represented and utilized scheduling model in this study.

Table 2

Current Model in any Year

Model	Frequency	Percent
ADB	28	3.31
FPT	140	16.53
SB	56	6.61

Scheduling Models and Student Achievement

SPS	448	52.89
VPS	175	20.66

Table 3 below represents the frequency and percentage in which a change occurred from one scheduling model to another in any of the cohorts.

Table 3

Type of Model Change

Model Change	Frequency	Percent
No Change	691	81.58
(ADB) to (SPS)	10	1.18
(SPS) to (FPT)	36	4.25
(SB) to (SPS)	21	2.48
(SPS) to (VPS)	36	4.25
(ADB) to (VPS)	3	0.35
(FPT) to (SPS)	33	3.9
(FPT) to (VPS)	9	1.06
(SB) to (VPS)	4	0.47
(SB) to (FPT)	1	0.12
(SPS) to (SB)	3	0.35

Table 3 shows that of the 847 different cohorts represented, 691 operated with a consistent scheduling model. The most common changes in scheduling model include; a) (SPS) to (FPT), b) (SPS) to (VPS), c) (FPT) to (SPS) and d) (SB) to (SPS). It is important to note that of the 20

Scheduling Models and Student Achievement

possible scheduling model change types only ten occurred in this study. From the table it is evident that during the same time period, 36 cohorts were transitioning from (SPS) to (FPT) while almost the same number (33) of cohorts were doing the exact opposite.

Dependent Variables

The dependent variables were the scores for each high school on the ACT Composite, Math and English Language Arts assessment for each of the 2007-2014 school years as recorded and provided by the Michigan Department of Education. Table 4 below provides the summary mean, standard deviation, minimum and maximum of these variables for the one hundred and twenty one schools that responded to the survey.

Table 4

Dependent Variable Descriptives

Variable	Description	Mean	Std Dev	Min	Max
ACT Comp	ACT composite score	19.51	1.97	13.37	25.10
ACT ELA	ACT English language arts score	18.62	2.32	11.34	24.90
ACT Math	ACT math score	19.48	1.95	14.33	25.00

Research Design

Because random selection would not be employed, the research design was a quantitative ex post facto study.

Data Collection

The data representing the population and the sample were provided by the Michigan Department of Education website (MDE 2010, 2014). From the website, the data for the ACT scores for each year, along with the number of students tested per high school, were provided by

Scheduling Models and Student Achievement

the files “2008-2011 MME ACT Scores Sortable by ISD, District & School,” and “Spring 2011-2014 ACT Four Year Proficiency Data File-Sortable.” Data for the percentage of economically disadvantaged, and the percentage of white students tested was provided by the file titled “Spring 2011-2014 MME Four Year Demographic Data File-Sortable.” Data concerning the scheduling model used and any corresponding change in scheduling model from the 2007 – 2014 school year were provided via the survey responses.

Analysis/Model

To identify the extent to which there was an association between scheduling model and student achievement on the ACT exam, a series of OLS regression models were estimated following the general model:

$$ACT_{jt} = \beta_0 + \beta_1 \text{Number Tested}_{jt} + \beta_2 \text{PCT White}_{jt} + \beta_3 \text{PCT ED}_{jt} + \beta_4 \text{Model Type}_{jt} + e \quad (1),$$

where ACT score in school j during year t is modeled as a function of number tested within a school, the percent of student population that was white, the percent of students who were economically disadvantaged, and current scheduling model (error term assumed to be normally distributed). Separate models were estimated for ACT composite score, ACT English language arts (ELA) score, and ACT math score. A second series of models were estimated controlling for year and school fixed effects.

To address the second goal of the analysis, segmented regression analysis was used to identify the extent to which a change in scheduling model was associated with ACT scores. Stemming from the work of Wagner and colleagues (2002), the following regression model represents the general approach taken:

$$ACT_t = \beta_0 + \beta_1 X_t + \beta_2 S_t + \beta_3 L_t + \beta_4 M_t + e_t \quad (2),$$

Scheduling Models and Student Achievement

where ACT_t is the ACT score, X indicates the number of school years from the start of the time series, S is a dummy variable where 0 indicates pre-change segment and 1 indicates post-change segment. A value of 0 was assigned as the value for each year of the pre-change segment, and 1 was assigned to the change year and each year following the change. The variable L counts the school years in the post-change segment of time t . In this model, β_0 estimates the base level of ACT score at the beginning of the series, β_1 estimates the change in ACT per school year in the pre-scheduling model change segment, β_2 estimates the change in ACT score in the post-model change segment, β_3 estimates the change in trend in the post-intervention segment, M represents cohort-level variables (i.e., number tested, percent white, and percent economically disadvantaged), and e_t estimates the error.

