An Investigation of Selected Variables Related to Student Algebra I Performance in Mississippi

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AN INVESTIGATION OF SELECTED VARIABLES RELATED TO
STUDENT ALGEBRA I PERFORMANCE IN MISSISSIPPI

by

Undray Scott

Abstract of a Dissertation
Submitted to the Graduate School
of The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

May 2016
ABSTRACT

AN INVESTIGATION OF SELECTED VARIABLES RELATED TO STUDENT ALGEBRA I PERFORMANCE IN MISSISSIPPI

by Undray Scott

May 2016

This research study attempted to determine if specific variables were related to student performance on the Algebra I subject-area test. This study also sought to determine in which of grades 8, 9, or 10 students performed better on the Algebra I Subject Area Test. This study also investigated the different criteria that are used to schedule students into Algebra I. Principals in respondent schools indicated that 8th graders performed better on the Algebra I Subject Area Test, followed by 9th and then 10th grade students. The data indicated that administrators believed that 8th grade student performance on the Algebra I Subject Area Test was better for students in schools using the A/B block schedule. The findings of the study also indicated that administrators believed that 8th grade student performance was positively related to certain proportions of student-centered instruction.

Archival data indicated that the achievement gap between white and non-white students on the Algebra I Subject Area Test persists. The data also indicated that the achievement gap between low-income students and non-low-income students exists; however, the gap is smaller than the gap that exists based on race. Finally, the data indicated that the three most commonly used criteria to schedule students into Algebra I according to respondents were, student performance in previous math courses, teacher recommendations, and student performance on the MCT2.
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UNDRAY SCOTT

2016
AN INVESTIGATION OF SELECTED VARIABLES RELATED TO
STUDENT ALGEBRA I PERFORMANCE IN MISSISSIPPI

by

Undray Scott

A Dissertation
Submitted to the Graduate School
And the Department of Educational Leadership and School Counseling
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

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May 2016
DEDICATION

This work is dedicated to my girls, Veronica, Rena, Ashley, and Addison. Thank you so much for your love and support during this process. Your love, support, and patience are invaluable. I love the four of you so much. Also to my parents, thank you for expecting nothing but the best from me throughout my life. I love you both.

Last but not least, I want to thank God for allowing me to reach this achievement in my life. Without your guidance, Grace, and mercy, I would not have been able to reach this goal or any other.
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The completion of this Dissertation has been a rewarding experience. I would like to first thank my committee members, Dr. David Lee, Dr. Kyna Shelley, Dr. James Fox and, last but not least, Dr. Mike Ward. Thank you all so very much for your guidance through this process, but most of all, thank you Dr. Ward for not giving up on me even when I wanted to give up on myself. It is my hope that this research can benefit practitioners in the field of education.
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CHAPTER I

INTRODUCTION

Many U.S. states require that public school students take and pass algebra as a part of their graduation requirements. Mississippi also requires that public school students take and pass an Algebra I state assessment. This study investigated whether selected factors were related to Mississippi students’ achievement on the Algebra I Subject Area Test. This chapter provides a brief introduction to the study as well as a brief overview of the context of the study and the selected variables that were investigated.

Beginning with the passing of Mississippi Senate Bill 2488 in the 2000 regular session of the state legislature, the Mississippi State Board of Education mandated that all public high school students take and pass the state Algebra I test before graduation. This testing is a part of the Mississippi Subject-area Testing program (SATP) which assesses students in Biology I, English II, U.S. History and Algebra I (Senate Bill 2488, 2000). Since that time Mississippi high schools have used varying methods of helping students perform well on these assessments. These strategies have included scheduling adjustments such as moving from the seven-period schedule to block periods and vice versa (Smith, 2010). Other scheduling adjustments have included adding extra time to the school day for SATP help, double scheduling students into SATP classes, and making other adjustments to the time allotted to instructional approaches. Some schools have also delayed the class year that students take Algebra I in hopes that the students will be better prepared to take the course.
By adjusting schedules, some schools have gone from the traditional seven period day, which gives students approximately one hour per class every day, to a block-type schedule, which gives students approximately one and one-half hours per class meeting. Other schools that were on the block schedule have gone back to the traditional seven-period day (Smith, 2010). There are several different types of block schedules; a common model is the 4x4 block schedule, which gives students one and one half hours per class per day for a semester. The A/B block schedule is another version of the block that gives the students one and one half hours per class every other day for the entire school year. Other modified A/B schedules include A/B schedules Monday through Thursday and the Traditional seven-period day on Friday. There are other modifications in which the schools use A/B schedules with some 4x4 block classes imbedded within the master schedule (Handley, 1998; Smith, 2010). This means that the majority of the students had classes based on the A/B schedule, while some selected courses met every day for one semester. Another adjustment to the school schedule has been adding extra reinforcement/remediation time to the school day to aid students who will be testing.

Other adjustments to the allocation of time have been made with individual students’ schedules. Extra preparation is given to the students by having them to take pre-Algebra and/or Transitions to Algebra prior to taking Algebra I. This extra preparation often limits the number of upper-level math courses that students are able to take during their subsequent high school years. This process is often done based on the perceptions of the student’s math ability (Kennedy, 2004). Drew (1996) in *Aptitude Revisited*, wrote that students who could achieve in math and science were being
discouraged from taking these subjects based on the thought that they were not smart enough.

Finally, teachers have adjusted their teaching styles to better prepare the students. Many teachers have gone from the traditional teacher-centered methods of teaching to instructional methods that are more student-centered. These strategies typically include more inquiry, more student choice, and more student-input in the learning (Cubucku, 2012). One particular study indicated that teachers in Florida in higher performing schools used more student-centered teaching and learning within their classrooms, while teachers in lower performing districts employed more teacher-centered methods of teaching (Peabody, 2011).

Statement of the Problem

A troubling issue in the United States is that students continue to lag behind international students in science, engineering technology, and math (STEM) performance (National Science Board, 2010). Nappi (1990) wrote that U.S. students consistently perform lower than students in most European and some Asian countries in math and science. Nappi wrote that the math taken by middle school students in the U.S. was a slower-paced math, and the content learned in other countries in middle school was similar to the math learned in high school in the United States. Nappi (1990) also summarized that because the math courses taken by high school students in the U.S. were limited by student choice, most U.S. students graduate high school having taken math equivalent to middle school students in Europe and Asia. The trend of poor performance of students from the U.S. as described by Nappi in 1990 continues today as
is indicated on the PISA and TIMSS assessments (Hanushek, Peterson, & Woessmann, 2010; Provasnik et al., 2012).

U.S. students’ choosing non-STEM related careers is also a problem in college. Only 16% of U.S. students chose to pursue a degree in a natural science or engineering field (Lehming et al., 2010). This compared to 25% of students in the European Union, 47% in China, and 38% in South Korea. This trend also holds true in post-graduate education where 33% of the doctoral students in universities in the United States are foreign nationals. These data indicate a fundamental need to develop a talent pool of STEM innovators (Lehming et al., 2010).

Students from the state of Mississippi continue to perform lower than students from most states in the United States on standardized assessments (Provasnik et al., 2012). An investigation of data provided by the Mississippi Department of Education revealed many trends as it relates to student performance in algebra since 2003. In 2003, 81.9% of students taking the Algebra I subject area test successfully passed the test. This passing percentage has fluctuated from a high of 91.6% of students passing in 2005 to a low of 71% passing in 2008. The 2008 test year occurred during the implementation of the new algebra curriculum and new subject area test in algebra (Mississippi Department of Education, 2015).

The data also indicate gaps in achievement between majority and minority subgroups. During the years reported on the Mississippi Department of Education’s website, a minimum of 10% more white students were successful in passing the subject area test in algebra. The largest gap occurred in 2008 when 82.8% of white students successfully passed the test, while 59% of African American students passed the test in
Algebra I. Performance of students in other subgroups such as disabled students, English language learners, economically disadvantaged were all lower than the performance of white students. The largest gap for any sub-group occurs with the disabled student group. The disabled subgroup had fewer of the students within the group to pass, and for several years, this group had more than 40% fewer of the students to pass the test when compared to all students tested (Mississippi Department of Education, 2015). An investigation of selected variables may provide information that could close achievement gaps within the subgroups as well as close the gaps in achievement among students in Mississippi and students worldwide.

One research question within the study will examine the processes used to assign students to Algebra I. Riegle-Crumb (2006) wrote that high school math courses are an organized hierarchy. This means that students generally take math courses in a specific sequence under the presumption that mastery of certain content is foundational to mastery of subsequent content. Schools throughout the state of Mississippi use different methods of scheduling students into subject area courses. One of the student scheduling criteria used for algebra may include whether the student has taken Pre-Algebra or Transitions to Algebra. Because Algebra I is a course that is built on skills gained in the previous courses, some schools throughout the state only schedule students into Algebra I after the student has taken either Pre-Algebra or Transitions to Algebra or both.

Another criterion commonly used to schedule students into Algebra I is their grades in the previous courses. For example, a student earning a letter grade of A in Pre-Algebra in some schools may be allowed to not take Transitions and therefore take Algebra I a year earlier. Riegle-Crumb (2006) also wrote that one of the reasons students
may not be given access to algebra earlier and thus, miss the opportunity for the upper-
level courses later in high school, is because of their performance in the math courses
taken previously, and the resulting assignment to additional preparatory coursework for
algebra.

Another criterion used in making the determination of when students take Algebra
I is the student’s scores on the state math assessments that are part of the Mississippi
Curriculum Test, 2nd Edition (MCT2) program. Some schools use student test results
from previous standardized tests such as the MCT2 in order to place students into
Algebra I, or developmental algebra courses. Another research question will compare the
performance of students who take algebra in the 8th, 9th, and 10th grades. This question
will investigate the performance of students within those three grade levels to try and
determine if courses such as Transitions to Algebra and Pre-Algebra help the students
who took the test in later years. Another research question is based on the amount of
time in class and how often the class meets. This research question will investigate
whether the amount of time per day or every other day of the Algebra I class is
significantly related to the success of students on the Algebra I subject area test. There
are varying types of schedules being used in school, as was described earlier. This
research will try to determine if students within the state of Mississippi are performing
better on the Algebra I test based on the schedule used within the school.

The factors to be investigated within this study are the relationships of Algebra I
test scores to (1) the process or criteria used to assign students to Algebra I, (2) the
differences in the performance on the Algebra I state exam among students who take the
exam in the 8th grade, the 9th grade or the 10th grade, (3) the relationship of differences
among student test results to the schedule of class meetings, (4) the amount of time students are given to independently practice problem solving with teacher feedback, and (5) the relationship of race and ethnicity to the school year in which students are placed in Algebra I.

Context for the Study

This study occurred within the context of an intense national and international dialogue underway about math curricula and math assessment. International comparisons of student performance in math and lackluster performance on national assessments like the National Assessment of Education Progress (NAEP) are generating concerns about the competitiveness of US students. The Common Core State Standards have significantly influenced state curricular decisions, and Common Core assessments and international assessments are likewise impacting the teaching of math.

The Common Core State Standards is an initiative undertaken by chief state school officers and governors and is designed to develop a common set of content standards across states for students in kindergarten through twelfth grade. These standards outline what students should know in math and language arts. Two assessment consortia, The Partnership for Assessment of Readiness for College and Careers (PARCC) and Smarter Balanced Assessment Consortium (SBAC), were formed by two groups of states with similar interests in developing assessments aligned to the Common Core State Standards. Mississippi is a part of the PARCC consortium. Educators in the state of Mississippi began implementing Common Core curricula in the 2011-2012 school year and will assess students using the PARCC assessment in Algebra I in 2015 (Anderson, Harrison, & Lewis, 2012).
The transition to Common Core and PARCC testing comes with challenges and concerns. Cut scores for PARCC testing will be established during the summer of 2015 after the first testing cycle. The Smarter Balanced Assessment Consortium has established preliminary cut scores, and it is estimated that less than half of the students taking the SBAC tests will be proficient in mathematics (Gewertz, 2014). It is expected that the implementation of any new education initiative would come with lower student performance initially; scores would rise over time as students and educators become more familiar with the initiative (Murphy & Torff, 2014).

Another concern in the implementation of Common Core is professional development. Standards and content are different from the established state curricula and required a shift in the teaching of these standards, which in turn required staff development. There is also a difference in instructional material in the shift to Common Core (Bostic & Matney, 2013). Another challenge to the Common Core is the opposition to the initiative that is now a national phenomenon. In Mississippi, both the governor and lieutenant governor have voiced a desire to move away from Common Core in part due to a perceived tie to the Obama administration (Pender, 2014). In fact, Governor Bryant vetoed anti-Common Core legislation in the 2015 session of the legislature because it did not decisively abolish use of the standards in the state (Pender, 2015). The Mississippi Department of Education has not, however, followed suit in opposing the standards.

There have been numerous studies comparing the results of student tests among states within the U.S. and comparing the results of student tests with other countries. The average student score for students in the state of Mississippi is consistently at or near the bottom in most of these studies (Hanushek et al., 2010). The Program for International
Student Achievement (PISA) is a test administered worldwide every three years to selected 15 year-old students to assess their ability to problem solve and apply their knowledge to real world situations. There was a comparison of the 2005 NAEP scores for U.S. 8th grade students and the 2006 PISA 9th grade international students. On the 2006 PISA math test, there were 30 countries that had a higher percentage of their students to score an equivalent to an advanced score in comparison to the NAEP scores for students in the United States. This indicated that students from 30 countries who took this assessment had a higher percentage of students who would be considered advanced in comparison to students in the United States (Hanushek et al., 2010). This study also compared the PISA results to individual state NAEP results. There were 18 U.S. states that had a higher percentage of their students considered advanced in math in comparison to the U.S. average of 6.04% (Hanushek et al., 2010). This finding indicated that there are 32 U.S. states that had a less than 6.04% of their students to be considered advanced in math in the 9th grade (Hanushek et al., 2010). This also means that 30 countries had a higher percentage of their students to be considered advanced in Math than those 32 states. Students in the state of Mississippi had the lowest percentage of their students to be considered advanced in math out of all of the U.S. states. On the most recent PISA assessment, 2% of the U.S. students who were tested scored at the advanced level on the assessment (Petrova, 2014).

TIMSS (Trends in International Mathematics and Science Study) is a research study done by the International Association for the Evaluation of Educational Achievement. This is an international study of schools and achievement in math and science for fourth and eighth grade students. In the most recent study completed in 2011,
it was found that the average math score of U.S. fourth graders was higher than the TIMSS average (Provasnik et al., 2012). However, there were 7 education systems in other countries whose fourth grade students’ average math scores were higher than those of math students in the United States. Those students who scored higher than students in the United States were in Singapore, Korea, Hong Kong, Chinese Taipei, Japan, Northern Ireland, and Belgium (Provasnik et al., 2012). U. S. students in grade 8 also had lower math scores than students in Korea, Singapore, Chinese Taipei, and Hong Kong.

The analyses of TIMSS result in 2011 also included estimates of state mean scores that were extrapolated from that year’s NAEP scores. The NAEP-TIMSS linking study is a study linked NAEP scores and TIMSS scores (National Center for Education Statistics, 2013). The linking of the two different assessments allowed the NAEP results of all of the states to be compared to the TIMSS results of all of the school systems and countries that participated in the TIMSS assessment. TIMMS scores have four established benchmarks. Those benchmarks are advanced from 625 and above, high from 550 to 624, intermediate from 475 to 549, and low from 400 to 474. According to the results from the NAEP-TIMSS linking study, the average score in mathematics for Mississippi students was 476. This average was lower than 48 other states and the District of Columbia. Only students in Alabama had a lower average score. The average score for Mississippi students were also lower than student scores from 25 international countries, including countries such as the Ukraine, Australia and Hungary (National Center for Education Statistics, 2013).

As the above issues illustrate, the teaching of math and the assessment of math performance are occurring in a dynamic policy and practice context. Concern about the
performance of Mississippi students in a national and world context is likely to be heightened by the increased rigor that attends these policy developments. This study addresses problems that may be exacerbated by these dynamics.

Research Questions

There are often many variables that help determine a student’s success in school in general and in specific courses. From success in prerequisite courses, a student’s learning styles, to teacher ability, these variables can affect student performance either positively or negatively. This study investigated several variables that may affect student performance on the Mississippi subject area test in Algebra I. The research questions for the study were:

1. Is there a difference in principals’ ratings of performance on the Algebra I Subject Area Test among students who take the exam in the 8th grade, the 9th grade, and the 10th grade?
2. Is there a difference in the performance on the Algebra I state exam between middle schools and high schools?
3. Is the type of instructional schedule for the Algebra I class related to the principals’ ratings of the success of students on the Algebra I Subject Area Test?
4. Is there a relationship between principals’ ratings of the success of students on the Algebra I Subject Area Test and the degree to which they experience student-centered instruction?
5. Is there a relationship between race and poverty and the year in which Algebra I is taken, administrators’ ratings of the level of growth in students’ Algebra I
achievement, and the performance of students on the Algebra I Subject Area Test?

6. What are the criteria used to place students into Algebra I?

Delimitations

The following are acknowledged as factors that limited the degree to which the results of this study may be applicable to the general school population.

1. Participants in this study were limited to separate middle and high school administrators within the state of Mississippi.

2. The research only investigated student performance on the Algebra I Subject Area Test, and the results may not be comparable to similar algebra tests in other states.

3. Some analyses depended upon administrators’ ratings about student performance in Algebra I rather than their actual achievement.

4. The analysis was based on student score reports on the Mississippi state subject area Algebra I test for the 2012-2013 because that was most recent year that disaggregated data was available and the data may not be applicable to subsequent tests.

5. The math achievement of the students before the administration of the subject area tests at the participating schools will not be included as a factor within the study.

6. The data on the nature of teacher practice (teacher-centered classroom vs. student-centered classroom) will be limited to administrator beliefs about the types of Algebra I teachers within their buildings.
Assumptions

It was assumed that the participants in this study were honest and thorough while completing this questionnaire. It was further assumed that their responses were not influenced in an attempt to change the outcome of this study. Finally, it was also assumed that the respondents to this survey would have participated voluntarily and would not fear retaliation due to their responses.

Definition of Terms

Terms relevant to this research are defined below.

4x4 block schedule - A type of block schedule in which students attend the same four classes every day for one semester and complete the course within the semester. Each class period lasts approximately 90 minutes.

