1-1-2013

The Effects of Public School Prekindergarten Attendance on Academic Achievement in Language Arts and Mathematics

Susan Newell Johnson

The effects of public school prekindergarten attendance on academic achievement in

language arts and mathematics

By

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A Dissertation
Submitted to the Faculty of
Mississippi State University
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy
in Elementary, Middle, and Secondary Education Administration
in the Department of Leadership and Foundations

Mississippi State, Mississippi

August 2013

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        The effect of public school prekindergarten (pre-K) attendance on academic

achievement has not been extensively studied for the purpose of funding these programs.

The MCT2 scale scores in the areas of language arts and math and the report card number

grades for the areas of language arts and math were analyzed for 114 students. Of this

number, 49 students attended a public school pre-K program, and 65 students did not

attend a public school pre-K program.

        This study was a causal-comparative study. A repeated measures approach with a

between-within design was used. An analysis of covariance, ANCOVA, was used to

examine if there was a statistically significant difference in the MCT2 scale scores for

language arts for 3rd-grade students who attended a public school pre-K program and

students who did not attend a public school pre-K program. In addition, 3 separate t-tests

were run for each grade level for language arts and math report card grades. Results

revealed that there was a statistically significant difference in the MCT2 language arts

mean scale scores. For the area of math, the students who attended a public school pre-K

program had comparable MCT2 math mean scale scores with the participants who did

not attend a public school pre-K program. For language arts and math report card number grades, students who attended a public school pre-K program had higher report card number grades compared with students who did not attend a public school pre-K program.

Based on these findings, it can be implied that public school pre-K attendance was effective for the academic areas language arts and math. It is recommended that public school pre-K programs continue to be funded and implemented for 4-year-old students in the Raleigh School District. The subjects of language arts and math should continue to be instructed for the pre-K students. It is also recommended that public school pre-K programs be funded and implemented in school districts across the state of Mississippi, as well as nationwide.

DEDICATION

I would like to dedicate the successful completion of this Doctor of Philosophy in Educational Leadership to my children Allison, Abbey, and Evan and my husband Al. Likewise, I am thankful for the encouragement of my family and friends.

ACKNOWLEDGEMENTS

I would like to acknowledge the contributions of many people so that the completion of this graduate program was successful. I am grateful for the many fellow administrators and educators with and from whom I have learned.

I also acknowledge and am grateful to the members of my graduate committee: Dr. Dwight Hare, Dr. Jack Blendinger, Dr. Linda Coats, and Dr. Kent Coffey. Dr. Hare, my advisor, was always available to provide the leadership and support necessary to complete the dissertation.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Early childhood education has consistently been at the forefront of educational

issues. Educating students at a younger age so that they have the opportunity to acquire

academic skills earlier is a priority for many school districts (Kagan & Reid, 2008).

Numerous programs exist that provide educational experiences for the prekindergarten

(pre-K) aged child. Among these programs are day care programs provided by churches

or private owners, Head Start programs, and pre-K programs located in public schools

(Kagan & Reid, 2008).

The goal of early childhood education varies with the facility that is providing the

service. Some child-care facilities focus on developing the child by incorporating direct

and indirect instruction on communication, motor, cognitive, social, and adaptive skills.

Other child-care facilities focus on the care of the child only rather than instruction.

According to Takanishi and Kauerz (2008), a goal of the pre-K program should be high

quality instruction and caring for children, and the program should raise expectations for

these students' school readiness prior to entry into kindergarten. These higher

expectations should "raise the bar higher, setting a standard of proficiency at the end of

grade 3" (p. 482).

Issacs (2008) reported a growing number of states in various phases of

implementing public school pre-K programs. During 2006–2007, there were

approximately 38 states that were providing pre-K programs, which served a little over 1 million children. In a study by Barnett, Hustedt, Friedman, Stevenson, and Ainsworth (2007), the money that these states spent averaged $4,100 for each child enrolled in public school pre-K.

Since the funding of pre-K programs proves costly for school districts, it is important that those school districts that provide funding for pre-K programs are ensured that these programs assist students in achieving academic success. This study assisted in determining whether students who attended a school-based pre-K program have achieved academic success in the classroom and on statewide assessments.

Much of the research resulting from the implementation of pre-K programs has shown to have positive effects on children's cognitive skills in the areas of pre-reading and pre-math skills. In a brief found in *Impacts of Early Childhood Programs* (2008), it is reported that although children from all income levels gain from attending public school pre-K programs, the largest gains were seen with disadvantaged children. Therefore, in general, state pre-K programs are viewed as effective.

One state with effective long-term pre-K results is Michigan. In a study conducted by Gilliam and Zigler (2004), it was found that children who attended a state pre-K program passed the fourth-grade literacy and math tests at a higher rate than students who did not attend a state pre-K program. O'Brien and Dervarics (2007) reported on five studies in five different states. For students who attended state pre-K programs in Michigan, Oklahoma, New Jersey, South Carolina, and West Virginia, significant gains in language and math skills were observed when compared to peers who did not attend a pre-K program.

With the passage of the *No Child Left Behind Act of 2001* (*NCLB*), the emphasis on accountability in educational programs has become a focus for the American system of education (U. S. Department of Education, 2001). For accountability purposes, some states have developed their own standards and assessments in the subjects of language arts, math, and science for students in grades three through eight. In the state of Mississippi, the *Mississippi Curriculum Test, Second Edition* (MCT2) is the assessment instrument designed to assess students' mastery of skills in mathematics and language arts.

According to the Mississippi Department of Education (MDE) Interpretive Guide for the MCT2,

> The MCT2 is a measure of student achievement in language arts and mathematics in grades 3-8 based on the *2006 Mississippi Language Arts Frameworks-Revised* and the *2007 Mississippi Mathematics Frameworks-Revised*. In addition to being the basis for state accountability in these grades, the MCT2 is designed to meet the federal testing requirements of the *No Child Left Behind Act* (NCLB) 2001. (p. 1)

Scale scores are calculated based on the number of questions that are answered correctly, and students are assigned a level of mastery for each subject area. According to the MDE Interpretive Guide for the MCT2 (2012),

> The range of scale scores and the *No Child Left Behind* (*NCLB*) levels for third grade language arts are as follows: 137 and below – Minimal; 138-149 – Basic; 150-161 – Proficient; and 162 and above – Advanced. For the area of third grade math, the range of scale scores and levels are as follows: 137 and below –

Minimal; 138-149 – Basic; 150-164 – Proficient; and 165 and above – Advanced. (p.5)

According to the Mississippi Department of Education (2012), schools receive ratings based on student performance on the MCT2. These ratings are correlated to a school's Adequate Yearly Progress (AYP). Teachers, administrators, and students are critiqued based on whether or not AYP has been met. There are several levels of attainment for schools based on test performance including failing, at risk of failing, academic watch, successful, high performing, and star school. Thus, MCT2 scores are very important for schools.