Finally, a series of regressions was estimated to identify the association between specific model type change and ACT score. Specifically, the following general model was estimated:

$$ACT_{jt} = \beta_0 + \beta_1 \text{Number Tested}_{jt} + \beta_2 \text{PCT White}_{jt} + \beta_3 \text{PCT ED}_{jt} + \beta_4 \text{Model Change Type}_{jt} + e \quad (3).$$

In separate estimations, the number of years after model change (Time After) was also included in the models. There were ten different model type changes that occurred within the sample of schools across the years in the study. Table 3 reports the frequency for each model change.

Statistical Hypotheses:

- 1) There will be no statistical significance in variance of student achievement as measured by the ACT Composite, ACT ELA, or ACT Math scores from 2007 to 2014 between scheduling models.

Scheduling Models and Student Achievement

- 2) There will be no statistical significance in variance of student achievement as measured by the ACT Composite, ACT ELA, or ACT Math score from 2007 to 2014 due to scheduling model changes.
- 3) There will be no statistical significance in variance of student achievement as measured by the ACT Composite, ACT ELA, or ACT Math scores score from 2007 to 2014 between scheduling model changes.

CHAPTER 4: RESULTS

Variance between Scheduling Model and Student Achievement

Table 5 below represents both sets of regression models estimated to identify the association between scheduling model type and students' ACT scores. The first three columns of results report the estimates with no fixed effects, and the last three report the estimates when year and district fixed effects were included in the models. It is important to note that for all of the regression models presented in Table 5, the reference category model was the SPS model which, as evidence in Table 2, was by far the most frequently used scheduling model among the cohorts.

Column one (1) in Table 5 represented the regression model for the ACT composite with no fixed effects. From the table, it was evident that there was high statistical significance ($p < 0.01$) with regards to the intercept, the number tested, the percent white, the percent economically disadvantaged, indicating a positive association with students' ACT composite score. When comparing the scheduling models, there was a positive and statistically significant association ($p < 0.01$) between the FPT scheduling model and ACT composite, holding all other variables constant. Similarly, there was a positive and statistically significant association between the ADB scheduling model and ACT composite, though at a lower threshold ($p < 0.10$).

Table 5

Estimated Effects of Current Model Type on ACT Scores

	ACT Comp	ACT ELA	ACT Math	ACT Comp	ACT ELA	ACT Math
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	20.117***	19.252***	20.090***	19.764***	19.446***	19.612***
	(0.303)	(0.378)	(0.309)	(0.441)	(0.570)	(0.458)

Scheduling Models and Student Achievement

Number	0.002***	0.002***	0.003***	-0.001	-0.001	-0.001
Tested	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
PCT White	0.924***	1.026***	0.725***	0.579	0.090	0.376
	(0.242)	(0.303)	(0.247)	(0.501)	(0.647)	(0.519)
PCT ED	-5.960***	-6.702***	-5.631***	0.084	0.218	0.077
	(0.288)	(0.360)	(0.294)	(0.418)	(0.540)	(0.434)
ADB	0.467*	0.541*	0.338	4.736***	5.350***	4.782***
	(0.253)	(0.316)	(0.258)	(0.373)	(0.482)	(0.387)
FPT	0.412***	0.755***	0.452***	3.433***	4.117***	3.660***
	(0.126)	(0.157)	(0.128)	(0.342)	(0.442)	(0.355)
SB	0.183	0.211	0.263	2.063***	2.283***	2.420***
	(0.183)	(0.229)	(0.187)	(0.350)	(0.453)	(0.364)
VPS	0.136	0.238	-0.083	1.135***	1.596***	0.656
	(0.122)	(0.152)	(0.124)	(0.420)	(0.543)	(0.437)
Year fixed effects	N	N	N	Y	Y	Y
School fixed effects	N	N	N	Y	Y	Y
R-square	0.574	0.524	0.550	0.915	0.899	0.908

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Columns two (2) and three (3) in Table 5 represent the regression models for the ACT ELA and ACT Math with no fixed effects. The results for the ACT ELA and ACT Math were

Scheduling Models and Student Achievement

similar to those for ACT Composite in column (1). The results showed a high level of statistically significant association ($p < 0.01$) between ACT ELA and Math scores and the number tested, the percent white, the percent economically disadvantaged. In comparing the provided scheduling models, the estimates for the FPT scheduling models remained statistically significant ($p < 0.01$) in both models, while the estimate for ADB scheduling model had a positive and statistically significant ($p < 0.10$) association with ACT ELA but not with ACT Math.