A/B block schedule - A type of schedule in which students attend four classes on one day and a different set of four classes on the next, alternating through the entire school year. Each class period lasts approximately 90 minutes.

Algebra I - The beginning algebra course designated by the Mississippi Department of Education as the math course in which a student must take and pass the course and the subsequent state exam as a requirement for graduation.

Block Schedule - A type of school schedule utilizing longer classes or blocks of time but with fewer classes during the school day.

Placement Criteria - The variables used by administrators and teachers to place students in different math classes.
Student-centered classroom- for the purpose of this study, a classroom environment in which the student is discussing the lesson in collaborative groups for more than 60% of the allotted class time.

Traditional seven-period daily schedule- a school schedule in which there are seven different class periods during the school day, with each class period lasting approximately 60 minutes.

Teacher-centered classroom- for the purpose of this study, a classroom environment in which the teacher is discussing the lesson, and providing or demonstrating solutions to problems for more than 60% of the allotted class time.

Justification

With the 2015 transition to assessments based on the Common Core State Standards, this study was important because there may be some implications of the research that can be generalized from SATP tests to tests. This study was also important in order to determine factors that are effective in the teaching Algebra I, and possibly math content in general, to Mississippi students. If research can identify factors that are related to student success in mathematics and determine effective methods for instruction, steps can be taken to improve the standing of Mississippi students when compared with students in other U.S. states.

There is extant research documenting the relationship between course scheduling and student performance and schedule types. There is also extant research documenting the criteria used to schedule students into Algebra I. Prior research further addresses how students perform on in Algebra I based on the year the student takes the course and how well he/she student perform based on teacher types. There is no existing research that
investigates the proposed independent variables and their effect on student performance on the Algebra I Subject Area Test. There is also little to no existing research done within the state of Mississippi investigating the proposed variables independently. The findings of this study could possibly provide information to school decision makers that would support more effective scheduling, hiring, and data use in order to potentially improve student performance within the different school districts. In addition, the findings of this study could potentially influence teacher practices within the classroom.

Summary

Research has indicated that Mississippi students continue to score lower than students in most states on national and international assessments. This study attempted to find variables that have had positive influences on student performance within schools and districts within the state. The findings of this research may provide information to school district administrators that may help to increase the performance of the students within their districts.

Chapter II provides an extensive review of literature related to student performance in algebra as that performance relates to scheduling and teaching style. The literature review also investigated the history of algebra and the conclusions of two well-known theorists that can have an influence on the current research. Chapter II provides an investigation of current education policy from the federal and state government. Chapter II also provides a comparison between the current Mississippi math framework and the new Common Core Mississippi framework.
CHAPTER II
REVIEW OF RELATED LITERATURE

The purpose of this study was to determine if selected variables affect how students in the state of Mississippi performed on the Subject-area testing program for Algebra I. The purpose of Chapter II was to examine the literature as it pertains to the current topic. The background section of this literature review explores the history of algebra in the United States, and the push for algebra proficiency. This section concludes with an examination of the policy and practice context within which this study occurred. The second section of this literature provides the theoretical framework for this study through an examination of the theory of constructivism and the beliefs of constructivists with regards to mathematics. The last section of the literature review discusses the different variables within algebra courses, as well as those within schools, that may have an effect on how students may perform on the Algebra I subject area test. Pertinent research and professional perspectives are also examined in this section.

Background for the Study

A History of Algebra

The beginnings of algebra seem to appear in Mesopotamia around 4000 years ago with two distinct areas, accountancy and Geometry. This body of mathematics is often called Babylonian mathematics (Katz & Barton, 2007). The term algebra comes from an Arabic textbook with the name Al-Jabr and al-muqabala, which was written by Al-Khwarizmi around 825 B.C. The meaning of the term Al-Jabr was to move back and forth (Ringel, 2001). There were also other contributions to algebra made by Islamic mathematicians. Omar Khayyam developed a way of solving cubic equations using
Another Islamic mathematician who worked with solving linear equations was Sharaf al-Din al-Tusi. Sharaf al-Din did not complete his work, and because he did not use symbols in his work, there was not a follow up done to complete the work (Katz & Barton, 2007). The Islamic algebra textbook that was developed by Al-Khwarizmi was first seen in Europe in the twelfth and thirteenth centuries. Abraham bar hiyya in Spain, Leonardo of Pisa, Robert of Chester and Gerard of Cremona are all credited with introducing or translating Al-jabr into European languages (Katz & Barton, 2007). Until the time that algebra came into Europe, algebra problems were abstract, and there had not been any real world applications for the subject. Robert Recorde, an English mathematician, began developing real world algebra problems in the sixteenth century (Katz & Barton, 2007).

It is assumed by historians that the first math textbook to be published in the Americas was Sumario Compendioso. Sumario Compendioso was written by Juan Diez Freyle and was published in Mexico City in 1556 (Gray & Sandifer, 2001). Early settlers in colonial England established the first grammar school in Boston in 1635 (Wiles & Bondi, 2002). The Latin grammar school was established to educate the male students of Boston’s prominent families in the classic languages and religion. In 1647, the Ye Old Deluder Satan Act was passed with the goal of creating educational opportunities under the assumption that literate persons could read, and more specifically, could read the Bible in order to help “ward off the work of the devil” (Wiles & Bondi, 2002, p. 21). This act required towns of 50 or more families to establish an elementary school and towns of 100 or more families to establish a grammar school (Wiles & Bondi, 2002). Algebra did not appear in curriculum in the United States until 1796 at Harvard.
University. In 1820, Harvard began requiring algebra for admission, followed by Colombia University in 1821, Yale University in 1846, and Princeton University in 1848 (Kilpatrick & Izsák, 2008). In response to the college requirements, in 1847, Massachusetts required algebra to be taught in towns with 500 or more families (Kilpatrick & Izsák, 2008). Early algebra textbooks in high schools focused primarily on more practical uses of the discipline, often including questions concerning calculating acreage and dispensing charity to the poor (Reese, 1998). Algebra through the 19th century was primarily for older students. This algebra consisted mainly of what was termed the rule methods, which included definitions, rules and tables that were memorized to be used during the practicing of algebra (Florio, 2006). During this time algebra was mainly taught by instructors who had not been instructed on how to teach the subject matter, and most textbooks included methods on teaching particular content (Florio, 2006). During the mid-nineteenth century, algebra problems focused on commerce, and by the end of the nineteenth century, the emphasis had shifted to fractions, proportions, and the metric system (Florio, 2006).

With the passing of the Elementary and Secondary Education Act of 1965, congress began appropriating funds to local education agencies that serve low-income families (Elementary and Secondary Education Act, 1965). The goal of that law was to improve the educational quality of elementary and high schools in the United States and to provide additional educational supports to disadvantaged students. With the passing of the No Child Left Behind Act of 2001 (NCLB), which was a reauthorization of the Elementary and Secondary Schools Act, all public school students in the United States were required to be proficient in Math and Language arts by the year 2014. As a result of
No Child Left Behind Act, subject area testing in Mississippi began in 2000 with the passing of Senate Bill 2488 (Senate Bill 2488, 2000). With this bill the Mississippi State Board of Education mandated that Mississippi public school students take and pass a state Algebra I exam as a requirement for graduation.

*Contemporary Policy and Practice Context*

_The Federal Race to the Top initiative._ There are numerous studies detailing U.S. student performance in comparison to students from other countries in science, technology, engineering, and mathematics (STEM) subjects as well as a perceived lack of rigor in public schools in the United States. Hanushek and colleagues (2010) found that the percentages of students in the United States who were performing well in STEM courses and on STEM assessments was significantly lower than students from other developed countries. There were also fewer students from the U.S who were majoring in STEM disciplines in college. With fewer students majoring in STEM subjects, there becomes a possibility that there will be a shortage of employees going into STEM related fields with the necessary skills to be successful and thus negatively impacting U.S. competitiveness internationally (Hanushek et al., 2010). Peterson and Hess (2008) wrote that according to the NAEP Standards, only educators in Massachusetts and South Carolina had established standards in math and reading that were considered globally competitive. Peterson and Hess (2008) also found that most states established standards of proficiency that were much lower than NAEP standards.

In 2009, under the American Recovery and Reinvestment Act, President Barack Obama authorized the Race to the Top (RttP) educational assessment initiative. This initiative was enacted through the executive branch, due in large part to the inaction of
congress to re-authorize the Elementary and Secondary Schools Act. Much of the
funding from the American Recovery and Reinvestment Act went toward creating and
preserving jobs; however, a portion of the funds was earmarked for state incentive grants
through Race to the Top (McGuinn, 2014). The funds were set aside for state education
agencies that were innovative in their educational reform efforts. This initiative provided
resources to states for the purpose of supporting teaching and learning, developing valid
assessments and providing accurate data on what students know and are able to
accomplish (American Recovery and Reinvestment Act, 2009). The initial Race to the
Top grants were awarded in two phases; the first phase was awarded in April of 2010 and
the second in September of 2010 (U.S. Department of Education, 2009). Race to the Top
funds, like federal education funding in the past, were used to effect change in state and
school policies on education. The Race to the Top initiative is largely thought to be the
reason many states adopted common core standards for education, increased charter
schools programs, and overhauled teacher evaluation processes and criteria (McGuinn,
2014). State agencies submitted applications for RttP funds and those funds were
awarded based on the rigor and reforms in four areas. Those areas were the development
of common standards and assessments, more effective teacher training, evaluation and
retention, adoption of effective school improvement policies, and improving student data
systems (McGuinn, 2014). Upon the initial inception of the Race to the Top initiative,
fourty-six states and the District of Columbia submitted plans of change as a requirement
to compete for Race to the Top funds (McGuinn, 2014). State leaders from Mississippi,
with the approval from then Governor Haley Barbour, submitted a Race to the Top
application in phase two of the grant process in 2010 (Mississippi Department of
Education, 2010). The Mississippi state Department of Education was not awarded the grant; however, many of the reforms set forth in the Race to the Top application have been enacted within the education system in the state of Mississippi (Mississippi Department of Education, 2010).

The first reform area, the development of common standards and assessments, involved a change in what was to be taught and how what was taught was to be assessed. Many states adopted Common Core State Standards in math and language arts because the two areas included skills necessary in all of the other content areas (Wallender, 2014). These standards were developed to be more rigorous and were internationally benchmarked to countries whose students continuously outperform U.S. students (Wallender, 2014). The Common Core State Standards were divided into two categories, college and career ready standards and Kindergarten –12th grade standards. The overarching purpose of the college and career-ready standards was to focus on what students should know and be able to do upon leaving high school (Common Core State Standards Initiative, 2014). The K-12 standards focused on what was to be taught between Kindergarten and twelfth grade. The state of Mississippi adopted the Common Core in 2010 because it provided a clear focus on what students were expected to learn and be able to perform and a clear focus on what parents and educators needed to do in order to help the students learn (Mississippi Department of Education, 2014b). These standards were also adopted in an attempt to make education in Mississippi more comparable to other states, regardless of where a student lives (Mississippi Department of Education, 2014b).
The second reform area encompassed increasing the ability and competence of the classroom teacher and school administrators. Research has shown that an effective teacher inside the classroom is an important factor in the success of students (Partee, 2012). Research has also shown that if low performing students are taught by an effective teacher for two years in a row that could help decrease the achievement gap between low-income and high income students (Hershberg & Robertson-Kraft, 2010). Two strategies listed in the Race to the Top application for Mississippi included an increase in the quantity and quality of teachers and administrators (Mississippi Department of Education, 2010). Initiatives for teacher and administrator improvement efforts in the state of Mississippi led to the development of the Mississippi Statewide Teacher Appraisal Rubric (MSTAR) and the Mississippi Principal Evaluation System (MPES). A portion of this research will investigate different teaching styles as they are reported by responding administrators based on their observations during the MSTAR process. MSTAR, which was piloted in the state of Mississippi in 2012, had four purposes. The first purpose was to provide formative information on individual teachers based on a statewide rubric that highlighted strengths and identified weaknesses. The second purpose was to serve as a tool for teachers to use as a means of self-improvement. The third purpose was to provide a list of standards and expectations to the classroom teacher. Finally, the fourth purpose was to serve as a guide to administrators to provide instructional feedback to the teacher (Mississippi Department of Education, 2014a). Full implementation of MSTAR evaluation began with the 2014-2015 school year (Mississippi Department of Education, 2014a).
The third reform area outlined in the Race to the Top initiative was the adoption of effective school improvement policies (McGuinn, 2014). This initiative involved improvement of achievement among lower-performing students and lower-performing schools. The Mississippi Department of Education’s response to this portion of the Race to the Top initiative included the Children First Act, the New Start School Program, and the Conversion Charter School Act, which were already in place; however, the initiatives were deemed appropriate and used for the Race to the Top mandates (Mississippi Department of Education, 2010). These pieces of legislation provided amendments to several sections of the Mississippi code of 1972 (Senate Bill 2293, 2010).

School ratings in Mississippi are based on how the students at the particular school perform on specific assessments. An important aspect of student performance is making sure that they are ready to take the required assessment so that their performance can help the school rating. The final reform outlined in the Race to the Top initiative was the establishment of data systems that support education. The Race to the Top initiative required that individual state agencies develop statewide data systems for student test results, and a means of analyzing the collected data and using the data to guide instruction (U. S. Department of Education, 2009). There have been several revisions to the state accountability model during the time period since the introduction of Race to the Top.

As was outlined in the previous section, there have been many legislative actions and changes within public education within the state of Mississippi since the introduction of the Race to the Top legislation (Mississippi Department of Education, 2010). Some of these legislative actions had already been proposed to the before the Race to the Top
initiative and was added to the Race to the Top grant application. Changes such as
Common Core adoption, modifications to the state data collection system, the charter
school initiative, and the implementation of MSTAR and MPES would lead one to
believe that the changes were in response to the Race to the Top initiative. The next
section will explore the theoretical background for the study.

Theoretical Foundations

This research will use constructivism as a theoretical framework. Constructivism
is a theory based on the thought that all knowledge builds or is constructed upon previous
information (Greenes, 2009). Constructivists believe that knowledge increases as
students make sense of new information in their own personal way (Mikusa & Lewellen,
1999). Constructivists believe that the students learning environment should allow the
learning to construct their own knowledge of and within their current environment (Eret,
Gokmenoglu, & Engin-Demir, 2013).

One well-known constructivist was Jean Piaget. Piaget was a Swiss psychologist
who was known for his theory on the models of intelligence (Riegle-Crumb, 2006).
Piaget hypothesized that there were four successive models of intelligence (1)
sensorimotor, (2) preoperational, (3) concrete operational, and (4) formal operational
(Piaget, 1952). Piaget theorized that learning in children was a building process and that
children went through this process by experiencing and interacting as learning took place.
During the child’s sensorimotor stage, between the ages of zero to two years, one key
intellectual advance is object permanence. Object permanence is when an infant
understands that an object in his or her surroundings still exists even if it is out of his or
her sight (Piaget, 1952). An example of object permanence would be placing a toy
underneath a blanket where the infant is aware that it is covered and attempts to uncover the toy. The preoperational stage of development, which has a key component called symbolic play, occurs when the child is between the ages two and seven (Piaget, 1952). Piaget (1952) theorized that at the preoperational stage of development, children can mentally represent objects and events even if they are not physically real or occurring. An example of symbolic play at this stage would be the creation of imaginary friends. During the concrete operational stage of development, between seven and eleven years of age, the child develops what is termed logical thought, in which the child only applies to real or concrete objects (Piaget, 1952). Piaget’s final stage of development, formal operational, occurs when a child is 11 or older. At the formal operational stage, the child is able to manipulate thoughts and calculations mentally without a dependence on concrete objects (Piaget, 1952). Piaget’s theories are particularly applicable to student achievement in mathematics. Using Piaget’s theory gives educators and parents an understanding of why in theory, for example, students must learn to count before they are able to add and subtract and possibly why algebraic concepts are not introduced until middle school. It is therefore understandable that schools in Mississippi and other states as well have a natural progression of mathematics courses from the less difficult, such as basic math or Pre-Algebra, to the more difficult courses such as calculus (Riegle-Crumb, 2006).

Another well-known constructivist was Lev Vygotsky. Vygotsky was a Soviet psychologist who developed the construct of the zone of proximal development (ZPD). In his work on the ZPD, Vygotsky theorized that students have a current volume of knowledge or stage of development and that there is another volume or zone of proximal
development that can be ascertained with the aid of a teacher (Vygotsky & Kozulin, 2011). Vygotsky’s zone of proximal development theory is commonly viewed as foundational to the development of the concept of scaffolding that contemporary educators frequently employ. Scaffolding builds instruction based on learned concepts. It employs temporary support for students during the learning process that are removed when the scaffolds are no longer needed (Cole & Washburn-Moses, 2010).

Another of Vygotsky’s theories involved the increase in knowledge gained by a child as he or she interacts within their environment and with their peers (Burkholder & Pelaez, 2000). Vygotsky’s theory, as applied in the mathematics class, would include the process of students practicing math examples as well as the concept of cooperative learning. Vygotsky’s theory emphasizes the need for students to interact within the learning environment by working examples, and interacting with the teacher and their peers (Burkholder & Pelaez 2000). Vygotsky also theorized on three different types of speech. Those three speech types were external, egocentric and internal speech. Egocentric speech, commonly referred to as private speech, is directly applicable to mathematics. A student using private speech in a mathematics classroom would be a student using the ability to perform mathematic operations mentally (Jones, 2009). Using Vygotsky’s work as a frame of reference, one might assume that a student in a mathematics course must apply the principles of solving a one-step equation, along with quality instruction from a teacher, to advance to solving multistep equations. By employing the theories of Vygotsky and Piaget within math concepts, one can better understand the reasoning behind circumstances in which educators allow certain students access to algebra at an early age, while not allowing other students the same access.
The Mississippi Algebra Framework and Common Core State Standards

This portion of the literature review will investigate the Algebra I curriculum that has been used in the state of Mississippi since 2007, as well as the newly introduced Common Core State Standards for mathematics that were implemented in the state of Mississippi. A major component to the success or lack of success for students in Algebra I classrooms throughout Mississippi is the teaching of the actual Algebra I curriculum.

According to the Mississippi Department of Education (MDE) mathematics framework revised in 2007, there are five different strands in the Algebra I curriculum. Those strands were listed as:

1. numbers and operations
2. algebra
3. geometry
4. measurement
5. data analysis and probability, (Mississippi Department of Education, 2007).