In the state of Mississippi, the debate over the funding and implementation of public school pre-K programs with state policy makers has continued for many years. The importance of this study for state policy makers is that the effects on the academic achievement in the areas of language arts and math for students attending a public school pre-K program and for those students who did not attend a public school pre-K program were documented. The results of the study should help policy makers in their consideration of fully funding and implementing pre-K programs across the state.

For school district administrators who are held accountable for the academic achievement of students, the debate over funding and implementing public school pre-K programs has also continued to be an issue. The results of this study provide documentation of the effects on the academic achievement in the areas of language arts and math for students who attended a public school pre-K program and for those who did not.

It is important that parents receive a report of how their young children are progressing in these programs. In order for parents and students to be aware of how students are progressing in the classroom, the Raleigh School District (RSD) assigned report card grades at particular intervals throughout the school year. In the RSD, grades that students received on report cards were generally an average of the grades given by classroom teachers for assignments, projects, and tests in the classroom. These grades were typically assigned in all subject areas in which students are instructed, including language arts, math, and science. These grades may be reported in letter or number form. All students in grades pre-K through 12 in the RSD receive a report card. The report card for pre-K and kindergarten students may look slightly different than the report card for students in grades one through 12. According to K. Lapper, former elementary principal in the RSD, (personal communication, May 31, 2012), students enrolled in pre-K typically receive a plus (+) or a minus (-) for indication of mastery or non-mastery of skills that are listed on the report card. For kindergarten, a report card indicates that the student has mastery of particular skills at a level of 70%. Although a different grading scale is utilized for students enrolled in pre-K and kindergarten, mastery of skills may be indicated to parents. At the time of this study, the use of number grades on report cards for each subject that was instructed was mandatory.

Statement of the Problem

There is a lack of conclusive research as to what effect attendance in a pre-K program has on student achievement (Entwisle, 1995; Marcon, 2002). The absence of research in this area may cause school district officials to question the validity of funding these programs. It is, therefore, incumbent upon school district administrators to assess

the impact that public school pre-K attendance has on student achievement. An examination of MCT2 scale scores in the areas of language arts and math and report card number grades in grade levels first, second, and third in the areas of language arts and math was conducted to determine the academic achievement of students who attended or did not attend a public school pre-K program.

The implementation of pre-K programs in public schools across the United States has risen over the past decade. Although pre-K programs are not mandated by many states, many parents choose to enroll their children in these programs so that they will gain more knowledge at an earlier age (Bushaw & McNee, 2009).

The problems of the lack of conclusive research that the attendance of public school pre-K has on student achievement were addressed by examining MCT2 scale scores in the areas of language arts and math. Additionally, report card number grades in grade levels first, second, and third in the areas of language arts and math were analyzed. The analysis of this data aids in the determination of whether or not the attendance of a public school pre-K program has an effect on student achievement. These results assist school district officials in deciding to fund public school pre-K programs.

Purpose

The purpose of this study was to determine the effectiveness of attendance of a public school pre-K program as measured by students' MCT2 scale scores in language arts and math and the report card number grades in the areas of language arts and math for the same students when they attended first, second, and third grades. The results of the study assist in gaining insight as to whether or not attending a public school pre-K program has an effect on student achievement. This information assists school district

administrators in planning for programs and curricula to better educate 4-year-old students. In addition, this may aid parents in deciding whether to enroll their children in a public school pre-K program.

Research Questions

There were four research questions guiding this study:

1. Is there a statistically significant difference in the MCT2 scale scores for language arts for third grade students who attended a public school pre-K program and students who did not attend a public school pre-K program?

2. Is there a statistically significant difference in the MCT2 scale scores for math for third grade students who attended a public school pre-K program and students who did not attend a public school pre-K program?

3. Is there a statistically significant difference in the report card number grades for language arts for grades one, two, and three for students who attended a public school pre-K program and students who did not attend a public school pre-K program?

4. Is there a statistically significant difference in the report card number grades for math in grades one, two, and three for students who attended a public school pre-K program and students who did not attend a public school pre-K program?

Definition of Terms

MCT2 is defined by the MDE Interpretive Guide for the MCT2 as the following:

The MCT2 is a measure of student achievement in language arts and mathematics

in grades 3-8 based on the *2006 Mississippi Language Arts Frameworks-Revised*

and the *2007 Mississippi Mathematics Frameworks-Revised*. In addition to being

the basis for state accountability in these grades, the MCT2 is designed to meet

the federal testing requirements of the *No Child Left Behind Act* (NCLB) 2001. (p.

1)

Pre-K program may be defined by MDE (2001) as the following:

The Pre-Kindergarten Program shall reflect an understanding of child

development principles. These principles shall be embodied in the curriculum

design and general learning environment. The instructional delivery is to be

organized around learning centers where opportunities are provided for children

to acquire skills and concepts involving problem-solving, decision-making,

questioning, evaluating, and discovering. (p. v)

Students entering a public school pre-K program in the state of Mississippi must

be 3 or 4 years of age on or before September 1 of the attending school year.

Report cards are a way to communicate with parents and students about

individual student grades that have been assigned to particular subject areas (Tomlinson

& Allan, 2000). These grades are typically based on assignments, projects, and district

level tests that are administered at the students' grade level.

Scale scores on the MCT2 are calculated based on the number of questions that are answered correctly (MDE, 2012). Students are assigned a level of mastery for each subject area (i.e., Minimal, Basic, Proficient, and Advanced).

Description of the Pre-K Program

The public school pre-K program attended by the 4-year-old students in RSD during the 2005–2006 and 2006–2007 school years included a certified teacher and an assistant teacher in each classroom. There were 20 students in each of the three classrooms at the school. The classrooms were set up to encourage the development of motor, cognitive, adaptive, social-emotional, and communication skills. Activities for learning pre-reading and pre-math skills were readily available. Some of the activities included puzzles, books, dramatic play materials, housekeeping play materials, music, and art activities.