Columns (4), (5), and (6) from Table 5 represent the regression models with year and school fixed effects for all three assessments of ACT Composite, ACT ELA, and ACT Math. Controlling for year and school essentially accounted for unobservable characteristics of the cohorts and schools, leaving only the scheduling models for comparison. By accounting for the variances in year, school, student count, percent white and percent economically disadvantaged, the regression models were greatly changed. The results showed no statistical significance for any of the cohort factors (year, school, student count, percent white and percent economically disadvantaged), which was expected since these characteristics were fixed to the extent that there was not great variation in student characteristics in a given school from year to year.

Fixing these variables provided a much clearer picture in comparing the association between scheduling models and ACT scores. From columns (4), (5), and (6) the regression results show a high level of statistical significance ($p < 0.01$) with regards to the estimates for ADB, FPT, SB, and VPS when compared to the SPS model for all assessment types. The only exception was for the ACT Math, in which case there was no statistical significance for the parameter estimate for the VPS scheduling model. In summary, the regression models in columns (4), (5), and (6) support the statement that all of the scheduling models studied had a statistically significant and positive association with ACT scores when compared to the SPS model.

Scheduling Models and Student Achievement

Controlling for year and school and essentially accounting for and negating all of the individual characteristics of the cohorts greatly improved the overall fit of the regression lines. In comparing the R-squared statistics between models with no fixed effects and those with fixed effects, the R-squared went from .574 to .915 for ACT Composite, .524 to .899 for ACT ELA, and from .550 to .908 for ACT Math. This meant that accounting for the unobservable cohort and school accounted for approximately 40 percent more of the variance in ACT scores providing for a sharper, more accurate model, and made the variance due to scheduling model more predominant.

Variance in Student Achievement due to Change in Scheduling Model

Table 6 contains the segmented regression analysis results which were estimated to address the second research focus. These regression models did not control for year and school, so essentially all individual characteristics of the cohorts are still intact and will contribute to the overall variance. As expected, Table 6 provides results that show that there is high statistical significance ($p < 0.01$) for the parameter estimates for the number tested, the percent white, and the percent economically disadvantaged for all three assessments.

The one remaining topic of discussion for this regression series is the topic that it was designed to answer. Does a change in scheduling model have any statistical significance in variance on assessment scores? According to Table 6, there is positive and statistically significant association ($p < 0.10$) between model change and ACT composite and ACT ELA scores. However, according to the results, a change in scheduling model has no statistically significant effect on the ACT math assessment. Further study involving the fixing of interior variance within cohorts as was done in the first series of regressions may provide different results and documentation for this series of regression models.

Scheduling Models and Student Achievement

Table 6

Estimated Effect of Changing Model on ACT Scores

	ACT Comp	ACT ELA	ACT Math
	(1)	(2)	(3)
Intercept	19.416***	18.439***	19.369***
	(0.268)	(0.335)	(0.287)
Time	0.318***	0.408***	0.277***
Series	(0.021)	(0.027)	(0.023)
Model	0.339*	0.442*	0.174
Change	(0.196)	(0.245)	(0.209)
Time After	-0.092	-0.128*	-0.078
	(0.060)	(0.075)	(0.064)
Number	0.002***	0.002***	0.003***
Tested	(0.000)	(0.000)	(0.000)
PCT White	0.845***	0.936***	0.697***
	(0.218)	(0.272)	(0.232)
PCT ED	-6.854***	-7.900***	-6.326***
	(0.257)	(0.321)	(0.275)
R-square	0.666	0.626	0.614

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Variance in Student Achievement due to Specific Change in Scheduling Model

Table 7 below represents both sets of regression models identifying the association between the type of scheduling model change and ACT scores for all three assessments of ACT composite, ACT ELA, and ACT Math, one set without the number of years after model change (columns (1), (2), and (3)), and one set with the number of years after model change (Time After), (columns (4), (5), and (6)). The reference category excluded from the model was “no change occurred.”