The Common Core state standards were designed to provide more depth of knowledge of math concepts and less breadth as has been common with past state frameworks. An example of the depth would be teaching students why the foil method for multiplying binomials in math works as opposed to simply teaching students how to use the foil method (Mississippi Department of Education, 2014b). There are 8 listed standards that are common from 8th grade through high school. These mathematical practice standards are standards that educators should work toward to making students proficient in using the standards. The standards are written to ensure that students:
1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure (Mississippi Department of Education, 2014b, pp. 12-14)

Factors Affecting Student Performance

This portion of the literature review will investigate different factors that may affect the performance of students on the Mississippi state Algebra I exam. The factors affecting student performance on the Algebra I subject area test that will be investigated are:

1. The criteria used to place students into Algebra I and possible unintended consequences
2. The differences in performance on state exams among grades
3. Test results in comparison to the different amounts of time the students spend in an Algebra I class
4. Teacher instructional practices

Math Placement Criteria

Eighth grade Algebra I enrollment has increased from approximately 16% in 1986 to 22% in 1999 to 29% in 2004 to 34% in 2011 (National Center for Education Statistics, 2013; Perie, Moran, & Lutkus, 2005). There have been many research studies done on
the criteria used to place students into Algebra I (Faulkner, Crossland, & Stiff, 2013; Moller & Stearns, 2012; Spielhagen, 2010). Some research has indicated that placement into Algebra I is often based on the students’ performance in previous math courses (Faulkner, et al., 2013). If students consistently score high in the math courses leading up to 8th grade, one would reasonably assume that those same students would perform equally as well in the next math course, which typically would be Algebra I (Faulkner, et al., 2013; Moller and Stearns, 2012; Spielhagen, 2010).

Research has also indicated that socioeconomic status was a good predictor of placement into 8th grade Algebra I (Raudenbush, Fotiu, & Cheong, 1998). Parents of students from higher socioeconomic brackets tend to have more resources and skills needed to assist their students in education (Raudenbush et al., 1998). Students from higher socioeconomic conditions tend to be placed into Algebra I in the 8th grade with greater regularity than students from lower socioeconomic conditions (Spielhagen, 2010). In a study on algebra and geometry exposure in eighth grade, Masini (2001) found that White, Asian and other minority groups with a lower socioeconomic status received algebra and geometry exposure at the same rate. Masini (2001) also determined that the same ethnic groups, but with higher socioeconomic standings, received exposure to geometry and algebra at differing rates, while the White and Asian students received more exposure to math and geometry than did other minority groups. Sharma, Moss, Joyner, and Osment (2014) determined that Black students in predominately Black schools in North Carolina scored significantly lower on the end of course exam than their white counterparts in diverse schools. Faulkner et al. (2013) also found that Black students’ opportunities to be placed into algebra in the eighth grade were lower even if
other variables such as previous performance was equal to their white counterparts. In light of research from some studies indicating that the students’ socioeconomic status and race could be factors in determining when students are placed into Algebra I, this current research will attempt to determine if this is a factor in Mississippi.

Another factor used to place students into math courses is teacher perception; Bright (2009) addressed this factor in a study on the criteria used to assign student to high school math courses. Inconsistent student performance or students who, at times earned excellent grades and at other times earned poor grades was also a factor in student algebra placement according to Faulkner et al (2013). If the teacher’s perception of a student’s ability is a key factor used to place students into Algebra I, then the process may become subjective (Smith, 1996).

Student readiness has also been examined as a criterion for placing students into Algebra I. In some instances students are enrolled into algebra before they are adequately prepared and in other cases students are not enrolled in algebra even though they may be intellectually ready for algebra (Stein, Kaufman, Sherman, & Hillen, 2011). A lack of student preparedness can be detrimental to a student’s success if they are enrolled into algebra too early (Lovelace, 2008).

In recent years, some schools have implemented what is often called double blocking. Students in these types of courses are generally lower-performing students (Kennedy, 2004). According to Kennedy (2004) this type of scheduling is designed to teach a one year course over two years, or in some instances the course meets twice as long as other courses for one year. This allows the teacher to cover the material but at a slower pace than the normal course. One researcher in California determined that
students who were on double period schedules were just as successful in passing the California exit test as were their counterparts using seven period schedules (Green, 2010). This finding indicated that increasing the time the students spent with their algebra teacher increased the student’s achievement. In some instances, this type of schedule also allows the student to be able to earn two math credits during one year and essentially be placed into position to take upper level math courses later in his/her academic career.

Another factor influencing a student’s early access to Algebra I is family pressure (Smith, 1996). Students who are enrolled in Algebra I as 8th graders generally have parents who are more involved in their education (Useem, 1992). Often, highly educated parents are more involved in the education of their children, and therefore understand the impact that early algebra access can have on their children later in their academic career (Smith, 1996; Useem, 1992). Research has indicated that students who are enrolled in algebra during middle school are more likely to enroll in upper level math courses during their high school career (Moller & Stearns, 2012; Smith, 1996). For example, if a student in Mississippi completes Algebra I as an 8th grader, that student will be able to take geometry, Algebra II, trigonometry, calculus, statistics or any other math they choose during their four years of high school.

There is also research indicating that ethnicity is a factor influencing student placement into Algebra I. Diette (2012) found that when African American students attended middle schools with a large majority of Caucasian students, the African American students were less likely to be enrolled in Algebra I. McCoy (2005) and Smith (1996) also found that there were ethnic disparities within the number of students allowed early access to algebra as well. Other research indicates that historically underserved
student representation in 8th grade Algebra I is increasing and in California the number has doubled since 2003 (EdSource, Inc., 2008).

Spielhagan (2010) surveyed graduating seniors about taking algebra in 8th grade. The students responded that the math taken during their 8th grade year had an effect on their high school course choices as well as their college and career plans. The students also said that being assigned to algebra in the 8th grade was based on their work ethic more than their intellect. These students opined that assigning all 8th graders to algebra would be beneficial to all students for the future (Spielhagan, 2010).

*Unintended Consequences of Delayed or Early Enrollment in Algebra*

In light of the high stakes often associated with state testing, the process of deciding when a particular student or group of students should take Algebra I does not come without consequences. For example, if a student waits to enroll in Algebra I in either the ninth or tenth grade, the opportunities that the student has for taking upper level courses are limited due to the number of course-taking opportunities that the student has during his/her entire secondary academic career. For example, if a student is required to take four math courses during high school, there may not be enough room within the schedule to take a fifth math course. The student’s limited math course history may therefore hamper the student’s college readiness due to a lack of alignment between the courses taken and the courses required for college success (Brown & Conley, 2007).

Another unintended consequence can occur if the process of selectively placing students into early Algebra I did not occur. According to Nomi and Allensworth (2009), when students were not grouped by ability, the higher performing students did not perform as well on assessments. The resulting lower performance by the higher
performing students may have been due to the teacher having to slow down the pace of the class due to a mixture of abilities within the class.

Finally, an unintended consequence of students accessing Algebra I too early is the level of student success in higher-level courses. Liang, Heckman, and Abedi (2012), in a study on the effects of the movement in California toward 8th grade algebra for all, found two contrasting trends. The researchers found that between 2003 and 2008 there was an increase in the number of students taking the California Standards Test (CST) in Algebra I as well as an increase in the number of students taking the CST for summative high school math in the 11th grade. This was an indication that more students were accessing the higher-level math courses (Liang et al., 2012). The issue with more students accessing Algebra I in the 8th grade is that as those students moved through to the 11th grade, the number of participants plummeted. The researchers above found that between 2003 and 2008, an additional 96,441 8th grade students took the algebra assessment. From 2006 to 2011 an additional 33,151 students took the CST for summative high school assessment, indicating a loss of approximately 63,000 students from this initial peer group (Liang et al., 2012). A key reason for increasing the number of students taking Algebra I in 8th grade was to allow the students the opportunity to take higher-level math courses later in their academic career. As indicated in Liang et al. (2012), there were fewer students accessing those upper level courses in high school, and a higher percentage of those who were accessing the courses were not successful.

Differences among Grades in Performance on State Exams

It may be assumed by some educators that students taking algebra in the 8th grade will perform better on state assessments. This portion of the literature review will discuss
studies that examined those assumptions as well as other factors affecting the performance of students who take algebra in high school. Studies have indicated that students who take Algebra I in the 8th grade score considerably higher in the course and on assessments than students who take Algebra I in the 9th grade (Smith, 1996; Spielhagen, 2006). While some research appears to verify the assumption that 8th grade Algebra I students would typically perform better than ninth grade algebra students, there are other studies that indicated otherwise. According to research on the California Standards Test (CST), students who took and passed the standards test for general math in the 8th grade had a 69% chance of successfully passing the CST Algebra I test in 9th grade (Liang et al., 2012).

Some school districts within the United States have gone to 9th grade academies to help to ease the transition from middle to high school for 9th graders. Ninth grade academies are schools or schools-within-schools, consisting of only the 9th grade, developed to help to ease the transition from middle school to high school for 9th graders (Styron & Peasant, 2010). The implementation of 9th grade academies has been credited with increasing graduation rates as well as increasing 9th grade attendance (Jordan, 2009). Some research indicates that 9th grade academies help to increase student performance (Styron & Peasant, 2010; Waden, 2011). However, there is also research indicating that 9th grade academies do not have a significant impact on student achievement (Crosby, 2011; Jordan, 2009). The research indicating positive results found that students in ninth grade academies scored significantly higher than their counterparts in traditional schools. Those studies also indicated that students enrolled in ninth grade academies from traditionally underserved groups also scored higher than
Caucasian and African American students in traditional schools (Styron & Peasant, 2010).

In a study completed in Atlanta, Crosby (2011) found that students who attended a particular ninth grade academy earned scores on the Georgia High School Graduation Test in algebra that were similar to the scores earned by their peers in traditional high schools. Crosby also detailed the fact that only three high schools were used in the study. Another factor that potentially impacted Crosby’s findings was the fact that curriculum for the Algebra I exam had changed and may have been a factor in the results. The Crosby (2011) study is important because it indicates that there was not a difference in performance between students in ninth grade academies and students in traditional high schools.

**Student Exam Results and Class Schedules**

There have been many studies conducted to determine if particular school schedules affected student achievement. The present research will try to determine if the type of schedule used within the school has any effect on the students’ performance on the Algebra I Subject Area Test. There are commonly two different types of schedules used in high schools across the United States. One type of schedule is called a traditional seven or eight-period day which is a schedule in which students attend six or seven classes of approximately 50 minutes each day over a total of 180 days (Carroll, 1990). Another type of schedule is commonly called block scheduling. There are several types of block schedules. The 4x4 semester model is a schedule in which students attend four classes daily each semester. The A/B block schedule is another form of scheduling in which students attend classes based on an alternating basis. On this type of block
schedule the students would attend four A-day classes every other day and a different set of four B-day classes on the days opposite the A-day. There are also several different modifications or hybrid types of block schedules (Handley, 1998; Smith, 2010).

Alternative or block scheduling ideas appear to originate with the Copernican Plan developed by Carroll (1990). In this plan Carroll proposed a move away from the traditional six or seven-period day in which classes met for a total of approximately 50 minutes each to a schedule providing for longer class meetings but with fewer number of meetings. Carroll termed these schedules macro-schedules. Carroll (1990) proposed two different schedules. The first was a schedule in which students would be enrolled in class for 30 days, and the class would meet a total of four hours per day. The students would enroll in a total of six of these classes per year. The other schedule proposed by Carroll required that students be enrolled in courses that met for two hours per day for a total of 60 days.

Studies of block scheduling have provided a mixture of results. In several cases, there have been studies conducted in the same state and using the same assessment instrument and yet yielding different results. There are various reasons for the differences in results. These reasons could have been the differences in methodology, student populations, demographics or school climate. Two studies conducted in Mississippi revealed two different types of results. Smith (2010), in a study comparing block and traditional seven-period day schedules, found that administrator perceptions of the block schedule were favorable. Smith (2010) also found that students in schools using block schedules scored significantly higher on Biology I and Algebra I state assessments than students in schools using the seven-period day. A contradicting study
also conducted in Mississippi by Handley (1998) found that there was not a statistically significant difference in the scores on the Algebra I state assessment between students who were in traditional seven-period classes and students who were in block-scheduled classes. The study conducted by Smith used a statewide sample of data and the study conducted by Handley used data from one particular school. The difference in methodology and sample size may have contributed to the different findings.

Many other studies have been conducted assessing the effects of block scheduling in other states. As indicated earlier, different researchers have found different results. On the Massachusetts Comprehensive Assessment, which tests 10th grade students in math and language arts, Forman (2009) found that over a two-year time period after switching to block scheduling, nearly 22% more students passed the exam in math. This study investigated a school system over a three-year period using test results from 762 students. Harvey (2008) in another study conducted in Massachusetts found that there was not a statistically significant difference in math achievement on the Massachusetts comprehensive assessment system exam in 10th grade between students in schools who use block schedules and student in schools who use the traditional schedule. In the study conducted by Harvey (2008), data from 259 public high schools in the state were used in the sample. Both of the Massachusetts studies used the tenth grade assessment and the studies were conducted a year apart; yet, the Foreman study indicated that there was a large difference in achievement while the Harvey study indicated that there was not a statistically significant difference in achievement. The difference in results could have been attributed to the methodology used in the study. Another possible explanation
behind the differences in the results may have been the number of years that the schools studied have used block schedules.

The findings of studies on block schedules from other states indicated similar results within certain variables and differing results within other variables. Trinkle (2011) found that there was not a significant difference in the performance of students on the geometry and language arts end of course assessments in schools using the block schedules and students in schools using the traditional seven-period day. Researchers have found that different ethnic groups have different results in schools using block schedules. Gill (2011) found that there was not a significant overall difference in performance on Virginia’s Standards of Learning state test in math and reading. This study did show, however, that there was a significant increase in the percentage of African American and Hispanic students passing, who were in schools using the A/B block schedule versus students in schools using the traditional seven-period day (Gill, 2011).

Mattox, Hancock, and Queen (2005), in a study conducted with middle school students, determined that students in schools using the block schedule had a significant increase in math achievement. Students in schools using a traditional seven-period day did not show a significant increase in math achievement. The authors argued that some of the possible reasons for their conclusions could be that:

1. block scheduling allowed the student to take more classes,
2. classes within the block were longer, allowing for different types of instruction,
3. the block schedule had fewer class changes which allowed for fewer
distractions for the students, and
4. the longer classes allowed for more individualized instruction to take place
within the classroom (Mattox et al., 2005, p 10)

In a study completed in Florida in 2011, the researcher determined that students in
schools on the traditional seven-period day scored better on the Florida comprehensive
achievement test in math than did students on A/B block schedule (Williams, 2011).
Williams also cited several benefits as referenced by the administrators and teachers in
this study. The teachers and administrators questioned in this study believed that block
scheduling:

1. allowed for the implementation of different types of instructional strategies,
2. there was a decrease in discipline due to fewer transitions, and
3. block scheduling allowed for more time on task due to longer class periods
   (Williams, 2011).

In another study comparing the performance of students at the same high school
over different years after moving from a traditional schedule to a block schedule, the
researchers found that students who attended the school during the time on the traditional
schedule scored significantly higher on the Georgia High School Graduation Test in
math, language arts, social studies, and science than students on the block schedule
(Gruber & Onwuegbuzie, 2001). This study investigated results of the 115 students who
graduated in the 1996-1997 academic years, when the students were on the seven-period
day schedule. The comparison data were from the 1999-2000 school year, when there
were 146 students on the 4x4 block schedule. Gruber and Onwuegbuzie (2001) argued
that not only did the students on the block schedule not score better than students on the traditional schedule, those students scored much worse than their counterparts.

A study in North Carolina found results similar to those in the study conducted in Georgia. The researchers in this study found that students in schools using the traditional seven-period day scored significantly higher in the Algebra I, English I, biology and U. S. history state tests (Lawrence & McPherson, 2000). There were more than 4,700 student results used in this study. The researchers insisted that the results could have been attributed to the fact that the year being investigated was the first year that block scheduling was used in the test schools, and an implementation dip could have occurred.

**Curriculum and Teacher Instructional Practices**

The nature of the teacher’s orientation toward teaching, learning and pedagogical approach to the instruction of algebra is a factor in student success. Doyle (2008) describes a student or learner-centered classroom as one in which the student is in control of what is learned and how it is learned. For the purpose of this study a student or learner-centered classroom is defined as one in which the student is, providing or demonstrating solutions to problems or in collaborative groups for more than 60% of the allotted class time. For the purpose of this study, a teacher-centered classroom is defined as one in which the teacher is discussing the lesson and providing or demonstrating solutions to problems for more than 60% of the allotted class time.

Haas (2005) identified six effective teaching methods in secondary algebra. These are: “cooperative learning, communication and study skills, technology-aided instruction, problem-based learning, manipulatives, models and multiple representations, and direct instruction” (Haas, 2005, pp. 27-28). These methods are elaborated in the
following subsections in order to demonstrate the usefulness of these strategies within algebra classes in Mississippi.

Cooperative learning. There have been numerous studies on the effects of cooperative learning on student achievement. There are many benefits to cooperative learning such as the ability to use peer instruction, the ability to teach students to work within a team, and cooperative learning allows the teacher to act as a facilitator within the classroom. Kinel (1994) found that students who had math instruction with cooperative learning incorporated had a significant increase in scores on classwork and assessments. Some research has indicated that there are negative effects associated with the strategy of cooperative learning. Quattrin (2007) studied cooperative learning in a secondary calculus course in a Jesuit high school and concluded that there are four obstacles to cooperative learning:

1. the freeloader effect, in which one student typically completes the assignment; however, the entire group gets the grade,
2. the higher achieving learner’s resentment toward cooperative learning,
3. the status of student-centered or group-centered learning experience that requires that the teacher give the control of the learning to the students, and
4. the lack of research on cooperative learning in secondary calculus.

Other studies conducted in middle and elementary schools have found positive effects of cooperative learning. Torchia (2012) determined that cooperative learning was effective in a fourth grade classroom. Romero (2009) determined that cooperative learning had a positive effect on student achievement in the science classroom. Romero’s study was a review of over 2,500 citations that investigated student achievement when
cooperative learning was implemented in science classrooms. As indicated by the research discussed in the above paragraphs, cooperative learning can have a positive effect on student achievement in core subject areas; however, other research indicated that cooperative learning had some negative impacts on students’ perceptions of the cooperative learning process.