Some pre-K students rode a school bus to school. Other students were dropped off by their parents. All students were eligible to eat breakfast in the cafeteria upon arrival to school. After breakfast, the day of instruction would begin for these students. A recess time was incorporated into the morning's activities. Also, students were scheduled as a class to attend physical education and music classes.

Students ate lunch in the cafeteria and then returned to the classroom to take a nap. Restroom breaks were afforded as needed throughout the day. After nap time, students had snack time and then prepared to be picked up by the bus or by parents.

If students qualified for speech therapy, occupational therapy, or physical therapy, the appropriate therapist would come to the classroom and get the student for therapy. The therapy was typically conducted in another room in the school. The student was

returned to the classroom after therapy ended. During these 2 school years, only one student was present that had a disability other than speech/language. This student had a special education eligibility of autism. This student participated in all of the class activities and received some resource time and special education services inside the general education pre-K class.

Limitations of the Study

Limitations in a study help to identify potential weaknesses in the study (Creswell, 2003). There were several limitations in this study. The first limitation was the number of students who originally attended the public school pre-K program and exited the school district by the third grade. Some students originally attended the public school pre-K program as 4-year olds and then moved away to attend another school district or attended a private school during kindergarten and first, second, or third grade school years. Therefore, these students' MCT2 scale scores in the areas of language arts and math or report card grades were not available for examination.

Another limitation was that the results of the study were generalized to only students in the RSD. Students who attended a public school pre-K program in another school district would not have had exposure to the same type of classroom setting, including instruction in the curriculum, as those students who attended a public school pre-K program in the RSD.

A final limitation was that all students did not have the same teacher each year. Typically, each school year students move on to the next grade and have a different teacher with varying styles of teaching.

Delimitations of the Study

Delimitations may assist in limiting the scope of a study (Creswell, 2003). One delimitation to consider in this study included the variables upon which the students were matched. The variables upon which the students were matched include socioeconomic status (SES), race, gender, and age.

Another delimitation involved the students who have eligibilities in special education. Many students in special education are administered an MCT2 with or without accommodations, and they also receive report card number grades. The report card number grades received may include assignments and tests with or without accommodations.

A final delimitation was consideration of students who attended any other type of pre-K program, such as a day care, a Head Start program, or a private school pre-K program, or of students who did not attend pre-K. This was not deemed relevant to the study because the research focuses on how attending or not attending a public school pre-K program affects academic achievement. Because there were two groups in this study, students who attended a public school pre-K program and students who did not attend a public school pre-K program, the researcher had no control over the type of pre-K program students may have attended.

Justification for the Study

The results of this study provide additional information regarding the effectiveness of public school pre-K programs. The results also serve to provide information regarding differences in academic achievement, as measured by MCT2 scale scores in language arts and math and report card number grades in the areas of language

arts and math, for students who did and did not attend a public school pre-K program. By analyzing this data, the effectiveness of attending or not attending a public school pre-K program was studied. This information was valuable in assisting school district administrators in planning for additional programs and curricula to better educate 4-year-old pre-K students. Also, this information serves to guide decisions made by school district officials as to whether or not to fund district pre-K programs. In addition, the information from this study assists parents in determining whether to enroll their pre-K children in a public school pre-K program.

CHAPTER II

REVIEW OF THE LITERATURE

Educating students at an early age in public school systems is a topic of great debate in many states. The research on the effects of academic achievement for students who attend public school pre-K programs is limited. The review of the literature that is presented in this chapter addresses a brief history of early childhood education. In addition, studies that were conducted addressing the short- and long-term effects of pre-K program attendance will be introduced. An examination of the overall effects of pre-K program attendance on academic achievement in language arts and math utilizing classroom grading and standardized testing will provide the background for the study of the effects of attending a public school pre-K program.

Early Childhood Education History

Early childhood education has been at the forefront of educational issues for many years. The concept of providing very young children with instruction in structured settings has changed throughout the years based on changes in the social, political, and economic contexts of the educational system (Kagan & Reid, 2008).

The phrase "early childhood education" may represent several different types of programs. The preschool and pre-K programs that represent early childhood education are well known to educators. In 1965, the federal government initiated and funded a

preschool program known as Head Start (Kagan & Reid, 2008). Other early childhood

education programs include programs that local educational agencies may implement to

educate this age group in communities.

Other preschool or pre-K programs also exist and are operated by churches,

private schools, or individuals who own a private day-care facility. These programs

typically charge tuition for children to attend. Each type of program may follow a

specific direction or curriculum. Many parents who work need early childhood programs

for day care purposes. Other parents who are not in the workforce may be concerned

about their young children receiving an early start in education and enroll them in a child-

care program in which a more structured curriculum is taught. These day cares or early

childhood programs care for children and generally provide instruction on some skills

during the workday and charge an attendance fee.

Takanishi and Kauerz (2008) stated that the "P-3 (pre-Kindergarten through the

primary grades) perspective starts at birth and incorporates a broad array of programs that

serve infants and toddlers, as well as 3- and 4-year olds, including those in PK programs"

(p. 482). They further proposed that the educational system should offer services to all 3-

year-old and 4-year-old children and that attendance should be voluntary, not mandatory.

A debate existed over whether early education should be mandatory or voluntary.

When polled, Americans endorsed the idea of making either a half day or full day of

kindergarten compulsory (Bushaw & McNee, 2009). However, most did not favor having

children start school at age 4. The poll further indicated that most Americans "believe

that preschool programs should be housed in public schools, with parents even more

supportive of that idea" (p. 18).

14

Temporal Effect of Pre-Kindergarten Programs

A goal of the pre-K program should be high-quality instruction and care for children and should raise expectations of these students' school readiness prior to entry into kindergarten. These higher expectations, then, should rise "the bar higher, setting a standard of proficiency at the end of grade 3" (Takanishi & Kauerz, 2008, p. 482).

Several studies have been conducted that examined whether or not early childhood education has an effect on children in gaining academic skills that assist them in their later academic careers. Other studies have examined whether or not children maintain the level of mastery that they achieved in the early childhood programs attended.

Many studies on the effects of pre-K programs have focused on language arts and math. The current study also focuses on language arts and math.

Entwisle (1995) reported that attending a pre-K program may serve to advance student achievement temporarily. Entwisle also observed that pre-K attendance would ease the transition into the early elementary grades, especially for students from a low socioeconomic status. Easing the transition into the elementary grades was found to be advantageous for young children. This ease of transition and feeling more comfortable in the process promotes a more positive educational experience. Therefore, students may value their education and work harder to be successful.