Columns (1), (2), and (3) in Table 7 represents the regression models for the ACT composite, ACT ELA, and ACT Math without the number of years after model change (Time After). From the table, it is evident that there was a statistically significant association ($p < 0.01$) between ACT scores and the number tested and the percent economically disadvantaged for each assessment. There is also highly statistically significant association ($p < 0.01$) between the percent white for the ACT composite assessment, but moderate statistical significance in variance ($p < 0.05$) in the percent white for the ACT ELA and ACT Math assessments.

There were ten different model type changes that occurred within the sample of schools across the years in the study. Table 3 reports the frequency for each model change. The results varied by assessment for the change models. For the ACT Composite assessment there was a positive and statistically significant association ($p < 0.01$) between ACT scores and model changes SB to SPS, and SPS to VPS. Similarly, there was a positive and statistically significant association between ACT composite and model change SPS to FPT, though at a lower threshold ($p < 0.05$). With respect to ACT ELA, there was a positive and statistically significant association with model change SPS to VPS ($p < 0.01$), SPS to FPT, SB to SPS, SB to VPS ($p < 0.05$), and FPT to VPS (p

Scheduling Models and Student Achievement

< 0.10). Finally, with respect to ACT Math, there was a positive and statistically significant association with model change SPS to VPS ($p < 0.01$) and SPS to SB ($p < 0.10$).

Table 7

Estimated Effect of Model Change Type on ACT Scores

	ACT	ACT ELA	ACT Math	ACT	ACT ELA	ACT Math
	Comp	(2)	(3)	Comp	(5)	(6)
	(1)			(4)		
Intercept	20.393***	19.670***	20.208***	20.404***	19.684***	20.219***
	(0.294)	(0.370)	(0.302)	(0.294)	(0.370)	(0.302)
Time After				0.082	0.100	0.078
				(0.069)	(0.087)	(0.071)
Number	0.002***	0.002***	0.003***	0.002***	0.002***	0.003***
Tested	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PCT White	0.699***	0.769**	0.595**	0.698***	0.768**	0.594**
	(0.247)	(0.311)	(0.254)	(0.247)	(0.311)	(0.254)
PCT ED	-6.156***	-6.984***	-5.737***	-6.172***	-7.005***	-5.753***
	(0.289)	(0.363)	(0.297)	(0.289)	(0.364)	(0.298)
ADB to SPS	0.583	0.592	0.501	0.329	0.282	0.260
	(0.410)	(0.515)	(0.421)	(0.463)	(0.581)	(0.476)
SPS to FPT	0.438**	0.582**	0.199	0.152	0.233	-0.072
	(0.221)	(0.278)	(0.227)	(0.328)	(0.412)	(0.337)
SB to SPS	0.784***	0.855**	0.476	0.559	0.581	0.263
	(0.288)	(0.362)	(0.296)	(0.345)	(0.434)	(0.355)

Scheduling Models and Student Achievement

SPS to VPS	0.800*** (0.222)	0.902*** (0.279)	0.698*** (0.228)	0.561* (0.301)	0.610 (0.378)	0.471 (0.309)
ADB to VPS	0.102 (0.744)	-0.129 (0.935)	0.283 (0.765)	-0.064 (0.757)	-0.332 (0.952)	0.125 (0.779)
FPT to SPS	0.357 (0.229)	0.544* (0.288)	0.127 (0.236)	0.157 (0.285)	0.301 (0.359)	-0.063 (0.293)
FPT to VPS	-0.101 (0.435)	0.022 (0.547)	-0.461 (0.448)	-0.275 (0.460)	-0.19 (0.578)	-0.628 (0.473)
SB to VPS	1.007 (0.645)	1.883** (0.811)	0.706 (0.664)	0.803 (0.668)	1.634* (0.840)	0.513 (0.687)
SB to FPT	-0.336 (1.285)	-0.099 (1.615)	-0.422 (1.032)	-0.415 (1.287)	-0.196 (1.617)	-0.497 (1.323)
SPS to SB	0.622 (0.755)	0.408 (0.949)	1.343* (0.777)	0.467 (0.767)	0.218 (0.963)	1.195 (0.788)
R-square	0.581	0.5255	0.551	0.582	0.526	0.552

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Columns (4), (5), and (6) from Table 7 represent the regression models for the ACT composite, ACT ELA, and ACT Math controlling for the number of years after model change (Time After). As shown, none of the parameter estimates for Time After were statistically significant. At the same time, only two scheduling model changes showed a positive and statistically significant association with ACT scores, both at a lower threshold ($p < 0.10$). More specifically, model change from SPS to VPS was positively associated with ACT Composite scores and model change SB to VPS was positively associated with ACT ELA scores.