*Communication and study skills.* According to Haas (2005), it is also very important that students in math are taught how to read and study math, as well as having the ability to talk through math problems. Allowing students to talk through math examples or as Haas (2005) termed it thinking aloud gives the teacher the opportunity to know exactly what the student is thinking. This process also allows the teacher the opportunity to correct any misperceptions. Greenberg (2012) wrote that children began to develop math skills from the day that they were born by the way that they interact with their environment and with other humans. The author wrote that when infants learned the concept of asking for more or the concept of there was no more, the infant was learning math. Greenberg (2012) also noted that there were many opportunities to teach math concepts to young children on a daily basis; for example, telling a toddler that they had two hands and one nose helped them to see the difference between one and two. Greenberg (2012) also wrote that the more young children were exposed to math, the more likely they were to have a positive perspective of math in later years. Mercer and Dawes (2010) asserted that it is not enough to just allow students to converse in groups, but that the conversation should be guided to keep students on task, to assure that no one person is dominating the discussion and that all students are participating in the conversation.
There is additional research on cooperative learning. Mercer and Dawes (2010) concluded that there is a need for the teacher to find appropriate balance between teacher and student dialogue and student-to-student dialogue. The authors also theorized that for some students, the conversations with peers were possibly the only opportunities for those students to express their thoughts in an educated manner. The previous study combined two of the concepts proposed by Hass in that it used cooperative learning as well as the need of students to be able to have dialogue among them in a controlled environment. In summary, research has indicated that there is a need to allow students to verbally express their thoughts in order to increase their learning, and to allow the teacher to know exactly what the student is thinking.

*Technology-aided instruction.* Haas’s (2005) third proposed effective teaching method was the use of technology to help improve student retention of the material. This portion of the literature review will investigate studies involving the retention of information due to the use of technology. Technology in math has increased over time. From the implementation of the four-function calculator to graphing calculators to math analysis software the development and implementation has slowly increased (Pierce & Stacey, 2013). Pierce and Stacey (2013) attributed this slow pace in part to the inability to get the entire school community to embrace the infusion of technology. Technology in math is being used to understand and graph systems of equations, to solve complex math examples and to provide visual representations of math solutions (Eddy et al., 2015). Pane, Griffin, McCaffrey, and Karam (2014), in their research on a specific self-paced Algebra I course using technology, found that there was no significant difference in student performance on an algebra exam during the first year of implementation. The
researchers did find a slightly significant difference in performance between high school students in the second year of the program.

St. Clair (2004) investigated the retention of engineering students in a mechanics class, some of whom were taught the course using different forms of technology, while others in different sections of the course were taught using no software. The latter individuals solved problems only by hand. St. Clair’s results indicated that there was no significant difference in the amount of information retained between the students who were taught the course using technology and the students who were taught the course using no technology. St. Clair’s (2004) results did indicate, however, that the students using the technology were more efficient at solving problems.

Another study conducted by Ross (2003) investigated the implementation of technology in an elementary history class. The researcher used two different classes, one receiving instruction from a traditional teacher centered class and the other receiving instruction for a technology assisted problem based instruction program. The researcher found that there was not a significant difference in the knowledge gained by the students; however, the student who received instruction directly from the teacher retained more information from the experiment.

Savoy, Proctor, and Salvendy (2009), in a study on the retention of information through PowerPoint found that student in their particular study retained 15% less of the information delivered by PowerPoint than they did of the information delivered by traditional lecture. This study used 62 participants who were engineering students at Purdue University. The students participating in the study indicated that they preferred the PowerPoint presentations to traditional lectures (Savoy et al., 2009).
Problem-based learning. The ability of students to solve problems whether in math, science, or in society is key to their ability to compete in the global economy of the 21st century (Gasser, 2011). O’Brien, Wallach, and Mash-Duncan (2011) write that problem-based learning was developed in the late 1960’s at McMaster University to help teach medical students. The concept of problem-based learning has since been adopted by many other professions and disciplines as a way of teaching and training.

The need for educators to develop relevant problems in math or any other classroom is essential to ensure that students are adequately able to solve the problems and that those developed problems have a specific goal (O’Brien et al., 2011). Problem-based learning is also very essential to the Piagetian concept that knowledge is constructed from the learner’s surroundings. Giving students specific rules or parameters can be equivalent to providing a future mechanic a set of tools. The mechanic will eventually figure out which tools are needed to fix a specific problem essentially through trial and error. This process is often used in contemporary math classrooms. Students are provided specific information either through rules or formulas, and are then given a problem to solve using those rules or formulas.

Teachers are also implementing a newer concept called a flipped classroom to assist in problem-based learning. In a flipped algebra classroom, the students would learn the concepts, rules, and processes on their own either online or through video (Love, Hodge, Grandgenett, & Swift, 2014). The flipped classroom concept in a math class allows for more problem solving time within the classroom with the aid of the teacher. A key concept in the Common Core framework for math is a shift to performance-based assessments to more effectively assess what a student is able to do
during the process of solving a math example (Common Core State Standards Initiative, 2014). One component of the math assessments is performance-based items in which the students must show the process and the reasoning behind the process used to solve problems. Partial credit for each item comes from using the correct process (Common Core State Standards Initiative, 2014).

Manipulatives, models and multiple representations. The use of manipulatives in teaching and learning is providing students with the opportunity to physically interact with objects such as blocks or cones or other mathematical shapes or concepts (Carbonneau, Marley, & Selig, 2013). The use of manipulatives, models and multiple representations, essentially allows the teacher to address other learning styles within the classroom. According to the National Council of Teachers of Mathematics content standards (National Council of Teachers of Mathematics, 2000), teacher instruction should include teaching students to create and use different representations to solve problems, to interpret physical, social and mathematical issues or problems, and to organize and communicate mathematical ideas. The use of manipulatives is essential to teaching students math concepts (National Council of Teachers of Mathematics, 2000). Manipulatives within an algebra class, such as Algebblocks or other tangible objects, can be used to help to provide physical examples for algebra concepts. Additional examples of manipulatives in the algebra classroom include the use of different blocks, cones or cards to represent different shapes and objects, such as pop-sickle sticks, to represent different parts of an algebraic expression (Yun & Flores, 2012).

Direct instruction. The final effective teaching strategy proposed by Haas (2005) was the use of direct instruction. Haas (2005) described direct instruction as establishing
a direction for learning that involves relating new information to previously learned concepts, and leading students through those concepts by providing the students with feedback and the opportunity to practice. The process of direct instruction is a common practice used in schools today. Within a math classroom, direct instruction is often combined with discovery learning, problem-based learning, or differentiated instruction and studies have indicated that combinations of these instructional strategies help to improve student comprehension (Millikan, 2013; Star & Rittle-Johnson, 2008). Often teachers provide students with a given amount of information, and then allow the students the opportunity to apply the concepts and information, followed by testing that given information, before moving to new information that may be related to the previously learned material. The use of direct instruction is a key component to the teaching of vocabulary to lower grades to help students with comprehension skills (McAdams, 2011).

The teaching of vocabulary is a key component of instruction. For example, if a student does not understand what a particular question or example is asking them to do, finding the correct solution to the problem is even more difficult. Carter and Dean (2006) wrote that vocabulary instruction included the teaching of strategies that allow students to make a connection between concepts and the vocabulary used within those concepts. Direct instruction in contemporary classrooms is often used to build a foundation with vocabulary terms, rules, and procedures to be used further into the lesson.

Summary

The importance of algebra dates back to its beginnings. It has and continues to be an important course that often has been called the gatekeeper course (Fuchs & Miller, 2012). This metaphor for the course occurred because success in algebra can often lead
to success in other upper level math courses, which, in turn, can lead to college success. The process in which algebra is being taught and assessed is being changed within the state of Mississippi and this study will attempt to determine if certain variables have any effect on student success. There are many differences within the state with different school schedules, scheduling practices, different teaching practices, and differences among students. This study will attempt to determine if there are differences in student performance based on schedule types, teacher practices, or the point at which algebra is taken. The goal of this research is to provide information that can be used throughout the state to help to increase student performance in Algebra I.
CHAPTER III
METHODOLOGY

This chapter describes the research methodology used in this study that attempted to determine if selected variables had any effect on student achievement on the Mississippi Algebra I Subject Area Test. The research questions and hypotheses for this study are included in this chapter. The sampling method used to choose the participating schools in this study is detailed within this chapter. The variables investigated and the instrumentation are also detailed within this chapter. Finally, the procedures and processes for analysis are described.

Research Questions and Related Hypotheses

There are often many variables that are related to a student’s success in school in general and in specific courses. From success in prerequisite courses, student’s learning styles, to teacher ability; these variables can affect student performance either positively or negatively. This study investigated the variables described in the subsequent section on research design and examined their relationship to student performance on the Algebra I Subject Area Test. The research questions for the study were:

1. Is there a difference in principals’ ratings of performance on the Algebra I Subject Area Test among students who take the exam in the 8th grade, the 9th grade, and the 10th grade?

2. Is there a difference in the performance on the Algebra I Subject Area Test between middle schools and high schools?
3. Is the type of instructional schedule for the Algebra I class related to the principals’ ratings of the success of students on the Algebra I Subject Area Test?

4. Is there a relationship between principals’ ratings of the success of students on the Algebra I Subject Area Test and the degree to which they experience student-centered instruction?

5. Is there a relationship between race and poverty and the year in which Algebra I is taken, administrators’ ratings of the level of growth in students’ Algebra I achievement, and the performance of students on the Algebra I Subject Area Test?

6. What are the criteria used to place students into Algebra I?

The hypotheses that are related to Research Questions 1, 2, 3, 4, and 5 were stated as follows:

H₁: There are differences in the principals’ ratings of performance on the Algebra I Subject Area Test among students who take the exam in the 8th grade, the 9th grade, or the 10th grade.

H₂: There is a difference in performance on the Algebra I Subject Area Test between middle and high school students.

H₃: There is a relationship between the type of instructional schedule for Algebra I and the principals’ ratings of success of students on the Algebra I Subject Area Test.
H₄: There is a relationship between principals’ ratings of the success of students on the Algebra I Subject Area Test and the degree to which they experience student-centered instruction.

H₅: There is a relationship between race and poverty and the year in which Algebra I is taken, administrators’ ratings about the level of growth in students’ Algebra I achievement, and the performance of students on the Algebra I Subject Area Test.

Research Design

The research design chosen to investigate the relationship of selected variables to Algebra I subject area scores within the state of Mississippi was non-experimental and employed quantitative data. Data were gathered in the form of questionnaires, which were completed by middle and high school administrators. The questionnaire, which is described in detail in the section on instrumentation, focuses on the type of schedule employed by the school, the methods used to place students into Algebra I, the types of teaching methods used to teach Algebra I, and administrators’ ratings about the level of growth in students’ Algebra I achievement. Algebra I subject area testing data was also gathered from the Mississippi Department of Education’s website for the seven different geographical areas of the state.

Principals’ ratings of performance on the Algebra I Subject Area Test served as the dependent variable for Research Questions 1, 3 and 4 in this study. The independent variable for Research Question 1 was the grade in which the student’s took the Algebra I Subject Area Test. The independent variable for Research Question 3 was the type of instructional schedule being used in the school. The independent variable for Research
Question 4 was the percentage of student-centered instruction experienced by the student. The dependent variable for Research Question number 2 was the performance mean scale score on the Algebra I Subject Area Test for middle schools and high schools within that zone. These criteria were studied in an attempt to determine if they are related to student performance. The dependent variables for Research Question 5 was a) the year in which Algebra I is taken, b) administrators’ ratings about the level of growth in students’ Algebra I achievement, and c) Algebra I scores on the subject area test. The related independent variables were the mean performance based on race and the socio-economic status of the students within each region.

Participants

This study employed a questionnaire that was used to survey study participants. In order to implement this study, the researcher determined that the study participants would be school administrators from a sample of school districts across the state of Mississippi, who were in middle or high school building administration roles during the 2013-2014 school year. The researcher requested written permission from the superintendents (Appendix A) of the school districts to survey the building administrators of the district. Once superintendent permission was secured and the study was approved by the Institutional Review Board of The University of Southern Mississippi (Appendix B), the questionnaires (Appendix C) were either mailed or hand-delivered to the individual school principals for completion by either the principal or an assistant principal in each participating school. Each participant was provided with a cover letter requesting that he/she complete the questionnaire (Appendix D). The letter was accompanied by a consent document (Appendix E) and the questionnaire.
While students did not participate in the study, the researcher also used archival student Algebra I SATP scores from the Mississippi Department of Education to provide achievement data for the regions in which the schools were located. These achievement data, along with Items 13, 14 and 21-23 on the instrument were used to address Research Question 2. Archival Algebra I SATP scores from the Mississippi Department of Education were also used to answer Research Question 5. For Research Question 5, mean scale scores by race and socio-economic status within each region were computed.

The state was divided into seven different geographic regions; a map of these regions is included in the instrument (Appendix C). The initial goal was to reach a sample size of at least 5 schools within each accountability rating from each of the regions. The goal, therefore, was to have at least twenty-one middle schools and the high schools into which they feed within each of the five different accountability ratings. This would help to develop a diverse sample of schools from which to draw data for the study.

Region 1, the Northern Mississippi area, consisted of districts in counties from Desoto to Panola Counties north to south and all Mississippi counties to the east of those to Tishomingo and Itawamba Counties. Region 2 was the Delta districts and included counties along the Mississippi river from Tunica County to Issaquena County, from north to south. The Delta districts included those in Quitman, Tallahatchie, Leflore, Sunflower, Humphreys, and Sharkey Counties.

Region 3, the North Central region, included districts in counties from Yalobusha to Monroe in the north down to Holmes and over to Noxubee in the south. Region 4, the East Central region, included districts in counties from Leake to Kemper in the north down to Smith and Clarke Counties in the south. Region 5, the Metro area region,
included districts in Warren, Hinds, Madison, Rankin, and Yazoo Counties. Region 6, the southwestern region, included districts from Claiborne to Simpson County in the north down to Wilkinson and Walthall Counties to the south. Region 7, the southeastern region, included districts in all counties from Jefferson Davis and Wayne on the northern end to the Gulf coast on the southern end.

Instrumentation

*Instrument Elements and Subscales*

For purposes of data collection, the researcher developed and distributed an instrument to the principals and assistant principals in the previously described sample schools. The instrument, entitled An Investigation of Selected Variables Related to Student Algebra I Performance in Mississippi, began with a section on demographic information about the participant and the school. This section includes Items 1-4. Item 1 requests the general location of the respondent’s school based on the seven geographic areas outlined in the previous section as well as important information about the respondent’s school. Items 2-4 within this section ask about the respondent’s position within the school, the type of school, whether middle, high or a combination of middle and high school and the school rating for the 2013-2014 school-year. This information helped to identify the grade levels within the school.

SPSS was used to analyze descriptive statistics for these items, including frequency, means, and standard deviations. Item 5 asks about the type of schedule used within the school; the data from this item was used in answering Research Question 3 and the related Hypothesis 3. Item 6 provided information to help to answer Research Question 4 and the related Hypothesis 4. This item is related to the type of instruction,
either teacher-centered or student-centered, taking place within the classroom. This variable was operationalized through responses to survey items in which administrators’ recorded their ratings about the proportion of time students receive teacher-centered or student-centered instruction in the Algebra classrooms in their schools. Items 7-12 are all related to the criteria used to schedule students into Algebra I. These items used a horizontal numeric scale format with the responses being 1=”Never True”, 2= “Seldom True”, 3= “True as Often as Not”, 4= “Usually True” 5 “Always True”. These items were used to gather data to answer Research Question 6. Items 13 and 14 on the questionnaire are related to the differences in student performance by grade. These items, along with archival data from the Mississippi Department of Education, provided data for Research Questions 1 and 2 and related Hypotheses 1 and 2. Items 15-20 were used to provide data for Research Question 5 and the related Hypothesis 5. Archival data from the Mississippi Department of Education provided data for analyses related to Research Question 5 and Hypothesis 5.

*Instrument Validity and Reliability*

In order to contribute to the construct validity of the researcher-constructed instrument, a validity questionnaire (Appendix F) was distributed to a panel of experts prior to the submission of this proposal to committee members. The purpose of this questionnaire was to determine if the questions were appropriate for the study and if the information to be gained was relevant to the study. The panel of experts included a former state superintendent, who has experience with math testing. Another expert was a current middle school principal who schedules students into math courses. A third panel expert was the curriculum coordinator for one of the largest school districts within the
state of Mississippi. The fourth expert served as a district math specialist for a large school district and the final expert was a classroom teacher who had spent the last 29 years in the classroom. The expert reviewers asked for clarification of some of the items on the instrument as well as asking if some of the items were necessary because they did not provide pertinent information for the research.

Data Collection Process

The researcher distributed questionnaires (Appendix C) to the sample schools within the seven different geographic regions. After collecting signed consent forms from the district superintendents, the researcher retrieved contact information for the administrators from their district websites. The researcher then mailed the questionnaire to the principal in each building selected for the study and approved by the superintendent in order to collect the required data to complete the research. Each prospective participant was be provided a consent letter (Appendix D) requesting his/her consent to participant in the research study. Informed consent information accompanied this letter (Appendix E). Within the letter and informed consent document, the participant was informed that his/her permission was completely voluntary, that his/her responses would be kept completely anonymous, and that the information would not be shared with any party other than the researcher’s statistical advisor. The informed consent information (Appendix E) contained a participant agreement that the respondents signed and returned along with the questionnaire. Participants returned the agreement and the completed instrument in a stamped return envelope provided by the researcher. The participants and their local superintendents were provided the researcher’s contact information if they require more information during the course of this study.
The archival Algebra I SATP data that were used for the study was retrieved from the Mississippi Department of Education’s website from the reports menu. These data are located in the Department’s Mississippi Assessment and Accountability Reporting System (MAARS 2.0) database.

Data Analysis

The statistical software package SPSS and Microsoft Excel was used to analyze the data received from this research study. Descriptive statistics was computed for the demographic items within the survey and for constructs associated with the research questions and related hypotheses. The data for these research questions and hypotheses were analyzed using appropriate statistical tools. Research Question 1 was answered by using basic descriptive statistics, including frequency, percentages, means, and standard deviations. Research Question 2 and the related Hypothesis 2 was answered by assessing the differences in the performance of 8th, 9th and 10th grade students within the schools via the mean and frequency distribution of the scores using archival data for the selected schools. Items 13, 14 and 21-23 on the questionnaire, are all related to the differences in student performance by grade. These items, along with archival data from the Mississippi Department of Education, provided data for Research Question 2 and the related Hypothesis 2.