Heckman (2006) reported on a review of the Perry Preschool Program, and he indicated that early schooling such as preschool programs that target disadvantaged students "have higher returns than later interventions such as public job training, convict rehabilitation programs, tuition subsidies, or expenditures on police" (p. 1902). If money

is invested in early childhood education, then students will have an earlier start to a positive educational experience.

If children have mastered the skills necessary to begin kindergarten programs, they have an advantage. Lara-Cinisomo, Fuligni, Ritchie, Howes, and Karoly (2007) explored early childhood educators' beliefs on what children should know prior to entering kindergarten. It was found that the three basic categories of child, home, and teacher should be addressed to assist a child in school preparation. It was indicated in the study that readiness in the areas of physical and emotional development was also very important. In addition, reasoning skills and basic skill development were identified as important, as were teacher relationships. All of these factors contribute to the later academic success of the students. Attendance in a pre-K program assisted children in mastering these skills prior to entering kindergarten (Lara-Cinisomo et al., 2007).

Effects of Pre-Kindergarten Programs on Academic Achievement

In a study on children who entered a Head Start program at the ages of 3 and 4, Zehr (2010) reported that many of the children who entered Head Start at the age of 3 showed progress in the areas of learning math, pre-writing, and motor skills, as well as language and literacy. The children who entered Head Start at the age of 4 showed gains in the areas of language and literacy. For the 4-year-old group, more progress was seen in vocabulary, letter and word recognition, spelling, color identification, and letter naming when they were compared with other 4-year-olds who did not attend a Head Start program. When the children who began Head Start as 4-year-olds had completed the first grade, it was found that they were ahead of the children who had not attend Head Start in only the area of vocabulary. Most of the benefits in learning that they had reaped due to

Head Start attendance had faded by the time they finished the first grade. The benefits were not lasting (Zehr, 2010).

Hull (2011) conducted a study on the effects of students who attended a full-time pre-K program and a half day of kindergarten program and students who attended only a full day of kindergarten. The results of the study revealed that the students who attended a full time pre-K program and a half day of kindergarten had higher reading skills by the third grade than those who attended only a full day of kindergarten. However, the quality of each program that students attended was not taken into consideration in this study.

Lipsey, Hofer, Bilbrey, and Farran (2012) conducted a study using the Tennessee Voluntary Pre-Kindergarten program (TN-VPK), which was set in the Tennessee public schools and was in conjunction with the Tennessee State Department of Education Division of School Readiness and Early Learning. This study examined the effects of the TN-VPK and the progress of the students who attended. For the first cohort, it was found that the students who attended the TN-VPK significantly outperformed those who did not attend at the end of the school year on all assessments. When in kindergarten, the students who attended the TN-VPK outperformed those students who did not attend on teacher ratings of readiness skills. The authors are conducting a longitudinal study with results to follow.

Jung, Hartman, Smith, and Wallace (2013) conducted a study in the area of math, which examined the effects of teaching number relationships to students in a half-day public school pre-K program. The concept of number relationships is "the ability to represent a quantity in multiple, flexible ways, for example, thinking about the number 6 as 1 and 5, as 2 more than 4, as 2 groups of 3, or 3 groups of 2" (p. 166). Jung, et al.

17

(2013) advocate that there are three different types of number relationships: subitizing, parts-whole relationships, and more-and-less relationships. Subitizing assists children to understand cardinality of numbers. Parts-whole relationships assist children in understanding that wholes may be broken into parts. More-and-less relationships assist children in understanding which groups may have more or less objects when comparing them.

An intervention group was taught number relationships using computer software and hands-on activities while students in a control group were not taught these concepts. Pretests and posttests were administered to both groups. At the end of the 12-week period, the students in the intervention group scored significantly higher than those students who had not received math instruction in number relationships. These results support the inclusion of teaching math skills in pre-K classrooms (Jung, 2013).

In another study, Takanishi and Kauerz (2008) reported that the gains that were made by children who had attended pre-K programs might fade away if the kindergarten through third grade programs are not of high quality. If the elementary schools these children attend do not have low teacher to student ratios and high-quality, experienced teachers, then the gains made in earlier years could diminish.

Studies regarding the later academic success of students who have and have not attended a public school pre-K program are limited. Therefore, the results of the current study provide more information regarding the effectiveness of a public school-based pre-K program. Information regarding the differences in academic achievement, as measured by MCT2 scale scores in language arts and math and report card number grades in the areas of language arts and math for students who did and did not attend a public school

pre-k program, was analyzed in this study. This information is valuable in assisting

school district administrators in planning for additional programs and curricula to better

educate 4-year-old pre-K students.

CHAPTER III

METHODOLOGY

The purpose of this study was to determine the effects of attending a public school based pre-K program. Students' language arts and math skills as measured by the scale scores on the MCT2 and report card grades were analyzed for a 3-year period after pre-K. The MCT2 scale scores for third-grade students who did and did not attend a public school based pre-K program were analyzed. Longitudinally, the language arts and math report card number grades for students in grade levels first, second, and third who attended public school pre-K classes and students who did not attend public school pre-K classes were also analyzed.

This chapter includes a description of the research design and the participants involved in the study. In addition, the instrumentation used in the study is described. The procedures for collecting the data and analyzing the data are also described.

Research Design

This study was a causal-comparative study. Causal-comparative research determines causes or consequences of existing differences in or among individuals or groups of people (Fraenkel & Wallen, 2009). This type of research also studies the conditions that have already taken place between groups. According to Fraenkel and Wallen (2009),

The group difference variable in a causal-comparative study is either a variable that cannot be manipulated (such as ethnicity) or one that might have been manipulated but for one reason or another has not been (such as teaching style). (p. 363)

The variable in this study that cannot be manipulated was that of attending or not attending a public school pre-K program. This difference has already occurred. Causal-comparative research is the most appropriate research design for this particular study because the data involved in this study were archived data and because the group difference variable could not be manipulated.

A dependent variable is a variable that is observed to assess the effect of the treatment (Gravetter & Wallnau, 2009). There were four dependent variables for this study. One dependent variable was the MCT2 scale scores in language arts for third-grade students. The second dependent variable was the MCT2 scale scores in mathematics for third-grade students. The MCT2 scale scores were analyzed to determine academic achievement at the end of 3 years for students who attended or did not attend pre-K programs.