Scheduling Models and Student Achievement

In comparing the R-squareds' of the two regression models for each assessment the results show the R-squared remained relatively the same for both regression sets. This means that the number of years after model change (Time After) had very little impact on the variance of the assessment scores.

CHAPTER 5 - SUMMARY

Summary

As previously stated, the purpose of this study was to add to the current literature regarding the relationship between commonly used scheduling models and student achievement. From the research and corresponding literature reviewed, there was little evidence supporting a relationship between scheduling model and student achievement. The information and data gathered from the reviewed studies were inconsistent, and, for the most part, supported the premise that no scheduling model provided superior student assessment results over another. The intent of this study was to add to existing literature and thereby assist school administrators in comparing scheduling models. This would allow them to focus on other factors such as; (a) the cost of implementation in regards to staffing, (b) how the model supports the curricular and program demands, and (c) the training required to implement a new model if needed. The results of this study do not support the practice of changing scheduling model for the primary purpose of greatly improving student outcomes on the ACT exam.

The results of this study indicated that there was variance in student achievement due to the scheduling model being utilized, and that some models were associated with results that are superior to others in student achievement. What started with the intent of making the decision in selecting a scheduling model easier for school administrators, now has made that decision more complicated. Administrators now must do a cost-benefit analysis to determine whether or not the gains provided by implementing a new scheduling model are worth the cost associated with such organizational change. For instance are the gains in academic performance in using the standard block schedule model enough to offset the additional costs of implementing that more expensive model? How much improvement can be expected? Is it worth the investment?

The Association between Scheduling Model and Student Achievement

The first research question dealt with the association between scheduling models and student achievement. The research hypothesis stated;

“There will be no statistical significance in variance of student achievement as measured by the ACT Composite, ACT ELA, or ACT Math scores from 2007 to 2014 between scheduling models.”

The assumption was that all scheduling models would deliver equivalent student achievement results. As discussed in Chapter 4, two sets of regression estimates were run to estimate the relationship between the scheduling models. The first set did not fix the year or the school, and as a result, the model provided very similar results as presented in previous research. That is, there was a positive and statistically significant association ($p < 0.01$) between the FPT scheduling model and ACT composite, ACT ELA and ACT Math holding all other variables constant. Similarly, there was a positive and statistically significant association between the ADB scheduling model and ACT composite and ACT ELA but not with ACT Math, though at a lower threshold ($p < 0.10$).

The second set of regression models was conducted with year and school fixed effects for all three assessments of ACT Composite, ACT ELA, and ACT Math. Controlling for year and school essentially accounted for unobservable characteristics of the cohorts and schools leaving only the scheduling models for comparison. By accounting for the variances in year, school, student count, percent white and percent economically disadvantaged, the regression models were greatly changed. The results showed no statistical significance for any of the cohort factors (year, school, student count, percent white and percent economically disadvantaged), which was

Scheduling Models and Student Achievement

expected since these characteristics were fixed to the extent that there was not great variation in student characteristics in a given school from year to year.

Fixing these variables provided a much clearer picture in comparing the association between scheduling models and ACT scores. The regression results show a high level of statistical significance ($p < 0.01$) with regards to the estimates for ADB, FPT, SB, and VPS when compared to the SPS model for all assessment types. The only exception was for the ACT Math, in which case there was no statistical significance for the parameter estimate for the VPS scheduling model. In summary, the regression models with the fixed components support the statement that all of the scheduling models studied had a statistically significant and positive association with ACT scores when compared to the SPS model.

Having statistically significant results when comparing scheduling models to SPS necessitates additional inquiry. First, what does that statistical significance mean for the actual ACT scores? What level of increase can administrators expect when comparing models? For example, on average a student in a school utilizing a FPT scheduling model was predicted to score 1.28 points higher on the ACT composite (1.97 standard deviation for ACT score * 0.65 standardized estimate for FPT) compared to a student in a school utilizing the SPS scheduling model, holding all other variables constant. A 1.28 gain may be statistically significant, but it may be insignificant from a practical stand point, especially in regards to the time and resources expended to change models.