Research Question 3 and the related Hypothesis 3 were answered based on administrators’ beliefs about student performance growth on the Algebra I exam among students who receive Algebra I instruction for the amount of time provided in the different schedule types as reported by the respondents. The statistical procedure for this question was a cross tabulation using administrators’ beliefs about student performance
and schedule type. Research Question 4 and the related Hypothesis 4 were answered by analyzing the relationships among administrators’ beliefs about student-centeredness (Items 6 on the survey instrument) with administrators’ beliefs about student performance growth on the Algebra I exam among students (Items 21-23); the statistical procedure in this instance was a cross tabulation. Research Question 5 and the related Hypothesis 5 were also answered via cross tabulation.

Summary

Research indicates that the timing of when a student is given access to Algebra I is pivotal to the student’s ability to take upper-level math courses before exiting high school. The upper level math courses also increase the chances for success in college for those students (Moller & Stearns, 2012). This research study attempted to determine if specific variables were related to student performance on the Algebra I Subject Area Test.

A researcher-created survey titled An Investigation of Selected Variables Related to Student Algebra I Performance in Mississippi was used to gather data for this study. A quantitative design was used to conduct this research. The independent variables within this study were the amount of time students spend in an Algebra I class, the degree to which students experience a student-centered Algebra I classroom, the students’ race and the students’ socio-economic status. The dependent variables within this study included the year in which Algebra I is taken and also student performance on the Algebra I exam (as operationalized via administrators’ beliefs about the level of growth in Algebra I achievement), and also via archival state data on the Algebra I SATP. Statistical tools appropriate to the types of analyses necessary to answer the research questions were
employed. This study was conducted during the summer and early fall of the 2015-2016 school year with middle and high school administrators within the state of Mississippi.
CHAPTER IV

RESULTS

This study focused on the factors influencing student performance on the Algebra I Subject Area Test. One purpose of this study was to attempt to determine if there was a difference in performance on the Algebra I Subject Area Test between 8th, 9th, and 10th grade students according to the building level administrators. Another purpose was to attempt to determine if there was a difference in performance on the Algebra I Subject Area Test between middle and high school students. Other aims of the study were to determine if the type of instructional schedule, the type of instruction, the students’ socio-economic status, and race had any effect on the students’ performance on the Algebra I Subject Area Test according to administrators. Finally, the criteria used to schedule students into Algebra I were also investigated.

A researcher-created instrument was used to gather data from administrators throughout the state of Mississippi. The instrument was entitled Student Algebra I Performance in Mississippi. Middle and high school building administrators from throughout the state of Mississippi completed the instrument. The researcher distributed the instrument to all of the schools within the state of Mississippi in which permission to research was granted by the superintendent and in which there were separate middle and high schools. There were a total of 175 instruments distributed to schools throughout the state of Mississippi. Of the 175 distributed, there were a total of 33 respondents who returned the instrument. This represents a response rate of 19%. Seven of the returned instruments were returned incomplete. Responses from the incomplete instruments were included only in items that were answered.
Descriptive Data Analysis

Demographic Data

The first four items of the instrument addressed demographic information regarding the respondent and his/her school. An analysis of these data from the respondents revealed that, of those who completed the instrument, 1 was from Region 1 (the north Mississippi region), 7 were from Region 3 (the northeast to central region), 17 were from Region 5 (the metro Jackson area), 1 was from Region 6 (the southwestern region), and 7 were from Region 7 (the coastal region). These data can be found in Table 1. A total of 33 respondents answered this item. Student performance by region is discussed later in the chapter under the sub-heading Research Question 2.

Table 1

Survey Respondents from the Regions of the State

<table>
<thead>
<tr>
<th>Region within the state</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid percent</th>
<th>Cumulative percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Northern Region</td>
<td>1</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>3. North Central Region</td>
<td>7</td>
<td>21.2</td>
<td>21.2</td>
<td>24.2</td>
</tr>
<tr>
<td>5. Jackson Metro Region</td>
<td>17</td>
<td>51.5</td>
<td>51.5</td>
<td>75.8</td>
</tr>
<tr>
<td>6. South Western Region</td>
<td>1</td>
<td>3.0</td>
<td>3.0</td>
<td>78.8</td>
</tr>
<tr>
<td>7. South Eastern Region</td>
<td>7</td>
<td>21.2</td>
<td>21.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>
The researcher examined Algebra I performance among the regions. This information can be found in Table 2.

Table 2

*Student Mean Scale Scores by Region*

<table>
<thead>
<tr>
<th>Region</th>
<th>Middle School</th>
<th>High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Northern Region</td>
<td>666.9</td>
<td>657.8</td>
</tr>
<tr>
<td>3. North Central Region</td>
<td>662.1</td>
<td>654.2</td>
</tr>
<tr>
<td>5. Jackson Metro Region</td>
<td>659.8</td>
<td>652.3</td>
</tr>
<tr>
<td>6. South Western Region</td>
<td>660.0</td>
<td>653.4</td>
</tr>
<tr>
<td>7. South Eastern Region</td>
<td>666.8</td>
<td>656.9</td>
</tr>
</tbody>
</table>

The student mean scale scores on the Algebra I Subject Area Test by race and socio-economic status varied by region. The mean scores of African American high school students and Caucasian high school students are contained in Table 3 and will be detailed further in the sub-section for Research Question 5.

Table 3

*Student Mean Scale Scores by Region and Race*

<table>
<thead>
<tr>
<th>Region</th>
<th>Middle School</th>
<th>High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Northern</td>
<td>666.9</td>
<td>659.0</td>
</tr>
<tr>
<td>Caucasian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>659.6</td>
<td>655.5</td>
</tr>
<tr>
<td>3. North Central</td>
<td>663.5</td>
<td>656.7</td>
</tr>
<tr>
<td>Caucasian</td>
<td>658.5</td>
<td>652.4</td>
</tr>
<tr>
<td>African American</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Item 2 asked the respondents about their official title at the schools during the 2013-2014 school year. There were 16 respondents who indicated that they were administrators in a high school containing grades 9-12. There were 2 administrators who indicated that they were administrators in senior high schools that contain grades 10-12. One respondent indicated that he/she was an administrator in a junior high school containing grades 7-9 and 13 respondents indicated that they were administrators in middle schools grades 6-8 (Table 4).
Table 4

*Indicated Grade Level of the Respondents’ Schools*

<table>
<thead>
<tr>
<th>School Type</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School 9-12</td>
<td>16</td>
<td>48.5</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Senior high 10-12</td>
<td>2</td>
<td>6.1</td>
<td>6.3</td>
<td>56.3</td>
</tr>
<tr>
<td>Junior High 7-9</td>
<td>1</td>
<td>3.0</td>
<td>3.1</td>
<td>59.4</td>
</tr>
<tr>
<td>Middle school 6-8</td>
<td>13</td>
<td>39.4</td>
<td>40.6</td>
<td>96.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>97.0</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Missing</strong></td>
<td><strong>1</strong></td>
<td><strong>3.0</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33</strong></td>
<td><strong>100.0</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An analysis of the respondents’ school performance levels during the 2013-2014 school-year revealed that 12 respondents indicated that their schools were A-level schools. Seven respondents indicated that their schools were B-rated schools. Six of the respondents indicated that their schools had a rating of C, and 8 of the respondents indicated that their schools had a D rating. None of the respondents indicated that their school had an F rating. Table 5 profiles these data.

Table 5

*Performance Level of the Respondents’ Schools*

<table>
<thead>
<tr>
<th>Rating</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A rating</td>
<td>12</td>
<td>36.4</td>
<td>36.4</td>
<td>36.4</td>
</tr>
<tr>
<td>B rating</td>
<td>7</td>
<td>21.2</td>
<td>21.2</td>
<td>57.6</td>
</tr>
<tr>
<td>C rating</td>
<td>6</td>
<td>18.2</td>
<td>18.2</td>
<td>75.8</td>
</tr>
<tr>
<td>D rating</td>
<td>8</td>
<td>24.2</td>
<td>24.2</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>
An analysis of Item 5, which attempted to determine the type of bell schedule used within the respondents’ schools, revealed that there were 14 respondents who worked in schools that used the traditional schedule of 50 to 60 minute classes that met every day for the entire year. There were also 14 respondents who indicated that they were employed in a school that used the A/B block schedule, which met for approximately 90 minutes on alternating days for the entire school year. There were also respondents who indicated that they were employed in a school that used a 4x4 block, which met every day for approximately 90 minutes for one semester. Finally there was 1 respondent who indicated that the schedule was categorized as other (Table 6).

Table 6

Bell Schedule Type within the Respondents’ Schools

<table>
<thead>
<tr>
<th>Schedule Type</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional 60 min</td>
<td>14</td>
<td>42.4</td>
<td>43.8</td>
<td>43.8</td>
</tr>
<tr>
<td>4x4 block</td>
<td>3</td>
<td>9.1</td>
<td>9.4</td>
<td>53.1</td>
</tr>
<tr>
<td>A/B Block</td>
<td>14</td>
<td>42.4</td>
<td>43.8</td>
<td>96.9</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>3.0</td>
<td>3.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>97.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>3.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Item 6 from the questionnaire addressed the type of instruction taking place within the respondent’s school. The respondents indicated that the teachers within their buildings spent an average 36.5% of their time lecturing or providing content. The respondents indicated that the teachers within their building spent 35.5% of their time
with the students actively participating in the lessons. The respondents also indicated that teachers within their building spent an average of 21.5% of their time in cooperative learning groups while teachers spent an average of 11.7% of their time in other activities (Table 7).

Table 7

*Types of Instruction Occurring within Respondents’ Schools*

<table>
<thead>
<tr>
<th>Type of Instruction</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecturing</td>
<td>29</td>
<td>10.00</td>
<td>70.00</td>
<td>36.5517</td>
<td>15.87358</td>
</tr>
<tr>
<td>Active participation</td>
<td>29</td>
<td>10.00</td>
<td>65.00</td>
<td>35.5172</td>
<td>14.96095</td>
</tr>
<tr>
<td>Cooperative learning</td>
<td>29</td>
<td>5.00</td>
<td>50.00</td>
<td>21.5517</td>
<td>11.18860</td>
</tr>
<tr>
<td>Other</td>
<td>15</td>
<td>5.00</td>
<td>30.00</td>
<td>11.6667</td>
<td>6.72593</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Items 13 and 14 on the questionnaire will be addressed under the sub-heading Research Question 1 later in Chapter IV. Items 7-12 on the questionnaire will be addressed under the sub-heading Research Question 6.

Items 15 - 17 were designed to determine the degree to which the proportion of low-income students in Algebra I was the same or different from the proportion of low-income students in the overall population of the respective grades. The questions read, “Thinking about the overall proportion of low-income (either 8th, 9th, or 10th) graders, the proportion of low-income (8th, 9th, or 10th) graders in Algebra I was:” The response options were, much lower than, lower than, the same as, higher or much higher. On item 15, which asked if there were a difference in the proportion of low-income 8th graders assigned to Algebra I when compared to the proportion of low-income 8th graders in the school population, 37.9% of the respondents indicated that the proportion of low-income
8th graders in Algebra was lower than the proportion of low-income 8th graders in the population. Thirty-four percent of the respondents indicated that the proportion of low-income 8th graders was the same as the proportion of low-income 8th graders in the population. On item 16, which asked if there was a difference in the proportion of low-income 9th graders in Algebra I, 48.1% of respondents indicated that the proportion of low-income 9th grader in Algebra I was the same as the proportion of low-income 9th graders in the overall population. Twenty-nine percent of the respondents indicated that the overall proportion of low-income 9th graders in Algebra I was lower than the proportion of low-income 9th graders in the overall population. On item 17, which asked if there was a difference in the overall proportion of low-income 10th graders in Algebra I compared to the proportion of Low-income 10th graders in the overall population, 44.4% of the respondents indicated that the percentage of 10th graders was the same as the percentage of 10th graders in the overall population. Twenty-nine percent of the respondents indicated that the percentage of low-income 10th graders in Algebra I was higher than the percentage of low-income 10th graders in the overall population. Finally, 25.9% of the respondents indicated that the percentage of low-income 10th graders in Algebra I was lower than the percentage of low-income 10th graders in the overall population.

Items 18-20 on the questionnaire were designed to determine the degree to which the proportion of African American, Native American, and Latino students in Algebra I was the same or different from the proportion of African American, Native American, and Latino students in the overall population of the respective grade. The questions read, “Thinking about the overall proportion of American, Native American, and Latino
students (either 8th, 9th or 10th) graders, the proportion of American, Native American, and Latino students (8th, 9th, or 10th) graders in Algebra I was:” The response options were, much lower than, lower than, the same as, higher or much higher. On Item 18 which inquired if the proportion of African American, Native American and Latino 8th graders in Algebra I was proportional to the overall population of African American, Native American, and Latino 48% of the respondents indicated that the proportion of students from those groups were lower than the percentage of students from those groups in the population. Thirty-four percent of the respondents indicated that the proportion of African American, Native American, and Latino 8th graders was the same as the proportion of African American, Native American, and Latino 8th graders in the overall population. Item 19 inquired if the proportion of African American, Native American, and Latino 9th grade students was proportional to the overall population of African American, Native American, and Latino 9th graders in the population. Fifty-two percent of respondents indicated that the proportion of African American, Native American, and Latino 9th graders in Algebra I was the same as the percentage of African American, Native American and Latino students in the overall population. Thirty-two percent of the respondents indicated that the population of African American, Native American, and Latino student in Algebra I was the lower than the percentage of African American, Native American and Latino students in the overall population. Item 20 inquired if the proportion of African American, Native American, and Latino 10th grade students was proportional to the overall population of African American, Native American, and Latino 10th graders in the population. Fifty-six percent of respondents indicated that the proportion of African American, Native American, and Latino 10th graders in Algebra I
was the same as the percentage of African American, Native American and Latino students in the overall population. Thirty percent of the respondents indicated that the population of African American, Native American, and Latino student in Algebra I was lower than the percentage of African American, Native American, and Latino 10th graders in the overall population.

The final three survey items requested information to determine the performance of 8th, 9th, and 10th graders over the past three years of the Algebra I Subject Area Test. Forty-four percent of the respondents indicated that the performance by 8th grade students on the Algebra I Subject Area Test remained the same over the past three years, while 33% indicated that 8th grade performance improved slightly. Finally, 3.7% of the respondents indicated that 8th grade performance improved greatly over the past three years. Thirty-seven percent of the respondents indicated that the performance of 9th grade students on the Algebra I Subject Area Test improved slightly over the past three years. Twenty-nine percent of the respondents indicated that the performance of 9th grade students decreased slightly over the past three years. Twenty-six percent of the respondents indicated that the performance of 9th grade students remained the same while 7.4% indicated that 9th grade performance improved greatly. Forty-four percent of the respondents indicated that the performance of 10th grade students on the Algebra I Subject Area Test declined slightly. Twenty-two percent of the respondents indicated that the performance of 10th graders remained the same while a different 22% indicated that the performance of 10th graders improved slightly. Finally, 11.1% of the respondents indicated that the performance of 10th grade students on the Algebra I Subject Area Test improved greatly.
Research Questions

Research Question 1

Research Question 1 was constructed as follows: Is there a difference in principals’ ratings of performance on the Algebra I Subject Area Test among students who take the exam in the 8th grade, the 9th grade, and the 10th grade? The related Hypothesis 1 was constructed as follows: There will be differences in the principals’ ratings of performance on the Algebra I Subject Area Test among students who take the exam in the 8th grade, the 9th grade, or the 10th grade. Items 13 and 14 from the questionnaire requested information to answer Research Question 1 and related Hypothesis 1. An analysis of item 13 revealed that 75.9% of the survey respondents indicated that eighth grade students had the highest performance within their system. Twenty-one percent of the respondents indicated that 9th grade students had the highest performance within their system while 3.4% of the respondents indicated that 10th grade students had the highest performance within their system. Item 14 revealed similar, but inverted results; 74% of respondents indicated that 10th grade students performed the lowest, followed by 12% who indicated that 9th graders performed the lowest followed by 9% who indicated that 8th graders scored the lowest.

Research Question 2

Research Question 2 was constructed as follows: Is there a difference in the performance on the Algebra I Subject Area Test between middle schools and high schools? Related Hypothesis 2 read: There is a difference in performance on the Algebra I Subject area test between middle and high school students. Archival data from the
Mississippi Department of Education was analyzed to gather data for Research Question 2.

Analysis of archival data retrieved from the Mississippi Department of Education indicated that students in Region 1 in schools categorized as high schools for this study had a mean scale score on the Algebra I Subject Area Test of 657.82, while students in Region 1 who attend schools categorized as middle schools had a mean scale score of 666.49. Students in Region 3 in high schools, where seven respondents indicated they were administrators, had a mean scale score of 654.16. Students in Region 3 in middle schools had a mean scale score of 662.1 on the Algebra I Subject Area Test. There were 17 respondents from Region 5. High school students in Region 5 had a mean scale score of 652.34, and students in middle schools in Region 5 had a mean scale score of 659.76. High school students in Region 6, where there was 1 respondent, had a mean scale score of 653.35, and students in middle schools had a mean scale score of 660.37. High school students in Region 7, where there were 7 respondents, had a mean scale score of 656.91, and students in middle schools had a mean scale score of 666.8.

**Research Question 3**

Research Question 3 was constructed as follows: Is the type of instructional schedule for the Algebra I class related to the principals’ ratings of the success of students on the Algebra I Subject Area Test? The related Hypothesis 3 was constructed as follows: There is a relationship between the type of instructional schedule for Algebra I and the principals’ ratings of success of students on the Algebra I Subject Area Test. An analysis of the results indicate that among the respondents who indicated that 8th
grade Algebra I performance declined slightly, 40% were in schools using the traditional 60 minute class schedule and 20% were in schools using the 4x4 block schedule.

(Table 8).