A third dependent variable was report card number grades in language arts for first, second, and third grades. The fourth dependent variable was the report card number grades for math. The report card number grades reported from student records were analyzed to determine academic achievement over a period of 3 years after having attended or not attended pre-K.

Student records were matched on selected characteristics including socioeconomic status (SES), race, gender, and age. The records of students were divided

into two groups: those who attended a public school pre-K program and those who did not attend a public school pre-K program. These records were matched on all variables, and then an analysis will be run. These records were requested by the researcher to be de-identified prior to collection. Identification numbers were assigned to each student record prior to the de-identification process of the students' names. For example, the first group of records for students who attended a public school pre-K program was assigned a number correlating with the group (e.g. Group 1a1, 1a2, 1a3, etc.). The first group of records for students who did not attend a public school pre-K program was assigned a number consistent with its group (e.g., Group 1b1, 1b2, 1b3, etc.). The second group of records for students who attended a public school pre-K program was assigned numbers consistent with the group (e.g., Group 2a1, 2a2, 2a3, etc.). The second group of records for students who did not attend a public school pre-K program was assigned numbers correlating with the group (e.g., Group 2b1, 2b2, 2b3, etc.). This information was requested in electronic form with de-identification from the superintendent's office of RSD.

Table 1 displays the two attendance groups along with the years of school attendance as students progress from attending or not attending pre-K through third grade. Longitudinal data were collected as the two groups attended first, second, and third grades.

State law does not mandate attendance in pre-k and kindergarten. In the grade levels of first, second, and third grades, number and letter grades are assigned to students on report cards in the areas of language arts and math. For this study, number grades were utilized in the analysis. It was important to collect the report card number grade data so

that the effects on academic achievement of attending or not attending a public school pre-K program could be determined. The state of Mississippi begins mandatory state testing in the third grade. In third grade, all students are administered the MCT2 in the areas of language arts and math. Therefore, the MCT2 test data in the areas of language arts and math were collected and analyzed for effects of attending or not attending a public school pre-K program.

As shown in Table 1, Group 1a is the first group that attended a public school pre-K program during the 2005–2006 school year. Group 1b is the first group of students that did not attend a public school pre-K program during the 2005–2006 school year. All of these students attended kindergarten during the 2006–2007 school year, first grade in 2007–2008, second grade in 2008–2009, and third grade in 2009–2010.

Group 2a is the second group of students that attended a public school pre-K program during the 2006–2007 school year. Group 2b is the second group of students that did not attend a public school pre-K program during the 2006–2007 school year. All of these students attended kindergarten in 2007–2008, first grade in 2008–2009, second grade in 2009–2010, and third grade in 2010–2011.

Table 1

School Year, Grade, and Pre-K Attendance Status

2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Pre-Kindergarten (Group 1a)	Kindergarten	1st Grade	2nd Grade	3rd Grade	
Non Pre-Kindergarten (Group 1b)	Kindergarten	1st Grade	2nd Grade	3rd Grade	
	Pre-Kindergarten (Group 2a)	Kindergarten	1st Grade	2nd Grade	3rd Grade
	Non Pre-Kindergarten (Group 2b)	Kindergarten	1st Grade	2nd Grade	3rd Grade

Participants

This study included the records of 114 students. The student records were not identifiable. Of the 114 students, 49 were de-identified records of students attended a public school pre-K program. These students' records were matched with 65 de-identified records of students who did not attend a public school pre-K program.

The students' records for the 49 de-identified students who attended a public school pre-K program were matched with 65 de-identified student records that did not attend a public school pre-K program. The student records were matched on selected variables including SES, race, gender, and age. An analysis was then conducted.

Instrumentation

In order to determine the effects of attending a public school pre-K program, MCT2 scale scores in the areas of language arts and math for those students who did and did not attend a public school pre-K program were analyzed. In addition, report card number grades for the grade levels of first, second, and third for students who did and did not attend a public school pre-K program were analyzed.

Mississippi Curriculum Test, Second Edition (MCT2)

According to the MDE Interpretive Guide for the MCT2 (2012),

The MCT2 is a measure of student achievement in language arts and mathematics in grades 3-8 based on the *2006 Mississippi Language Arts Frameworks-Revised* and the *2007 Mississippi Mathematics Frameworks-Revised*. In addition to being the basis for state accountability in these grades, the MCT2 is designed to meet the federal testing requirements of the *No Child Left Behind Act* (NCLB) 2001. (p. 1)

According to the *Mississippi Curriculum Test, Second Edition, Technical Manual for 2007-2008 Test Administration* (2008),

The MCT2 scale score was established starting with a number-correct scoring approach rather than pattern scoring. As described in Chapter 4 (QC and Data Cleaning), correct student responses to test items were given a value of 1 and missing or incorrect responses were assigned a value of 0. Summing the values given to correct, incorrect, or missing responses give a number-correct raw score. That is, the raw score on the test is the unweighted number of correct answers given by the student. Pattern scoring, on the other hand, is a scoring approach that

essentially weights correct items differently based on their difficulty and discrimination. The number-correct (summed raw score) approach calculates an ability estimate for each student based on the total number of items that the student answered correctly. For that same 40-item test, there are 41 possible raw scores (from no items correct to all items correct). (p. 66)

According to the MDE Interpretive Guide for the MCT2 (2012),

The range of scale scores and the *No Child Left Behind* (*NCLB*) levels for third grade language arts are as follows: 137 and below – Minimal; 138-149 – Basic; 150-161 – Proficient; and 162 and above – Advanced. For the area of third grade math, the range of scale scores and levels are as follows: 137 and below – Minimal; 138-149 – Basic; 150-164 – Proficient; and 165 and above – Advanced. (p. 5)

According to the *Mississippi Curriculum Test, Second Edition, Technical Update for 2009-2010 Test Administration* (2010), "the focus of reliability is to ascertain the relationships among scores derived from individual items, whereas validity may refer to a collection of evidence to demonstrate test fairness and valid uses and interpretations of the test scores" (p. 64). Reliability tests for selected subgroups were conducted using *Cronbach's Alpha.*

In the *Mississippi Curriculum Test, Second Edition, Technical Manual for 2007-2008 Test Administration* (2008), the following is reported:

Language Arts tests demonstrated high reliability with *Cronbach's* alpha higher than .84. In fact, except for Grade 6 tests, all Language Arts tests reported reliability higher than 0.85 which is the generally accepted value for a high-stakes

26

assessment. Reliability for the Mathematics test ranged from 0.87 to 0.91. The

relatively lower internal consistency for Language Arts tests could be attributed to

the introduction of items which measure new skills or test the same skill in a

different format. (p. 104)

The reported reliability for the MCT2 areas of language arts and mathematics is

crucial for this study. This indicates that the MCT2 language arts and mathematics

subtests measure consistently what the test claims to measure. It is important to include a

reliable measure of language arts and mathematics skills in this study.