Regardless of the practical significance or insignificance of the results, the statistically significant data certainly demonstrates that something is going on within these cohorts that provides for higher student achievement. Perhaps the fact that these schools have the resources

Scheduling Models and Student Achievement

and the drive to break from the norm translates into other aspects of educational programming. Further study is warranted and other factors need to be identified.

The Association between Change in Scheduling Model and Student Achievement.

The second research question dealt with the association between scheduling model changes and student achievement. The research hypothesis stated;

“There will be no statistical significance in variance of student achievement as measured by the ACT Composite, ACT ELA, or ACT Math score from 2007 to 2014 due to scheduling model changes.”

The assumption was that all scheduling models would deliver equivalent student achievement results, and that changing models would have no effect on student achievement results. As discussed in Chapter 4, segmented regression analysis was estimated to address this question. These regression models did not control for year and school, so essentially all individual characteristics of the cohorts are still intact and will contribute to the overall variance.

According to Table 6, there is positive and statistically significant association ($p < 0.10$) between model change and ACT composite and ACT ELA scores. However, according to the results, a change in scheduling model has no statistically significant effect on the ACT math assessment. Further study involving the fixing of interior variance within cohorts, as was done in the first series of regressions, may provide different results and documentation for this series of regression models. As with the first series, controlling for the interior variance would probably, once again, reveal a higher level of statistical significance in variance due to a scheduling model change.

The research hypothesis for this area of focus were not supported from the results provided. The results suggest that on average changing scheduling models was associated with higher ACT

Scheduling Models and Student Achievement

scores. Intuitively, a drop in student achievement would be expected, due to the disruption of the model. Instead, the disruption produces a positive effect. Perhaps, as observed in series one, just the effect of doing something different energized the staff and/or students and pronounced a residual effect on student achievement in the positive direction.

The Change in Scheduling Model with the Greatest Association to Student Achievement.

The final research question dealt with the association between scheduling model changes and student achievement in relation to each other. The research hypothesis stated;

“There will be no statistical significance in variance of student achievement as measured by the ACT Composite, ACT ELA, or ACT Math scores score from 2007 to 2014 between scheduling model changes.”

Two sets of regression models were used to identify the association between the type of scheduling model change and ACT scores for all three assessments of ACT composite, ACT ELA, and ACT Math, one set without the number of years after model change, and one set with the number of years after model change (Time After). There were ten different model type changes that occurred within the sample of schools across the years in the study. The results varied by assessment for the change models. For the ACT Composite assessment there was a positive and statistically significant association ($p < 0.01$) between ACT scores and model changes SB to SPS, and SPS to VPS. Similarly, there was a positive and statistically significant association between ACT composite and model change SPS to FPT, though at a lower threshold ($p < 0.05$). With respect to ACT ELA, there was a positive and statistically significant association with model change SPS to VPS ($p < 0.01$), SPS to FPT, SB to SPS, SB to VPS ($p < 0.05$), and FPT to VPS ($p < 0.10$). Finally, with respect to ACT Math, there was a positive and statistically significant association with model change SPS to VPS ($p < 0.01$) and SPS to SB ($p < 0.10$).

Scheduling Models and Student Achievement

The regression models for the ACT composite, ACT ELA, and ACT Math controlling for the number of years after model change (Time After) resulted in two scheduling model changes that showed a positive and statistically significant association with ACT scores, both at a lower threshold ($p < 0.10$). More specifically, model change from SPS to VPS was positively associated with ACT Composite scores and model change SB to VPS was positively associated with ACT ELA scores.

In comparing the two sets of regression models, it is clear that, the statistical significance of the scheduling model changes lessen over time. This may indicate, and reinforce the previous statements that, when a change occurs, or when a plan that deviates from the norm is implemented, an energy is expelled that results in a positive variance in student achievement. Perhaps, as time goes on, these positive effects wear off and the student achievement, once again, lessens, and continues to lessen as the length of time from the occurrence of the change increases.

Reexamination of the Literature

Upon completion of the study, and considering the significant difference in outcomes as compared to the expected hypothesized outcomes, it seems prudent to re-examine some of the studies referenced in the literature review regarding student achievement and scheduling models. The main reason to re-examine some of the previous works would be to verify that the descriptive characteristics associated with the test takers and/or cohorts had been accounted for in the studies.