Table 8

Relationship of Schedule Type and 8th Grade Student Performance

<table>
<thead>
<tr>
<th>Grade 8 Perf.</th>
<th>Decline</th>
<th>Count</th>
<th>Bell schedule</th>
<th>4x4 Blk</th>
<th>A/B Block</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slightly</td>
<td>Count</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>% within perf 8</td>
<td>40.0%</td>
<td>20.0%</td>
<td>40.0%</td>
<td>0.0%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within bellsch</td>
<td>22.2%</td>
<td>33.3%</td>
<td>14.3%</td>
<td>0.0%</td>
<td>18.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No change</td>
<td>Count</td>
<td>7</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>% within perf 8</td>
<td>58.3%</td>
<td>16.7%</td>
<td>25.0%</td>
<td>0.0%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within bellsch</td>
<td>77.8%</td>
<td>66.7%</td>
<td>21.4%</td>
<td>0.0%</td>
<td>44.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved slightly</td>
<td>Count</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>1</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>% within perf 8</td>
<td>0.0%</td>
<td>0.0%</td>
<td>88.9%</td>
<td>11.1%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within bellsch</td>
<td>0.0%</td>
<td>0.0%</td>
<td>57.1%</td>
<td>100%</td>
<td>33.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved Greatly</td>
<td>Count</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>% within perf 8</td>
<td>0.0%</td>
<td>0.0%</td>
<td>100%</td>
<td>0.0%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within bellsch</td>
<td>0.0%</td>
<td>0.0%</td>
<td>7.1%</td>
<td>0.0%</td>
<td>3.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>9</td>
<td>3</td>
<td>14</td>
<td>1</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>% within perf 8</td>
<td>33.3%</td>
<td>11.1%</td>
<td>51.9%</td>
<td>3.7%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within bellsch</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An analysis of the results for Research Question 3 for 9th grade students yielded the following results: Thirty-seven and one-half percent of respondents who said that 9th grade performance declined slightly were on the traditional 60 minute schedule while 62.5% were on the A/B block schedule. Of the respondents who indicated that there was no change in the performance of 9th graders, 57.1% were in schools on the A/B block, 28.6% were in schools on the traditional 60 minute schedule, and 14.3% were in schools
on the 4x4 block schedule. Other survey respondents indicated different results. These data are indicated in Table 9.

Table 9

<table>
<thead>
<tr>
<th>Relationship of Schedule Type and 9th Grade Student Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bell schedule</strong></td>
</tr>
<tr>
<td><strong>Count</strong></td>
</tr>
<tr>
<td><strong>% within perf9</strong></td>
</tr>
<tr>
<td><strong>% within bellsch</strong></td>
</tr>
<tr>
<td><strong>Count</strong></td>
</tr>
<tr>
<td><strong>% within perf9</strong></td>
</tr>
<tr>
<td><strong>% within bellsch</strong></td>
</tr>
<tr>
<td><strong>Count</strong></td>
</tr>
<tr>
<td><strong>% within perf9</strong></td>
</tr>
<tr>
<td><strong>% within bellsch</strong></td>
</tr>
<tr>
<td><strong>Count</strong></td>
</tr>
<tr>
<td><strong>% within perf9</strong></td>
</tr>
<tr>
<td><strong>% within bellsch</strong></td>
</tr>
<tr>
<td><strong>Count</strong></td>
</tr>
<tr>
<td><strong>% within perf9</strong></td>
</tr>
<tr>
<td><strong>% within bellsch</strong></td>
</tr>
</tbody>
</table>

Analysis of the results for Research Question 3 for 10th grade students yielded the following: Thirty-three percent of respondents who said that 10th grade performance declined slightly were in schools using the traditional 60 minute schedule, while 66.7% were in schools using the A/B block schedule. Of the respondents who indicated that there was no change in the performance of 10th graders, 50% were in schools on the A/B
block, 33.3% were in schools on the traditional 60 minute schedule, and 16% were in schools on the 4x4 block schedule. Other survey respondents indicated different results. These data are indicated in Table 10.

Table 10

*Relationship of Schedule Type and 10th Grade Student Performance*

<table>
<thead>
<tr>
<th>Ratings of Performance</th>
<th>Bell Schedule</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trad</td>
<td>4x4</td>
</tr>
<tr>
<td></td>
<td>BLK</td>
<td>BLK</td>
</tr>
<tr>
<td>Declined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slightly Perf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>% within perf 10</td>
<td>33.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>% within bellsch</td>
<td>44.4%</td>
<td>0.0%</td>
</tr>
<tr>
<td>No Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>% within perf 10</td>
<td>33.3%</td>
<td>16.7%</td>
</tr>
<tr>
<td>% within bellsch</td>
<td>22.2%</td>
<td>33.3%</td>
</tr>
<tr>
<td>Improved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slightly Perf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>% within perf 10</td>
<td>16.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td>% within bellsch</td>
<td>11.1%</td>
<td>66.7%</td>
</tr>
<tr>
<td>Improved Greatly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>% within perf 10</td>
<td>66.7%</td>
<td>0.0%</td>
</tr>
<tr>
<td>% within bellsch</td>
<td>22.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>% within perf 10</td>
<td>33.3%</td>
<td>11.1%</td>
</tr>
<tr>
<td>% within bellsch</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Research Question 4*

Research Question 4 was constructed as follows: Is there a relationship between principals’ ratings of the success of students on the Algebra I Subject Area Test and the
degree to which they experience student-centered instruction? The related Hypothesis 4 reads: there is a relationship between principals’ ratings of the success of students on the Algebra I Subject Area Test and the degree to which they experience student-centered instruction. An analysis of the relationship between the principals’ ratings of 8th grade student success on the Algebra I Subject Area Test in relation to the amount of student-centered instruction at the school yielded the following results: Fifty-eight percent of the respondents who indicated that there was no change in the performance of 8th grade students indicated that those students experienced student-centered instruction between 11 and 20% of the time. Forty-four percent of the respondents who indicated that 8th grade student performance improved slightly indicated that the 8th grade students at their schools spent between 21 and 30% of their time receiving student-centered instruction. This information can be found in Table 11.

Table 11

*Relationship of 8th Grade Performance Rating and Student-Centered Instruction*

<table>
<thead>
<tr>
<th>Ratings of Performance</th>
<th>Percentage of 8th Grade Student Centered Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.0-10.0</td>
</tr>
<tr>
<td>Declined</td>
<td>Count</td>
</tr>
<tr>
<td>Slightly Declined</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>% within perf</td>
</tr>
<tr>
<td></td>
<td>% within stu</td>
</tr>
<tr>
<td>No Change</td>
<td>Count</td>
</tr>
<tr>
<td></td>
<td>% within perf</td>
</tr>
<tr>
<td></td>
<td>% within stu</td>
</tr>
</tbody>
</table>
An analysis of the relationship between the principals’ ratings of 9th grade student success on the Algebra I Subject Area Test in relation to the amount of student centered instruction at the school yielded the following results: Seventy-one percent of the respondents who indicated that there was no change in the performance of 9th grade students indicated that those experienced student centered instruction between 11 and 20% of the time. Thirty percent of the respondents who indicated that 8th grade student performance increased slightly indicated that the 9th grade students at their school spent between 11 and 20% of their time receiving student centered instruction. There were other time percentages that were indicated by respondents. These data are indicated in Table 12.
Table 12

Relationship of 9th Grade Performance Rating and Student-Centered Instruction

<table>
<thead>
<tr>
<th>Ratings of Performance</th>
<th>Percentage Of 9th Grade Student Centered Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.00-10.00</td>
</tr>
<tr>
<td>Declined Count</td>
<td>3</td>
</tr>
<tr>
<td>Slightly % within perf9</td>
<td>37.5%</td>
</tr>
<tr>
<td>% within stu</td>
<td>50%</td>
</tr>
<tr>
<td>No Change Count</td>
<td>1</td>
</tr>
<tr>
<td>% within perf9</td>
<td>14.3%</td>
</tr>
<tr>
<td>% within stu</td>
<td>16.6%</td>
</tr>
<tr>
<td>Improved Count</td>
<td>1</td>
</tr>
<tr>
<td>Slightly % within perf9</td>
<td>10.0%</td>
</tr>
<tr>
<td>% within stu</td>
<td>16.6%</td>
</tr>
<tr>
<td>Increased Count</td>
<td>1</td>
</tr>
<tr>
<td>% within perf9</td>
<td>50.0%</td>
</tr>
<tr>
<td>% within stu</td>
<td>16.6%</td>
</tr>
<tr>
<td>Total Count</td>
<td>6</td>
</tr>
<tr>
<td>% within perf9</td>
<td>22.2%</td>
</tr>
<tr>
<td>% within stu</td>
<td>100%</td>
</tr>
</tbody>
</table>

An analysis of the relationship between the principals’ ratings of 10th grade student success on the Algebra I Subject Area Test in relation to the amount of student-centered instruction at the school yielded the following results: Sixty-seven percent of the respondents who indicated that there was no change in the performance of 10th grade students indicated that those experienced student centered instruction between 11 and 20% of the time. Forty-two percent of the respondents who indicated that 10th grade student performance declined slightly also indicated that the 10th grade students at their school spent between 11 and 20% of their time receiving student-centered instruction. A different 25% of the respondents who indicated that 10th grade performance declined...
slightly indicated that their students experienced student-centered instruction between 21 and 30% of the time. A third group consisting of 25% of the respondents who indicated that 10th grade performance declined slightly also indicated that the 10th grade students at their schools experienced student-centered instruction between 5 and 10% of the time.

There were other time percentages that were indicated by respondents. These data are indicated in Table 13.

Table 13

Relationship of 10th Grade Performance Rating and Student-Centered Instruction

<table>
<thead>
<tr>
<th>Ratings of Performance</th>
<th>Percentage Of 10th Grade Student Centered Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.00-11.0</td>
</tr>
<tr>
<td>Declined slightly</td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>3</td>
</tr>
<tr>
<td>% within perf10</td>
<td>25.0%</td>
</tr>
<tr>
<td>% within stu</td>
<td>50.0%</td>
</tr>
<tr>
<td>No Change</td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>1</td>
</tr>
<tr>
<td>% within perf10</td>
<td>16.6%</td>
</tr>
<tr>
<td>% within stu</td>
<td>16.6%</td>
</tr>
<tr>
<td>Improved Slightly</td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>1</td>
</tr>
<tr>
<td>% within perf10</td>
<td>16.6%</td>
</tr>
<tr>
<td>% within stu</td>
<td>16.6%</td>
</tr>
<tr>
<td>Improved Greatly</td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>1</td>
</tr>
<tr>
<td>% within perf10</td>
<td>33.3%</td>
</tr>
<tr>
<td>% within stu</td>
<td>16.6%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>6</td>
</tr>
<tr>
<td>% within perf10</td>
<td>22.2%</td>
</tr>
<tr>
<td>% within stu</td>
<td>100%</td>
</tr>
</tbody>
</table>
Archival Data on Race, Socioeconomic Status, and Algebra I Achievement

The study also explored Algebra I performance within the context of race and poverty. The researcher also disaggregated archival data on the Algebra I SATP from the Mississippi Department of Education. High school Caucasian students in Mississippi had a mean scale score of 657, while African American students in Mississippi had a mean scale score of 653. Economically disadvantaged high school students in Mississippi had a mean scale score of 654, while non-economically disadvantaged students had a mean scale score of 656. Middle school Caucasian students in Mississippi had a mean scale score of 664 while African American students had a mean scale score of 658. Economically disadvantaged middle school students in Mississippi had a mean scale score of 660 while non-economically disadvantaged students had a mean scale score of 665.

Research Question 5

Research Question 5 read: Is there a relationship between race and poverty and the year in which Algebra I is taken, administrators’ ratings of the level of growth in students’ Algebra I achievement, and the performance of students on the Algebra I Subject Area Test? Related Hypothesis 5 reads: There is a relationship between race and poverty and the year in which Algebra I is taken, administrators’ ratings about the level of growth in students’ Algebra I achievement, and the performance of students on the Algebra I Subject Area Test. An analysis of the data from the questionnaire produced the following results: Fifty-seven percent of the respondents who indicated that low-income 8th grade students were placed into Algebra I at a much lower rate compared to the ratio of low-income students in the overall population also indicated that these students’
performance on the Algebra I Subject Area Test stayed the same over the past three years. Also, 57% of the respondents who indicated that low-income status 8th grade students were placed into Algebra I at a lower rate than the ratio of low-income students in the overall population indicated that these students’ performance on the Algebra I Subject Area Test declined slightly over the past three years. The largest number of respondents (9), which represented 81% of those indicating that the placement of 8th grade low-income status students was the same as their proportion in the population also indicated that these students’ performance stayed the same over the past three years.

An analysis of placement of 8th graders into Algebra I by proportions by race revealed the following results: The largest number of respondents (8), which represented 80% of those who indicated that placement of African American, Latino, or Native American students into Algebra I was the same as their proportions in the population, also indicated that their performance on the Algebra I Subject Area Test over the past three years stayed the same. The second largest number of respondents (7), which represented 63.6% of those who indicated that the placement of those ethnic groups into Algebra I was lower than their ratio in the overall population also indicated that students’ performance on the Algebra I Subject Area Test declined slightly over the past three years. These data can be found in Table 14.
Table 14

Ratings of 8th Grade Performance and Placement by Race and Low-Income Status

<table>
<thead>
<tr>
<th>Placement in Algebra I By Race and Income - Economic Status</th>
<th>Principal’s Rating of Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Declined Greatly</td>
</tr>
<tr>
<td>Much Lower Income</td>
<td>0%</td>
</tr>
<tr>
<td>Race</td>
<td>2%</td>
</tr>
<tr>
<td>Much Lower Income</td>
<td>33.3%</td>
</tr>
<tr>
<td>Race</td>
<td>9%</td>
</tr>
<tr>
<td>The Same Income</td>
<td>0%</td>
</tr>
<tr>
<td>Race</td>
<td>0%</td>
</tr>
<tr>
<td>Much Higher Income</td>
<td>0.0%</td>
</tr>
<tr>
<td>Race</td>
<td>0%</td>
</tr>
<tr>
<td>Much Higher Income</td>
<td>0.0%</td>
</tr>
<tr>
<td>Race</td>
<td>0%</td>
</tr>
</tbody>
</table>

An analysis of the data from the questionnaire for 9th grade students produced the following results: Forty-six percent of the respondents who indicated that low-income status 9th grade students who were placed into Algebra I at the same rate compared to the ratio of low-income students in the overall population also indicated that these students’ performance on the Algebra I Subject Area Test stayed the same over the past three years. Also, 80% of the respondents who indicated that low-income status 9th grade students were placed into Algebra I at a higher rate than the ratio of low-income students in the overall population indicated that those students performance on the Algebra I
Subject Area Test declined slightly over the past three years. The next highest number of respondents (4), which represented 50% of those indicating that the placement of 9th grade low-income status students was lower than their proportion in the population, also indicated that these students’ performance increased slightly over the past three years.

An analysis of placement of 9th graders into Algebra I by proportions according to race revealed the following results: The largest number of respondents (5), which represented 71.4% of those who indicated that placement of African American, Latino, or Native American students into Algebra I was the same as their proportions in the population, also indicated that their performance on the Algebra I Subject Area Test over the past three years stayed the same. The second largest number of respondents (4) was the same for multiple responses. Four respondents who indicated that African American, Native American and Latino students who were placed into Algebra I at a rate lower than the ratio of the ethnic groups in the overall population at their school, also indicated that their performance on the Algebra I Subject Area test declined slightly over the past three years. Finally, 40% of those who indicated that the placement of those ethnic groups into Algebra I was higher than their ratio in the overall population also indicated that students’ performance on the Algebra I Subject Area Test stayed the same over the past three years. These data can be found in Table 15.
### Table 15

**Ratings of 9th Grade Performance and Placement by Race and Low-Income Status**

<table>
<thead>
<tr>
<th>Placement in Algebra I By Race and Socio-Economic Status</th>
<th>Principal’s Rating of Performance</th>
<th>Declined Greatly</th>
<th>Declined Slightly</th>
<th>Stayed the Same</th>
<th>Increased Slightly</th>
<th>Increased Greatly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Much Lower Income</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Lower Low Income</td>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>The Same Income</td>
<td></td>
<td>0.0%</td>
<td>25%</td>
<td>12.5%</td>
<td>12.5%</td>
<td>50%</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>0.0%</td>
<td>25%</td>
<td>12.5%</td>
<td>12.5%</td>
<td>50%</td>
</tr>
<tr>
<td>Higher Income</td>
<td></td>
<td>14.3%</td>
<td>14.3%</td>
<td>71.4%</td>
<td>71.4%</td>
<td>71.4%</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>14.3%</td>
<td>14.3%</td>
<td>71.4%</td>
<td>71.4%</td>
<td>71.4%</td>
</tr>
<tr>
<td>Higher Much Income</td>
<td></td>
<td>10%</td>
<td>30%</td>
<td>40%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>10%</td>
<td>30%</td>
<td>40%</td>
<td>20%</td>
<td>20%</td>
</tr>
</tbody>
</table>

An analysis of the data from the questionnaire for 10th grade students produced the following results: Eighty percent of the respondents who indicated that low-income status 10th grade students who were placed into Algebra I at a higher rate compared to ratio of low-income students in the overall population also indicated that these students’ performance on the Algebra I Subject Area Test declined slightly over the past three years. Also, 63.3% of the respondents who indicated that low-income status 10th grade students were placed into Algebra I at the same rate as the ratio of low-income students in the overall population indicated that those students performance on the Algebra I Subject
Area Test stayed the same over the past three years. The next highest number of respondents (3), which represented 50% of those indicating that the placement of 10th grade low-income status students was the same as their proportion in the population, also indicated that these students’ performance declined slightly over the past three years.

An analysis of placement 10th graders into Algebra I by proportions according to race revealed the following results: The largest number of respondents (6), which represented 40% of those who indicated that placement of African American, Latino, or Native American students into Algebra I was the same as their proportions in the population, also indicated that their performance on the Algebra I Subject Area Test over the past three years declined slightly. The second largest number of respondents (4), who indicated that African American, Native American and Latino students are placed into Algebra I at the same rate as the ratio of the ethnic groups in the overall population, also indicated that their performance on the Algebra I Subject Area Test remained the same over the past three years. Finally, 50% of those who indicated that the placement of those ethnic groups into Algebra I was lower than their ratio in the overall population, also indicated that these student’s performance on the Algebra I Subject Area Test declined slightly over the past three years. These data can be found in Table 16.