According to the *Mississippi Curriculum Test, Second Edition, Technical Manual

for 2007-2008 Test Administration* (2008), the validity of the MCT2 is in the content and

construct that is being measured. Two sources of validity are noted. One source of

validity is the inclusion of students with various needs and their test accommodations. A

second source of validity is the statistical analysis, which is utilized to determine if items

could possibly favor a subgroup.

Content-related validity may be established by examining the content of the test

items to determine how well they sample the variable that the test intends to measure

(Ventry & Schiavetti, 1986). According to the *Mississippi Curriculum Test, Second

Edition, Technical Manual for 2007-2008 Test Administration* (2008), the MCT2

language arts and mathematics items were designed to measure the specific skills

described in the 2006 Mississippi Curriculum Framework for Language Arts and the

2007 Mississippi Curriculum Framework for Mathematics. Educators in Mississippi

reviewed the alignment of the MCT2 language arts and mathematics test items to these

standards. There was also a special study conducted by Pearson, the educational testing

corporation, to evaluate and compare the test items to the 2006 Mississippi Curriculum Framework for Language Arts and the 2007 Mississippi Curriculum Framework for Mathematics with Depth of Knowledge. The overall findings indicated that the test items were aligned and Depth of Knowledge was consistent across grade levels. Therefore, content-related validity was established.

According to the *Mississippi Curriculum Test, Second Edition, Technical Manual for 2007-2008 Test Administration* (2008), "Construct validity refers to what test scores mean and what kinds of inferences they support" (p. 89). This type of validity was the underlying concept for the MCT2 validation process. The evidence for construct-related validity for tests may come from numerous sources. The construct-related validity evidence for the MCT2 came from the following four sources: "alignment of MCT2 with test specifications, item-total point-biserial correlations, inter-correlation among competencies, and construct validation through confirmatory factor analysis" (p. 90). For the alignment of MCT2 test specifications, it was determined that the test covered the specific instructional objectives as required by the MCT2 test blueprint. The item-total point-biserial correlations were also found to be valid when reviewed by content experts of the Mississippi Department of Education, Mississippi teachers, and experts from Pearson. Regarding inter-correlation among competencies, it was determined that the constructs for the language arts competencies are highly inter-correlated. For the area of mathematics, the correlations were determined to be high. Regarding the construct validation through confirmatory factor analysis, this "confirmatory factor analysis results provide additional evidence to support the validity of the MCT2 tests" (*Mississippi*

Curriculum Test, Second Edition, Technical Manual for 2007-2008 Test Administration, 2008, p. 95).

The criterion–related validity of a test is determined by how well the "test or measure correlates with some outside validating criterion" (Ventry & Schiavetti, 1986, p. 98). There are two types of criterion-related validity: concurrent and predictive. "The criterion for evaluating the performance of a test can be measured at the same time (concurrent validity) or at some later time (predictive validity)" (Mississippi Curriculum Test, Second Edition, Technical Manual for 2007-2008 Test Administration, 2008, p. 96). According to the MCT2 Technical Manual for the 2007-2008 Test Administration, "The correlation coefficients for the MCT2 range from 0.53 to 0.65 indicating a moderate to strong correlation between MCT2 performance level, MCT2 scale scores, and teacher judgment of the students' attainment of the content" (p. 96).

The reported validity for the MCT2 areas of language arts and mathematics was crucial for this study. This indicated that the MCT2 language arts and mathematics subtests measure what they profess to measure. It was important to include a valid measure of language arts and mathematics skills in this study.

Report Card Letter Grades

Grades that students receive on report cards are an average of the grades given by classroom teachers for assignments, projects, and tests in the classroom. These grades are typically assigned in all subject areas in which students are instructed, including language arts and math. Many classroom teachers develop grading rubrics to assign grades while others assign grades subjectively to assignments, projects, and tests. Therefore, validity and reliability of report card number grades may be established based on individual

teachers' criteria for scoring assignments, projects, and tests. Due to the potential number of teachers involved in this study, reliability and validity for report card number grades cannot be established for this study.

An assumption of this study, however, is teachers in first, second, and third grades taught students who attended the public school pre-K program and students who did not attend the public school pre-K program in the same classroom. Teachers assign classroom grades based on the performance of students, not on whether students attended or did not attend the public school pre-K.

Procedure

The superintendent of the school district was contacted for permission to gain access to the de-identified electronic records of students who attended third grade in the 2009–2010 and 2010–2011 school years. These students in third grade consisted of students who did and did not attend a public school pre-k program during the 2005–2006 and 2006–2007 school years. In order to conduct this research, Institutional Revenue Board (IRB) approval was obtained (see Appendix A).

The request to the superintendent included third grade MCT2 scale scores in the areas of language arts and math and report card number grades for first, second, and third grades. The request also included socioeconomic status, race, gender, and age so that records could be matched. This information was de-identified, and it was in electronic format.

Identification numbers were assigned to student records prior to de-identifying them. The identification numbers enabled the tracking of students through grade levels. The purpose of de-identification of the student records was to be in compliance with the

Family Educational Rights and Privacy Act (FERPA). FERPA is a federal law that protects the privacy of student education records and "applies to all schools that receive funds under an applicable program of the U.S. Department of Education" (USDE, 2012).

Data Analysis

There are four research questions guiding this study:

1. Is there a statistically significant difference in the MCT2 scale scores for language arts for third-grade students who attended a public school pre-K program and students who did not attend a public school pre-K program?

2. Is there a statistically significant difference in the MCT2 scale scores for math for third-grade students who attended a public school pre-K program and students who did not attend a public school pre-K program?

3. Is there a statistically significant difference in the report card number grades for language arts for Grades 1, 2, and 3 for students who attended a public school pre-K program and students who did not attend a public school pre-K program?

4. Is there a statistically significant difference in the report card number grades for math in Grades 1, 2, and 3 for students who attended a public school pre-K program and students who did not attend a public school pre-K program?