Upon review, Zhang used analysis of covariance (ANCOVA) for analysis and identified covariates of pretest, minority students, free-reduced price lunch percentage and parent level of education. Zhang observed statistically significant results for Algebra assessment when comparing 4x4 block over traditional scheduling (SPS). Bonnor used a Chi square and accounted

Scheduling Models and Student Achievement

for African-American students and students with disabilities while comparing 4x4 block to traditional for biology.

Hackmann controlled for school size, socioeconomic levels, parental educational level, geographic area, and neighborhood ethnic, while running a very similar multilevel regression analysis. It is evident that these researchers also accounted for these factors, which, following this study, strengthens their findings. This study reinforces the findings of these researchers by mirroring their methods and achieving similar results.

Limitations and Future Research

No schools are alike in terms of x, y, and z. Therefore, comparisons must be made and interpreted with caution. Schools were categorized based on scheduling model, percent of economically disadvantaged, and percentage of white students only. As a result, there were many aspects of schools that may affect student achievement as measured by standardized assessments that were not discussed, including, but not limited to the following: training of staff in teaching and lesson planning with the adopted model, staff experience, consistency of the adoption of the scheduling model, size of the school, type of school (rural, urban, suburban) and other demographics of the students. Secondary faculties may need several years of instructional experimentation and practice before any academic improvements facilitated by a scheduling change can be realized (Wronkovich et al., 1997).

Additionally, all of the participating schools are located in a single state in the Midwestern region of the United States. Having participants from only one state and one part of the country will limit the validity of the study, due to the limited characteristics and demographics necessary for a true comparison of scheduling models.

Scheduling Models and Student Achievement

The study is also limited by the sample size. Even though the number of responses exceeded twenty percent, the study did not have enough participants to compare all of the potential change models. Respondents were also not random, so there is some doubt as to whether all demographics are covered by the study. Participating survey responses may identify districts that are more apt to experimentation and adaptability. A full account of what truly happened in the state of Michigan and how various scheduling models and scheduling model changes affecting student achievement will only be slightly evident from a 22.5% response of qualifying schools.

In comparing the change of scheduling models, the results may be skewed because the groups are too small. For instance, the scheduling model change from SB to FPT was evident in 1 cohort out of 847. These results will not be very reliable. The same argument can be made for (ADB) to (VPS), (SB) to (VPS), and (SPS) to (SB) where only 3 or 4 cohorts were represented. In addition, it is worth noting that districts are not randomly distributed across scheduling models. There is something intrinsic and specific about districts and the scheduling models they choose that cannot be account for related to selection of a particular model.

Finally, it is possible that results are limited due to the nature of the ACT. The ACT is scored between 0 and 36. This is a relatively small range. The mean scores and the standard deviation are not that large, so in essence, how pertinent is this evidence to a district that is considering making a significant investment of time and resources into changing a scheduling model? Further study comparing student achievement and scheduling model is warranted before any conclusions can be drawn. Other assessments besides the ACT, such as an assessment like the SAT, which covers a much wider range, may provide different results.

Conclusion

In conclusion, the results of this study demonstrate that the scheduling model was associated with student achievement as measured by the ACT for all components including the Composite, ELA, and Math assessment. In short, all of the scheduling models studied including, five period trimester (FPT), seven period semester (VPS), standard 4x4 block (SB), and alternate day block (ADB) demonstrated a positive variance in assessment scores of statistical significance over the six period semester (SPS) in all assessment areas. The results suggest that any deviation from the norm may lead to student achievement increases. There are, of course, many factors that go into implementing this change. Perhaps it is the innovation and leadership required to investigate or make a change that makes the difference on the assessments. It appears that anything innovative in a district will cause assessment results to improve. Summarily, doing something matters and is an improvement over doing nothing.

For the segmented time series, it is observed that the farther away from the implemented change, the less impactful are the variants of assessment scores. In other words, as change transforms to normalcy, the perceived benefit associated with the affirmative shift in student achievement gradually declines.

Superintendents and building principals, when selecting a scheduling model, should take into account other factors such as meeting student needs, matching the teaching style of the staff, and the availability of financial resources. The variance of student achievement on assessments is relatively insignificant compared to these other factors. Using a more expensive scheduling model when similar, or higher, gains can be made by using those same resources to provide intervention, classroom technology, or new curriculum is an inefficient way to operate.