Research Question 6

Research Question 6 read as follows: What are the criteria used to place students into Algebra I? Questionnaire Items 7-12 were all related to the criteria used to place students into the Algebra I course. Item 7 was an indication of how often student grades in previous math courses were used to schedule students into Algebra I. Sixteen
respondents indicated that it was always true that student grades in previous math courses were used to schedule students into Algebra I.

Table 16

*Ratings of 10th Grade Performance and Placement by Race and Low-Income Status*

<table>
<thead>
<tr>
<th>Placement in Algebra I By Race and Socio-Economic Status</th>
<th>Principal’s Rating of Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Declined Greatly</td>
</tr>
<tr>
<td>Much Lower SES</td>
<td>0</td>
</tr>
<tr>
<td>Race</td>
<td>0.0%</td>
</tr>
<tr>
<td>Lower SES</td>
<td>0.0%</td>
</tr>
<tr>
<td>Race</td>
<td>0.0%</td>
</tr>
<tr>
<td>The Same SES</td>
<td>0.0%</td>
</tr>
<tr>
<td>Race</td>
<td>0.0%</td>
</tr>
<tr>
<td>Higher SES</td>
<td>0.0%</td>
</tr>
<tr>
<td>Race</td>
<td>0.0%</td>
</tr>
<tr>
<td>Much Higher SES</td>
<td>0.0%</td>
</tr>
<tr>
<td>Race</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Eight respondents indicated that it was usually true that student grades were used to schedule students into Algebra I. Three respondents indicated that it was never true that student grades were used to schedule students into Algebra I, while 2 indicated true as often as not and 1 as seldom true (Table 17).
Table 17

Student Grades in Previous Math Course as a Basis for Scheduling

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never True</td>
<td>3</td>
<td>9.1</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Seldom True</td>
<td>1</td>
<td>3.0</td>
<td>3.3</td>
<td>13.3</td>
</tr>
<tr>
<td>True as often as not</td>
<td>2</td>
<td>6.1</td>
<td>6.7</td>
<td>20.0</td>
</tr>
<tr>
<td>Usually True</td>
<td>8</td>
<td>24.2</td>
<td>26.7</td>
<td>46.7</td>
</tr>
<tr>
<td>Always True</td>
<td>16</td>
<td>48.5</td>
<td>53.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>90.9</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>9.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Item 8 inquired as to how often teacher feedback was used to schedule students into Algebra I. Ten respondents indicated that it was usually true that teacher feedback was used to schedule students into Algebra I, while 8 indicated that it was always true that teacher feedback was used to schedule students into Algebra I. Of the remaining respondents, 5 each indicated that it was true as often as not and never true that teacher grades were used to schedule students into Algebra I. Finally, 2 respondents indicated that it was seldom true that teacher feedback was used to schedule students into Algebra I (Table 18).
Table 18

*Teacher Feedback as a Basis for Scheduling*

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never True</td>
<td>5</td>
<td>15.2</td>
<td>16.7</td>
<td>16.7</td>
</tr>
<tr>
<td>Seldom True</td>
<td>2</td>
<td>6.1</td>
<td>6.7</td>
<td>23.3</td>
</tr>
<tr>
<td>True As Often as Not</td>
<td>5</td>
<td>15.2</td>
<td>16.7</td>
<td>40.0</td>
</tr>
<tr>
<td>Usually True</td>
<td>10</td>
<td>30.3</td>
<td>33.3</td>
<td>73.3</td>
</tr>
<tr>
<td>Always True</td>
<td>8</td>
<td>24.2</td>
<td>26.7</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>90.9</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>9.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33</strong></td>
<td><strong>100.0</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Item 9 addressed the use of MCT2 scores as a factor in scheduling students into Algebra I. Fourteen respondents indicated that it was always true that student MCT2 math results were used to schedule students into Algebra I. Thirteen other respondents indicated that it was usually true that MCT2 math results were used to schedule students into Algebra I. Two respondents indicated that it was never true that MCT2 math results were used to schedule students into Algebra I, while 1 indicated that it was seldom true that MCT2 math results were used to schedule students into Algebra I (Table 19).

Table 19

*Student MCT2 Scores as a Basis for Scheduling*

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never True</td>
<td>2</td>
<td>6.1</td>
<td>6.7</td>
<td>6.7</td>
</tr>
<tr>
<td>True As Often as Not</td>
<td>1</td>
<td>3.0</td>
<td>3.3</td>
<td>10.0</td>
</tr>
<tr>
<td>Usually True</td>
<td>13</td>
<td>39.4</td>
<td>43.3</td>
<td>53.3</td>
</tr>
<tr>
<td>Always True</td>
<td>14</td>
<td>42.4</td>
<td>46.7</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>90.9</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>
An analysis of the respondent’s use of counselor feedback as a scheduling indicator (Item 10) revealed that 11 respondents indicated that it was seldom true that counselor feedback was used to schedule students into Algebra I. This was the largest number of respondents for this item. Five respondents each indicated that it was never true, true as often as not and always true that counselor feedback was used to schedule students into Algebra I (Table 20).

Table 20

*Counselor Feedback as a Basis for Scheduling*

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never True</td>
<td>5</td>
<td>15.2</td>
<td>16.7</td>
<td>16.7</td>
</tr>
<tr>
<td>Seldom True</td>
<td>11</td>
<td>33.3</td>
<td>36.7</td>
<td>53.3</td>
</tr>
<tr>
<td>True as Often as Not</td>
<td>5</td>
<td>15.2</td>
<td>16.7</td>
<td>70.0</td>
</tr>
<tr>
<td>Usually True</td>
<td>4</td>
<td>12.1</td>
<td>13.3</td>
<td>83.3</td>
</tr>
<tr>
<td>Always True</td>
<td>5</td>
<td>15.2</td>
<td>16.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>90.9</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>9.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An analysis of the respondent’s use of administrator feedback to schedule students (Item 11) into Algebra I revealed that 10 respondents noted that it was seldom true that administrator feedback was used to schedule students into Algebra I. Six administrators indicated that it was always true that administrator feedback was used to schedule students into Algebra I. Five respondents indicated that it was never true that administrator feedback was used to schedule students into Algebra I, and 5 administrators indicated that it was usually true that administrator feedback was used to schedule
students into Algebra I. Finally, 4 administrators indicated that it was true as often as not that administrator feedback was used to schedule students into Algebra I (Table 21).

Table 21

Administrator Feedback as a Basis for Scheduling

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never True</td>
<td>5</td>
<td>15.2</td>
<td>16.7</td>
<td>16.7</td>
</tr>
<tr>
<td>Seldom True</td>
<td>10</td>
<td>30.3</td>
<td>33.3</td>
<td>50.0</td>
</tr>
<tr>
<td>True as often as Not</td>
<td>4</td>
<td>12.1</td>
<td>13.3</td>
<td>63.3</td>
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<tr>
<td>Usually True</td>
<td>5</td>
<td>15.2</td>
<td>16.7</td>
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</tr>
<tr>
<td>Always True</td>
<td>6</td>
<td>18.2</td>
<td>20.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>90.9</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

System
3 9.1
Total
33 100.0

Item 12 addressed the degree to which parent feedback was factored into decisions about scheduling Algebra I. An analysis of the respondents’ answers as to whether parental feedback about their child’s course preference was used to schedule students revealed that 7 respondents each indicated that it was never true, seldom true, and usually true that parental feedback about student course preference was used to schedule students into Algebra I. Six administrators indicated that it was true as often as not that parental feedback was used to schedule students into algebra I. Finally, 3 administrators indicated that it was always true that parental feedback was used to schedule students into Algebra I. These data are profiled in Table 22.
Table 22

*Parent Feedback as a Basis for Scheduling*

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
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<td>7</td>
<td>21.2</td>
<td>23.3</td>
<td>23.3</td>
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<tr>
<td>Seldom True</td>
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<td>23.3</td>
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<tr>
<td>Usually True</td>
<td>7</td>
<td>21.2</td>
<td>23.3</td>
<td>90.0</td>
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<tr>
<td>Always True</td>
<td>3</td>
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<td>100.0</td>
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<tr>
<td>Total</td>
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<td>100.0</td>
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<td>Total</td>
<td>33</td>
<td>100.0</td>
<td></td>
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</tbody>
</table>

Summary

This study examined the relationship of different variables with student Algebra I Subject Area Test performance in the state of Mississippi. This study also investigated whether selected factors were related to Mississippi students’ achievement on the Algebra I Subject Area Test. Chapter IV detailed the descriptive statistics of the respondents to the survey. The chapter detailed the results of the analyses of testing data provided by the Mississippi Department of Education. This chapter also detailed the results found from an analysis of the survey responses that provided data for the different variables included in the study. Chapter V will provide a discussion of the findings in this chapter.
CHAPTER V
DISCUSSION

This study examined the relationship of different variables with student Algebra I Subject Area Test performance in the state of Mississippi. This study investigated whether selected factors were related to Mississippi students’ achievement on the Algebra I Subject Area Test. This chapter includes a summary of the findings of the study as well as a discussion of these findings.

The researcher analyzed Algebra I Subject Area Test data from the Mississippi Department of Education from the 2012-2013 school year. The researcher also analyzed questionnaires from 33 respondents from different regions within the state of Mississippi. Recommendations for policy and practice are provided. This chapter also discusses suggestions for future research.

Summary and Discussion of the Findings

This section provides a succinct summary of the findings of the study. These summaries are attended by relevant discussion of these findings. Due to the low response rate to the study, generalizing the study’s results to contexts other than the one in which the study was performed should be approached with caution. The study involved participation by 33 middle and high school principals in 5 regions of the state of Mississippi. Each principal responded to a survey instrument designed by the researcher. The instrument was entitled An Investigation of Selected Variables Related to Student Algebra I Performance in Mississippi.

Basic demographic data were gathered. Of the 33 administrators, 16 were in high schools, 2 were in senior high schools, 13 were in middle schools, and 1 was in a junior
high school. One respondent did not provide a job title. In addition to the geographic representation among the participants, there was a representative mix of school accountability performance levels. Of the respondents, 12 worked in a school that had an accountability rating of A, 7 had an accountability of B, 6 had an accountability rating of C, and 8 had an accountability rating of D. No principals in F-rated schools responded.

The schools were largely split between those that operate on a traditional schedule, and the A/B block schedule. There were 14 respondents who indicated that they worked in schools using the traditional 60 minute daily class schedule. Fourteen other respondents indicated that they worked in schools using the A/B block schedule. Finally, 3 respondents indicated that they worked in schools using the 4/4 block schedule, and 1 indicated the category of other. The most frequently used type of instruction in Algebra I in the respondents’ schools was lecturing, followed by active participation by students, with very little instruction through cooperative learning groups occurring.

The researcher investigated the principals’ ratings of student performance on the Algebra I Subject Area Test; survey respondents indicated that 8th grade students within their schools performed better than 9th and 10th grade students. The respondents also indicated that 9th grade students performed better than 10th grade students within their schools. The researcher investigated the mean scale score for students in each region. Students in high schools in the Region 1, the Northern region had the highest mean scale score with a score of 657.8. The next highest region was Region 7 the Southeastern Region with a mean score of 656.9. Region 3, the Northcentral Region had the next highest mean with a mean score of 654.2. The two lowest performing regions were the Southwestern Region (653.4) and the Jackson Metro Region (652.3). The rank order for
middle schools in the respective regions mirrored their high school counterparts. Middle schools in the Northern Region had a mean score of 666.9, followed by the Southeastern Region with a mean scale score of 666.8. The Northcentral Region was third with a mean score of 662.1. Finally the two lowest regions were the Southwestern Region (660 and the Jackson metro Region (659.8). These results indicated that middle school students performed better than high school students on the Algebra I Subject Area Test. These findings are consistent with literature that shows that stronger math students typically pursue Algebra on an accelerated schedule, with many taking the course in middle school. The finding that 8th grade students performed better on the Algebra I State Test appears to verify existing research such as that done by Smith (1996) and Spielhagen (2006).

According to Algebra I Subject Area Test results, Caucasian students performed better than African American students on the Algebra I Subject Area Test. The data indicate that an achievement gap exists between white and non-white students; however, the gap is smaller for middle schools than for high schools. The researcher also found that the difference in means between low-income students and non-low-income students was smaller than the difference in means between white and non-white students. The data also revealed that there was a larger difference in mean scale scores by region based on race than there was based on socio-economic status. An investigation of a change in Algebra I performance with respect to race and the ratio of students in Algebra I revealed the following results: The majority of respondents who indicated that there was not a difference in the percentage of students in Algebra I based on race and socio-economic status also indicated that the performance of 8th grade students on the Algebra I subject
Area Test stayed the same over the past three years. The findings from the archival data regarding student performance, socio-economic status, and race are, regrettably, very consistent with much of the research on math performance among students of color and students in poverty. In one interesting finding across grade levels, however, the respondents indicated that when there was not a difference in the ratio of non-white students in Algebra I compared to the population, student performance on the Algebra did not decline. However, this contradicts a trend in the literature. A representative study by Faulkner et al. (2013) found that there is a difference in the rate at which African American students are placed into Algebra I, even if their performance in previous courses were the same.

Students at the 8\textsuperscript{th}, 9\textsuperscript{th}, and 10\textsuperscript{th} grades performed differently on the Algebra I Subject Area Test based on the type of schedule used within the school. According to the majority of respondents, 8\textsuperscript{th} grade students showed improvement on the A/B block schedule. According to another groups of respondents, 8\textsuperscript{th} grade students on the traditional schedule showed no change in their performance on the Algebra I Subject Area Test. According to the majority of respondents, 9\textsuperscript{th} grade students’ performance decreased slightly on the A/B block schedule. Two other groups of respondents indicated that there was no change in 9\textsuperscript{th} grade performance while an equal group indicated that 9\textsuperscript{th} grade performance increased slightly on the A/B block schedule. The majority of the respondents indicated that 10\textsuperscript{th} grade student performance on the Algebra I Subject Area Test decreased slightly on the A/B block. Another group of respondents (4) indicated that the performance of tenth grade students declined slightly on the traditional schedule. The data indicate that 8\textsuperscript{th} grade Algebra students who are typically stronger students
academically, performed better on the A/B block schedule while the older students performed worse on the A/B block schedule. The 10th grade results are contradictory to the Forman (2009) study that found that over a two-year time period after switching to block scheduling, nearly 22% more students passed the Massachusetts state exam in math. Smith (2010) also found that students on the block schedule performed better on the Mississippi Subject area tests than students on the traditional schedule.

The respondents also indicated differences in performance on the Algebra I Subject Area Test based on the amount of student centered instruction experienced by the students. Respondents indicated that 8th grade student performance on the Algebra I Subject Area Test increased slightly with 21% to 30% of the time spent in student-centered instruction. The majority of respondents indicated that 9th grade performance increased with student centered instruction; however, the proportions of time varied. Finally, the majority of respondents indicated that 10th student performance either declined slightly or did not change based on the amount of student centered instruction experienced by the students. The 8th and 9th grade findings were consistent with Kinel (1994), who found that students in math courses that included student-centered learning performed better in math.

Respondents addressed the criteria that are used to schedule students into Algebra I. Respondents indicated that teacher feedback, student grades in the previous course, students’ prior performance on the MCT2, and the state’s summative grade-level testing program were the most commonly used criteria to schedule students into Algebra I. Bright (2009) found that teacher feedback was a key factor in student placement into Algebra I, while Faulkner et al. (2013) determined that student grades in previous courses...
was used to schedule students into Algebra I. Unstated criteria that were found in other studies included higher socio-economic status (Raudenbush et al., 1998).

Hypothesis 1 was stated as follows: There will be differences in the principals’ ratings of performance on the Algebra I Subject Area Test among students who take the exam in the 8th grade, the 9th grade, or the 10th grade. According to the findings, principals indicated that 8th grade students performed better on the Algebra I Subject Area test than 9th and 10th grade students and 9th grade students performed better than 10th grade students. Because the principals indicated that there was a difference in the performance of the three grade levels, this hypothesis was supported. As was noted earlier in the section, these findings are consistent with previous research that finds that more accelerated students tend to take Algebra I earlier, often in middle school.

Hypothesis 2 was stated as follows: There is a difference in performance on the Algebra I Subject area test between middle and high school students. According to the data found on the Mississippi Department of Education’s website, the mean scale scores on the Algebra I Subject Area Test for middle school students in every region was higher than the mean scores for high school students in the individual region. Due to the implications from the data, this hypothesis was supported. As was noted earlier in the section, these findings are consistent with previous research that finds that more accelerated students tend to take Algebra I earlier.

Hypothesis 3 was stated as follows: There is a relationship between the type of instructional schedule for Algebra I and the principals’ ratings of success of students on the Algebra I Subject Area Test. The respondents indicated that different grade level performances varied based on schedule types. The respondents indicated that 8th grade
students performed better on the A/B block schedule, while 10th grade students exhibited no change in performance on the A/B block schedule. Due to the varying responses this hypothesis was not supported. The 8th grade findings were contradictory to findings of Williams (2011), who found that students on the traditional schedule performed better in math than students on the block schedule.

Hypothesis 4 was stated as follows: There is a relationship between principals’ ratings of the success of students on the Algebra I Subject Area Test and the degree to which they experience student-centered instruction. The respondents indicated that 8th grade students performed better on the Algebra I Subject Area exam when they experienced student-centered instruction 21-30% of the time. The respondents also indicated that 9th grade students also performed better when experiencing student centered instruction; however, percentages of time varied. The respondents indicated that 10th grade students’ performance either declined or did not change based on the amount of student centered instruction experienced. Due to the varying responses, this hypothesis was not supported. These results appear to be contradictory to the findings of Torchia (2012), who determined that cooperative or student-centered learning was an effective teaching strategy.

Hypothesis 5 was stated as follows; There is a relationship between race and poverty and the year in which Algebra I is taken, administrators’ ratings about the level of growth in students’ Algebra I achievement, and the performance of students on the Algebra I Subject Area Test. The majority of survey respondents indicated that the placement of non-white students into algebra I was the same as their proportions in the overall population, thus the hypothesis was not supported. Again, as was noted earlier in
the chapter, this counters findings in the literature regarding patterns off placement into Algebra I. The data also indicate that the placement of low-income students into Algebra I was the same as their proportion in the overall population.