The data involved in this study were existing data and the group difference variable cannot be manipulated. The effects on MCT2 language arts and math scale scores, and report card number grades in the areas of language arts and math for students who attended or did not attend a public school pre-K program, were analyzed.

31

The data from this study were analyzed using a t-test for differences in means. According to Gravetter and Wallnau (2009), "The *t statistic* is used to test hypotheses about an unknown population mean μ when the value of σ (population standard deviation) is unknown" (p. 283). The t statistic examines differences in means to determine how the observed differences found in a study compare to the average differences in a hypothetical study (Ventry & Schiavetti, 1986). Using an independent-measures research method, the mean differences between the two populations, students who attended a public school pre-K program and those who did not attend a public school pre-K program, were evaluated with the t-statistic.

An analysis of covariance (ANCOVA) was also used in this study. An ANCOVA analysis "provides a way to match groups 'after the fact' on such variables as age, socioeconomic, aptitude, and so on. Before analysis of covariance can be used, however, the data involved need to satisfy certain assumptions" (Fraenkel & Wallen, 2009, pp. 370–371). The use of ANCOVA in this study provided an equal comparison of the randomly formed groups after the adjustment of the differences of age, race, sex, and SES. Each identified variable was used as a covariate. The variation of each covariate was removed from the dependent variables in this study prior to comparison.

The assumption of normality was checked using the Shapiro-Wilkes test. The assumption of homogeneity of variance was checked using the Levene's test. An alpha level of .05 was used for the between and within subjects effects.

The first research question guiding this study was the following: Is there a statistically significant difference in the MCT2 scale scores for language arts for third-grade students who attended a public school pre-K program and students who did not

32

attend a public school pre-K program? The independent variable was attendance in a public school pre-K program (attended and did not attend). The dependent variable for this research question was the MCT2 scaled scores for language arts. This research question was analyzed using a t-test for differences in means. Using an independent-measures research method, the mean differences between the two populations, those who attended a public school pre-K program and those who did not attend a public school pre-K program, were evaluated with the t-statistic.

ANCOVA was also used in this study. The use of ANCOVA in this study provided an equal comparison of the randomly formed groups after the adjustment of the differences of age, race, sex, and SES. Each identified variable was used as a covariate. The variation of each covariate was removed from the dependent variables in this study prior to comparison.

The second research question guiding this study was the following: Is there a statistically significant difference in the MCT2 scale scores for math for third-grade students who attended a public school pre-K program and students who did not attend a public school pre-K program? The independent variable was attendance in a public school pre-K program (attended and did not attend). The dependent variable for this research question was the MCT2 scale scores for math. The data collected to answer this research question were analyzed using a t-test for differences in means. Using an independent-measures research method, the mean differences between the two populations, those who attended a public school pre-K program and those who did not attend a public school pre-K program, were evaluated with the t-statistic. ANCOVA was also used in this study. The use of ANCOVA in this study provided an equal comparison

of the randomly formed groups after the adjustment of the differences of age, race, sex, and SES. Each identified variable was used as a covariate. The variation of each covariate was removed from the dependent variables in this study prior to comparison.

The third research question guiding this study was the following: Is there a statistically significant difference in the report card number grades for language arts for grades one, two, and three for students who attended a public school pre-K program and students who did not attend a public school pre-K program? The independent variable was attendance in a public school pre-K program (attended and did not attend). The dependent variable for this research question was the report card number grades for the grade levels of first, second, and third in the area of language arts. The data collected to answer this research question was analyzed using a t-test for differences in means. Using an independent-measures research method, the mean differences between the two populations, those who attended a public school pre-K program and those who did not attend a public school pre-K program, were evaluated with the t-statistic. ANCOVA was also used in this study. The use of ANCOVA in this study provided an equal comparison of the randomly formed groups after the adjustment of the differences of age, race, sex, and SES. Each identified variable was used as a covariate. The variation of each covariate was removed from the dependent variables in this study prior to comparison.

The fourth research question guiding this study was the following: Is there a statistically significant difference in the report card number grades for math in grades one, two, and three for students who attended a public school pre-K program and students who did not attend a public school pre-K program? The independent variable was attendance in a public school pre-K program (attended and did not attend). The dependent

variable used in this research question was the report card number grades for the grade

levels of first, second, and third in the area of math. The data collected to answer this

research question was analyzed using a t-test for differences in means. Using an

independent-measures research method, the mean differences between the two

populations, those who attended a public school pre-K program and those who did not

attend a public school pre-K program, were evaluated with the t-statistic. ANCOVA was

also used in this study. The use of ANCOVA in this study provided an equal comparison

of the randomly formed groups after the adjustment of the differences of age, race, sex,

and SES. Each identified variable was used as a covariate. The variation of each covariate

was removed from the dependent variables in this study prior to comparison.

CHAPTER IV

RESULTS

This study was a causal-comparative study. This type of study determines causes or consequences of existing differences in or among individuals or groups of people (Fraenkel & Wallen, 2009). This type of research also studies the conditions that have already taken place between groups. This research study used existing data.

This research used a repeated measures approach with a between-within design to examine if attending a public school pre-K program had an impact on academic achievement as measured by language arts and math report card grades for Grades 1, 2, and 3 and by scale scores on the third-grade language arts and math portions of the MCT2. This chapter includes a review of the descriptive statistics for the data, followed by the answers to each research question related to this study.

The purpose of the study was to determine the effectiveness of attendance in a public school pre-K program. The results of this study can assist in gaining insight as to whether or not attending a public school pre-K program has an effect on student achievement. The results can also assist school district administrators in planning for programs and curricula to provide better educational opportunities for 4-year-old students. In addition, the results may aid parents in deciding whether to send their children to a public school pre-K program.

Existing data were obtained from the RSD. Data were originally compiled from a total sample of 117 pre-K students for 2 consecutive school years: 2005–2006 and 2006–2007. Three students were subsequently removed from the study because no scores were available for analysis. These students attended a pre-K program as 4-year-olds in a public school located in the RSD. The school housed students from the public school pre-K program through third grade at the time of the study. The public school pre-K program classes were limited to 20 students in each class, and each class employed a certified teacher and a non-certified teacher assistant. There were three classes of public school pre-k students in this setting.

The independent variable for this study was attendance in a public school pre-K program. The two aspects of this independent variable were attendance and non-attendance. The dependent variables in this study were as follows: MCT2 scale scores in language arts for third-grade students, MCT2 scale scores in math for third-grade students, report card number grades in language arts for first, second, and third grades, and report card number grades in math for first, second, and third grade for each student in the study.