APPENDIX-SURVEY INSTRUMENT

This survey will be used to study the effects of the scheduling model on student achievement as measured by the ACT Composite, Math and ELA scores. Please complete the survey as completely and as accurately as possible.

- 1) County where your district is located _____.
- 2) School District name _____.
- 3) High school name _____.
- 4) What is the scheduling model used by your high school.
 - a. Six Period Semester (SPS).
 - b. Five Period Trimester (FPT).
 - c. Seven Period Semester (VPS).
 - d. Standard 4 x 4 block (SB).
 - e. Alternate day block (A/B).
 - f. Other: _____
- 5) Is the current scheduling model being used at your high school the same as the scheduling model used in 2007?
 - a. Yes. (If yes, then the survey is complete.)
 - b. No. (If no, please continue to Question #6.)
- 6) If the current scheduling model is different than the scheduling model used in 2007, indicate the original scheduling model.
 - a. Six Period Semester (SPS).
 - b. Five Period Trimester (FPT).
 - c. Seven Period Semester (VPS).
 - d. Standard 4 x 4 block (SB).

Scheduling Models and Student Achievement

- e. Alternate day block (A/B).
 - f. Other:_____
- 7) If the current scheduling model is different than the scheduling model used in 2007, indicate the year of transition between scheduling models. _____.
- 8) Is the change in scheduling models a result of the implementation of the Michigan Merit Curriculum?
- a. No.
 - b. Yes.
- 9) Did the scheduling model change more than once?
- a. No.
 - b. Yes.
- 10) Please explain.

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ABSTRACT**THE EFFECTS OF VARIOUS HIGH SCHOOL
SCHEDULING MODELS ON STUDENT ACHIEVEMENT IN MICHIGAN**

by

RUSSELL E. PICKELL**May 2017****Advisor:** Dr. Ben Pogodzinski**Major:** Educational Leadership and Policy Studies**Degree:** Doctor of Education

This study applies the framework and concepts of “Bridging and Buffering” of school systems to review research and provide data to determine whether student achievement is affected by the high school scheduling model, and whether changes in scheduling models result in statistically significant changes in student achievement, as measured by the ACT Composite, ACT English Language Arts, and ACT Math scores. The high school scheduling models included in this study are: six period semester, five period trimester, seven period semester, standard 4x4 block, and alternate day block. The research design was a quantitative ex post facto study.

The results of this study demonstrate that the scheduling model was associated with student achievement as measured by the ACT for all components including the Composite, ELA, and Math assessment. In short, all of the scheduling models studied, including five period trimester (FPT), seven period semester (VPS), standard 4x4 block (SB), and alternate day block (ADB), demonstrated a positive variance in assessment scores of statistical significance over the six period semester (SPS) in all assessment areas. The results suggest that any deviation from the norm may lead to student achievement increases.

Keywords: Michigan Merit Curriculum, ACT, High School Scheduling Models, Trimesters

AUTOBIOGRAPHICAL STATEMENT

I obtained my first position in public education as a Boys' Varsity Swim Coach for Riverview Community High School in the fall of 1985. I began teaching at Melvindale High School in the fall of 1996 in the Math and Science departments. I had the good fortune to teach all levels of math from Pre-Algebra through AP Calculus, Life Science, AP Physics, and Robotics. I completed the Masters of Education program from Wayne State University in December of 1998. My area of concentration was Secondary Administration, and my thesis was titled, *“A Study of the Freshman Failure Rates and Transitioning Practices of Melvindale High School.”*

Following the 2000-2001 school year, I was hired as the Assistant Principal for Allen Park High School. I worked with an excellent administrative team that had a solid foundation in educational leadership. This experience made it possible for me to accept the Principal position of Melvindale High School Following the 2001-2002 school year. I completed the Education Specialist Certification program at Wayne State University in 2004. My concentration was General Administration and Supervision, and my thesis title was *“A Study of Adequate Yearly Progress in Mathematics at Melvindale High School.”* In January of 2007, I was hired as Superintendent of Flat Rock Community Schools.

In July of 2011, my journey came full circle as I returned to the Riverview Community School District as Superintendent, the position I hold today. I completed the Doctor of Education program at Wayne State University in 2017.

Throughout this journey, I have witnessed and been blessed to be a part of the wonderful system known as public education. Public education is the cornerstone of our society, economy, democracy, and civilization. I am proud to stand tall with my colleagues who fight the good fight day in and day out.