Limitations

The following limitations were present in this study:

1. Participants in this study were limited to middle and high school administrators within the state of Mississippi.

2. The research only investigated student performance on the Algebra I Subject Area Test and the results may not be comparable to similar algebra tests in other states.

3. Some analyses depended upon administrators’ ratings about student performance in Algebra I, rather than their actual achievement.

4. The analysis was based on student score reports on the Mississippi state subject area Algebra I test for the 2012-2013 because that was most recent year that disaggregated data were available.

5. The math achievement of the students before the administration of the subject area tests at the participating schools was not included as a factor within the study.

6. The data on the nature of teacher practice (teacher-centered classroom vs. student-centered classroom) was limited to administrator beliefs about the types of Algebra I teachers within their buildings.

7. There was a low response to the questionnaire by potential participants.

8. Region 2 and Region 4 within the study did not have respondents.
9. No school with an accreditation rating of F participated.

10. Six of the questionnaires were returned incomplete; however, due to the low response rate, the items that were completed were used.

11. Due to the nature of the study, schools containing 8th, 9th, and 10th grades in the same facility were excluded, therefore limiting the sample population.

Recommendations for Policy and Practice

As was stated earlier in this chapter, due to the low response rate to the study, the study’s results should probably not be broadly generalized to contexts other than the one in which the study was performed. This study did not have respondents from all seven of the geographic regions. All of the various accreditation ratings were not represented among the sample respondents’ schools; therefore, readers should be careful of generalizations. Respondents indicated that middle school students who experienced increased percentages of student-centered instruction in math performed better than their counterparts who received less. Respondents also indicated that middle school students on the A/B block schedule performed better than 8th grade students on other schedule types and better than 9th and 10th grade students on the A/B block. School leaders can use the indicated scheduling practices to more adequately schedule students into Algebra I. School leaders in high schools on the block schedule could implement a modified schedule to better address the needs of 9th and 10th grade Algebra I students.

The researcher also found consistency between the archival data and administrator’s perception of performance between 8th, 9th, and 10th grade student. The archival data indicated that 8th grade students typically perform better than 9th and 10th grade students and respondents indicated that this was the case in their schools.
Administrators and teachers should consider mechanisms for getting students into Algebra I earlier, as this course is widely acknowledged as a pre-requisite course for access to other, more advanced math courses. Such access impacts a student’s future prospects. According to Moller and Stearns (2012), early access to Algebra I provides the student with the ability to take upper level math courses before exiting high school and therefore increases their chances for college success.

Recommendations for Future Research

The results of this study provide opportunities for future research. The following are potential opportunities for future inquiry:

1. Future studies should focus on strategies to increase the sample size and response rate among prospective participants.

2. A study focusing on schools that contain both middle and high school grade levels would help to increase sample size because there is a large number of schools containing both grades within the state.

3. Further research could narrow the scope of the study. Rather than a single study focused on many variables, it would be better to conduct multiple studies that each focus on fewer variables.

4. With Recommendation 3 in mind, it would be useful to explore the nature of instruction in a manner that is more detailed and provides for analysis of actual instruction than was provided for in this study.

5. Future research could use actual school performance scores, instead of the principals’ rating of performance, in order to better draw conclusions about student achievement.
6. Further research could investigate performance on nationally normed tests and the results could be better generalized.

7. Future research can use current results from the Mississippi Assessment Program. The present study was limited to data a couple of years old, since these were the most recent data that were disaggregated to include race and socio-economic status.

**Summary**

This research study attempted to determine if specific variables were related to student performance on the Algebra I subject-area test. This study also sought to determine in which of grades 8, 9, or 10 students performed better on the Algebra I Subject Area Test. This study also investigated the different criteria that are being used to schedule students into Algebra I. The principals in respondent schools indicated that 8th graders performed better on the Algebra I Subject Area Test, followed by 9th and then 10th grade students. The data indicated that administrators believed that 8th grade students’ performance on the Algebra I Subject Area Test was better for students in schools using the A/B block schedule. The findings of the study also indicated that administrators believed that 8th grade student performance was positively related to certain proportions of student-centered instruction.

Archival data indicated that the achievement gap between white and non-white students on the Algebra I Subject Area Test persists. The data also indicated that the achievement gap between low-income students and non-low-income students exists; however, the gap is smaller than the gap that exists based on race. Finally, the data indicated that the three most commonly used criteria to schedule students into Algebra I
according to respondents were, student performance in previous math courses, teacher recommendations and student performance on the MCT2.
APPENDIX A

LETTER TO THE SUPERINTENDENT

Date

Name of Superintendent

Name of School District

Address

RE: Permission to conduct Research Study

Dear Superintendent ___________________________,

My name is Undray Scott, and I am currently a doctoral student enrolled at The University of Southern Mississippi. As a part of fulfilling the requirements of the doctoral program, I must conduct a survey focusing on the topic of my research study. The focus of my study is selected variables and their effects on student Algebra I performance within the state of Mississippi. The information I obtain from this study hopefully will provide educators with information to help to increase student performance on the CCSS Algebra I assessments in the future.

The purpose of this letter is to request permission from you to gather the necessary information from middle and high school administrators within your school district. With your permission, the administrators will complete a short survey, and the information will be compiled with information from administrators around the state. I will be contacting these administrators during the summer months in order to minimize intrusions into school instruction or leadership activities. The information gathered will remain completely anonymous and the subsequent findings will not identify your district in any way. The gathered data will be compiled to complete my dissertation.

The participants will be surveyed by postal mail. The participants will be surveyed during the summer and/or early fall of 2015. None of the participating administrators, schools or districts will be identified within this study.

Your approval to conduct this research will be greatly appreciated. If needed please feel free to contact me if you have any questions or concerns at (601) 951-8474. My dissertation committee chair is Dr. Mike Ward who can be contacted at mike.ward@usm.edu.

If you agree to grant me permission to conduct my research study, please signify by cutting and pasting this form onto your district letterhead, signing below and returning the form in the self-addressed stamped envelope provided. Alternately you may also send a signed scanned copy on district letterhead to undray.scott@eagles.usm.edu.
also provided a digital copy via e-mail to allow you to cut and paste the document onto your district letterhead.

Sincerely
Undray Scott
Doctoral Candidate, The University of Southern Mississippi

Cc. Dr. Mike Ward, Committee Chair

Consent Form:
By signing this form, I give permission for Undray Scott a doctoral candidate from The University of Southern Mississippi to conduct a research study in ____________________ school district. I acknowledge that Mr. Scott may distribute consent forms and questionnaires to administrators during the summer of the 2015 school year.

Approved by:

_________________________________   __________________________
Please print your name and title Superintendents signature Date
APPENDIX B

IRB APPROVAL FORM

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD
118 College Drive 431-417 | Hattiesburg, MS 39406-0001
Phone: 601.266.3597 | Fax: 601.266.4377 | www.usm.edu/research/institutional.review.board

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 21, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the “Adverse Effect Report Form”.
- If approved, the maximum period of approval is limited to twelve months.
- Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 15070202
PROJECT TITLE: An Investigation of Selected Variables Related to Student Algebra I Performance in Mississippi
PROJECT TYPE: New Project
RESEARCHER(S): Undray Scott
COLLEGE/DIVISION: College of Education and Psychology
DEPARTMENT: Educational Leadership and School Counseling
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Expedited Review Approval
PERIOD OF APPROVAL: 07/15/2016 to 07/15/2018

Lawrence A. Hosman, Ph.D.
Institutional Review Board
APPENDIX C

ALGEBRA I PERFORMANCE IN MISSISSIPPI

Please read and complete all of the items within this survey if you were a middle or high school administrator during the 2013-2014 school year.

1. Within which of the seven geographic regions (depicted on page 4 of this questionnaire) of the state of Mississippi was the school in which you worked in 2013-2014 located?
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

2. What was your official title during the 2013-14 school year?
   □ Principal □ Asst. Prin. □ Other_______

3. Which of the following best describes the grade levels in your school?
   □ High School grades 9-12 □ Senior High grades 10-12 □ Junior High grades 7-9 □ Middle School grades 6-8

4. What was your school’s performance level for the 2013-2014 school year?
   □ A ☐ B ☐ C ☐ D ☐ F

All questions below refer to the 2013-2014 school year and pertain to Algebra I only.

For Algebra I

5. Which of the following best describes the type of bell schedule used in your school?
   □ Tradit. □ 4x4 Block □ A/B Block □ Double Block □ Other
   50-60 min. approx. 90 min. approx 90 block everyday everyday every other everyday all year for one day all year all year Semester

6. What percentage of time on average do teachers in your school spend
   ___% lecturing or provide content
   ___% students actively participating
   ___% in cooperative learning groups
   ___% other
   100% Total

Which of the following were used to schedule students into Algebra I?
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<th>Identification</th>
<th>Description</th>
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<th>2</th>
<th>3</th>
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<td>Student grades in previous math courses</td>
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<td>8.</td>
<td>Teacher feedback about student previous math ability</td>
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<td>9.</td>
<td>Students MCT2 math scores</td>
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<td>10.</td>
<td>Guidance counselor feedback on student ability</td>
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<td>Administrator feedback about student ability</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Parental feedback about their children’s course preference</td>
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<td></td>
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<tr>
<td>13.</td>
<td>The highest 2013-2014 Algebra I SATP performance was by 8th grade 9th grade 10th grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>14.</td>
<td>The lowest 2013-2014 Algebra I SATP performance was by</td>
<td></td>
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<td></td>
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<tr>
<td>15.</td>
<td>Thinking about the OVERALL proportion of low-income 8th graders, the proportion of low-income 8th graders in Algebra I was probably much lower the higher much lower same higher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Thinking about the OVERALL proportion of low-income 9th graders, the proportion of low-income 9th graders in Algebra I was probably much lower the higher much lower same higher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Thinking about the OVERALL proportion of low-income 10th graders, the proportion of low-income 10th graders in Algebra I was probably much lower the higher much lower same higher</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>18.</td>
<td>Thinking about the OVERALL ethnic proportions of 8th graders, the proportion of the proportion of African American, Native American, and Latino 8th grade students in Algebra I was probably much lower the higher much lower same higher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Thinking about the OVERALL ethnic proportions of 9th graders, the proportion of African American, Native American, and Latino 9th grade students in Algebra I was probably much lower the higher much lower same higher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
20. Thinking about the OVERALL ethnic proportions of 10th graders, the proportion of African American, Native American, and Latino 10th grade students in Algebra I was probably

<table>
<thead>
<tr>
<th></th>
<th>much lower</th>
<th>the same</th>
<th>higher</th>
<th>much higher</th>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

21. During the past 3 years the performance of 8th graders on the Algebra I SATP has

- [ ] declined greatly
- [ ] declined slightly
- [ ] remained the same
- [ ] improved slightly
- [ ] improved greatly

22. During the past 3 years the performance of 9th graders on the Algebra I SATP has

- [ ] declined greatly
- [ ] declined slightly
- [ ] remained the same
- [ ] improved slightly
- [ ] improved greatly

23. During the past 3 years the performance of 10th graders on the Algebra I SATP has

- [ ] declined greatly
- [ ] declined slightly
- [ ] remained the same
- [ ] improved slightly
- [ ] improved greatly
Dear Educator:

My name is Undray Scott, and I am pursuing a doctorate degree in the Educational Leadership program at The University of Southern Mississippi. I am currently working on my dissertation, which is entitled An Investigation of Selected Variables Related to Student Algebra I Performance in Mississippi. I am asking for your help in completing this study, which will take approximately 20 minutes of your time. By participating in this research, you are helping educators discover if variables within this study are related to student performance on the Algebra I subject area exam. Your participation is voluntary, and at any time, you may feel free to decline participation or discontinue your participation without penalty. To uphold confidentiality, please do not include any identifying information about yourself on your questionnaire. If this research is published or presented, neither you nor your school will be identifiable.

The included Notice of Informed Consent for Research Participants outlines additional information about this study and your rights as a participant. Please review this information carefully.

This project has been reviewed by the Human Subjects Protection Review Committee, which ensures that research projects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the chair of the Institutional Review Board, the University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, 601-266-6820

By completing and returning the attached questionnaire, you are granting permission for this anonymous and confidential data to be used for the purposes described above. I am requesting that you return the questionnaire within one week of receiving it. If you have any questions concerning this research project or if you would like a copy of the completed research, feel free to contact me at undray.scott@eagles.usm.edu. My doctoral committee chair, Dr. Mike Ward, can be contacted at mike.ward@usm.edu.

Thank you for taking the time to complete this questionnaire and for assisting me with my research.

Sincerely,

Undray Scott
APPENDIX E

INFORMED CONSENT INFORMATION

University of Southern Mississippi
118 College Drive #5147
Hattiesburg, MS 39406-0001
(601)266-6820

Consent to Participate in a Research Study

Date: May 27, 2015

Title of Study: An Investigation of Selected Variables Related to Student Algebra I Performance in Mississippi

Research will be conducted by: Undray Scott

Phone number: (601) 951-8474  Email Address: undray.scott@eagles.usm.edu

Dissertation Chair: Dr. Mike Ward

What is some general information you should know about this study?
This study will survey school administrators throughout the state of Mississippi. Participation in this study is completely voluntary. You have the right to refuse to participate in this study or if at some point you decide to stop participation, you may withdraw your consent to be in this study without penalty.

Research studies are designed with the intent to obtain new knowledge. This new information may help people in the future. You may not receive any direct benefit from being in the research study. There also may be risks to being in research studies.

The questionnaire for this study consists of 23 questions on four pages. You should ask the researcher or advisor named above any questions you have about this study at any time.

What is the purpose of this study?
The purpose of this study is to gain knowledge about the relationship of common variables to Algebra I performance. It is the researcher’s hope that the information gained from this study will better inform educators about factors related to student success in Algebra I.

How many people will participate in this study?
If you agree to participate, you will be one of approximately 100 administrators within the state of Mississippi who are participating in this study.
How long will your participation in the study last?
If you choose to participate in the study, you will be asked to read the cover letter and sign this informed consent document. You will then be asked to complete a questionnaire that will take approximately 20 minutes.

What will happen if you take part in the study?
If you choose to participate, you will complete the questionnaire. Please be advised that completion and return of the consent form and questionnaire serves as confirmation of your intent to participate in the study. After completion of the survey, you are asked to return the consent form and questionnaire in the self-addressed envelope that has been provided. If you would like to view the results of my findings you can request a report at the conclusion of the study by contacting me by email at undray.scott@eagles.usm.edu.

What are the possible benefits from taking part in this survey?
The findings from this study are intended to help inform school administrators about which factors that have an effect on student Algebra I achievement. Your responses may help school administrators to more effectively schedule students into Algebra I, to better identify effective teacher types, and to increase student achievement in Algebra I. (your call on confining the benefits to minority and low SES students, but your findings could potentially serve all students.)

What are the possible risks from participating in this study?
The possible risks from participating in this study may include discomfort from answering some of the questions contained within the questionnaire. As was mentioned earlier your responses will remain completely confidential. Only the researcher and the dissertation committee will view the responses and because there is not any identifying information contained within the survey, anonymity will be preserved.

How will your privacy be protected?
Participants will not indicate their identities on the questionnaire. They will not be identified in any report or publication about this study. Only the researcher and his university faculty advisors will have access to these questionnaires. Questionnaires will be kept secure and locked in the researcher’s home and will be shredded after a year.

What if you have questions about this study?
You have the right to ask, and have answered, any questions you may have about this research. If you have questions, or concerns, you should contact the researcher listed on the first page of this form.

What if you have concerns or questions about your rights as a participant?
This project has been reviewed by the Human Subjects Protection Review Committee, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820.
Title of Study: An Investigation of Selected Variables Related To Student Algebra I Performance in Mississippi.

Principal Investigator: Undray Scott

Participant’s Agreement:

I have read the information provided above. I have asked all the questions I have at this time. I voluntarily agree to participate in this research study.

_________________________________________________  ____________________
Signature of Research Participant                                  Date

_________________________________________________
Printed Name of Research Participant
APPENDIX F

VALIDITY QUESTIONNAIRE

An Investigation of the Effects of Selected Variables on Student Algebra I Test Results in Mississippi

Thank you for taking time out of your schedule to provide constructive feedback on this research instrument. Your expertise in the field of study covered by this instrument is extremely valuable. Your feedback is important and it will provide input on ways to improve the instrument before gathering information for this study.

The instrument that you were provided will be used to gather information to discover how selected variables impacted student performance on the Algebra I subject area test. This instrument will be distributed throughout the state of Mississippi and will attempt to discover if any of the researched variables have either a positive or negative impact on student Algebra achievement. The data collected during this study will hopefully provide information to improve student success in Algebra in Mississippi.

Please read the attached questionnaire and answer the questions based on the questions that it contains. Please answer either yes or no and provide any feedback that can be used to improve the items.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>If you chose no please provide Feedback to improve this section of questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are the questions on the instrument likely to be readily understood by secondary school principals and assistant principals?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the survey provide the researcher with adequate information on the types of schedules used within the schools of the respondents?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Does the survey provide the researcher with adequate information on the percentage of time students spend in either learner-centered or teacher-centered learning environments?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>yes</td>
<td>No</td>
<td>If you chose no please provide Feedback to improve this section of questions</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-----</td>
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<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Does the survey provide the researcher with adequate information on the information that is used to schedule students into Algebra I?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the survey provide the researcher with adequate information on the differences in Algebra I performance between 8th, 9th and 10th grade students?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the survey provide the researcher with adequate information on the proportion of low socio-economic students scheduled into Algebra I?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Does the survey provide the researcher with adequate information on the proportion of minority students scheduled into Algebra I?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Does the survey contain any questions that you would consider offensive?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the survey contain any items that you would modify?</td>
<td></td>
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</tr>
<tr>
<td>Does the survey contain any items that you think should be excluded?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the survey missing any items that you think should be included?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
REFERENCES


http://taylorandfrancis.metapress.com/link.asp?target=contribution&id=T44825607VX8KVW1


Handley, S. L. (1998). *Differences in student achievement between secondary students who received Algebra I instruction during a traditional class period and those who received Algebra I instruction during an extended time block class period*.


Psychology, 27(3), 178. Retrieved from


doi:10.3102/0162373712443307

doi:10.1080/0020739X.2013.822582


true&db=eric&AN=EJ747964&site=ehost-live;

http://dx.doi.org/10.1177/019263650508964202


(Jackson, MS) 1 Dec. 2014. Retrieved from