Descriptive Data of Students

Student Scores

There were originally 117 students in the sample for this study. One student was removed from the group that attended public school pre-K in 2005–2006 because there were no first grade math or language arts report card grades accessible for this student. The student had letter grades only with no number grades provided. Another student was removed from this same group because the student did not take the MCT2 math and

language arts tests. This student was in special education and received an alternate assessment instead of taking the MCT2. This was the only special education student in the study. One other student was removed from the study. This student was in the group that did not attend a public school pre-K program in 2006–2007. The reason for this student's removal from the study was that there were no third grade math or language arts MCT2 scale scores for the student. After these three students were removed, the researcher had 114 student scores in the study: 49 students who attended a public school pre-K program and 65 students who did not attend a public school pre-K program.

The mean MCT2 language arts and math scale scores were calculated for those students who attended a public school pre-K program and for those who did not attend a public school pre-K program during the 2005–2006 and 2006–2007 school years. These are identified in Table 2.

Table 2

Descriptive Statistics for Third-Grade MCT2 Language Arts and Math Scale Scores

		Language Arts		Math	
Pre-K	N	*M*	*SD*	*M*	*SD*
DNA	65	147.72	9.24	149.83	10.02
A	49	153.96	10.1	155.9	11.32
TOTAL	114	150.4	10.07	152.44	10.97

Note: DNA = did not attend, A = attended

The students' mean report card number grades for language arts for grades first, second, and third were calculated for those students who attended a public school pre-K program and those who did not attend a public school pre-K program. They are identified in Table 3.

Table 3

Descriptive Statistics for Language Arts Report Card Number Grades for Grades One,

Two, and Three

Pre-K		Language Arts						Math					
		Grade Level						Grade Level					
		1		2		3		1		2		3	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
DNA	65	88.8	8.94	86.23	8.75	85.71	7.99	87.63	7.8	85.58	8.26	85.97	7.88
A	49	93.18	4.15	90.41	5.95	89.18	6.48	90.24	6.78	89.35	7.93	89.35	6.42
TOTAL	114	90.68	7.57	88.03	7.92	87.2	7.55	88.75	7.47	87.2	8.29	87.42	7.45

Assumptions of ANCOVA

Assumptions for MCT2 Math and Language Arts Scale Scores

ANCOVA is used to test hypotheses of populations that have parameters, thus

making ANCOVA a parametric test. As such, there are four assumptions that must be

met in order for the researcher to be confident with the results of ANCOVA. If these

assumptions are not met, the results of ANOVA will be biased, and the researcher should

interpret them with caution (Howell, 2010). The four assumptions for MCT2 math and

language arts scale scores related to ANCOVA are of normality, homogeneity of

variance, linear association of the dependent variable and the covariate, and homogeneity

of regression.

Normality. The Shapiro-Wilk's tests (see Table 4) indicated a non-statistical

significant result for the MCT2 math scale scores of the students who attended a public

school pre-K program and those who did not attend a public school pre-K program.

These results allowed the researcher to conclude that the normality assumption was met

at the .05 alpha level for the MCT2 math scale scores. However, the MCT2 language arts scale scores of students who did not attend a public school pre-K program did not conform to a normal distribution. These scores were unlike the MCT2 language arts scale scores of students who attended a public school pre-K program whose scores were normally distributed. Howell (2010) stated that ANCOVA is robust when departure from normality is observed.

Table 4

Shapiro-Wilk's Test of Normality

	Pre-K	Statistic	*df*	Ssig.
MCT2 Math Scores (RQ1)	DNA	0.97	65	0.119
	A	0.973	49	0.319
MCT2 Language Arts Scores (RQ2)	DNA	0.959	65	0.031
	A	0.963	49	0.128

Homogeneity of variance. Another assumption associated with ANCOVA is that of the homogeneity of variance. This assumption is met if the variances of the groups are statistically equivalent, thus the term homogeneous. In Table 5, the results of the Levene's test of homogeneity of variance are displayed. These tests were not significant at the .05 alpha level, allowing the researcher to conclude that the groups who attended a public school pre-K program and those who did not attend a public school pre-K program were homogeneous for both the MCT2 math scale scores and MCT2 language arts scale scores.

Table 5

Levene's Test of Homogeneity of Variances

	Statistic	df1	df2	Sig.
MCT2 Math Scores (RQ1)	1.591	1	112	.210
MCT2 Language Arts Scores (RQ2)	2.789	1	112	.098

Because the MCT2 language arts scale scores of the group that did not attend public school pre-K program were not normally distributed, the researcher removed two outliers from the group. Although the normality assumption was met after the removal of the two outliers, the homogeneity assumption was violated at the .05 alpha level. The researcher decided to use the original data set ($N = 114$), concluding that meeting the homogeneity of variance assumption was more critical for the analysis than meeting the normality assumption.

Linear association of the covariate and the dependent variable. Another critical assumption related to the analysis of covariance is that of the linear association of the dependent variable and the covariate(s). For research questions one and two, SES, gender, and age of participants were hypothesized as possible covariates. Based on Pearson's *r* correlation coefficient, gender is not linearly associated with MCT2 language arts or MCT2 math scale scores (see Table 6). Thus, the researcher did not use gender as a covariate for either research question one or two. However, the age of participants had a linear association with both MCT2 language arts and MCT2 math scale scores. Thus, age was used as an appropriate covariate for the analysis. Spearman's rho coefficient indicated a statistically significant coefficient for SES and each MCT2 language arts and MCT2 math scale scores. This established a linear relationship between SES and MCT2

language arts and math scale scores. This linear relationship allowed the researcher to use SES as a covariate.

The researcher did not use gender as a covariate for research question one or two. The covariate of age was used for research questions one and two. SES was also used as a covariate for research questions one and two.

Table 6

Correlation Coefficients

		MCT2 Language Arts	MCT2 Math	Gender	Age at MCT2	SES
MCT2 Language Arts	Pearson Correlation	1	.720[**]	.062	-.343[**]	.288[**]
	Sig. (2-tailed)		.000	.510	.000	.002
	N	114	114	114	114	114
MCT2 Math	Pearson Correlation	.720[**]	1	-.060	-.387[**]	.228[*]
	Sig. (2-tailed)	.000		.525	.000	.015
	N	114	114	114	114	114
Gender	Pearson Correlation	.062	-.060	1	.058	.062
	Sig. (2-tailed)	.510	.525		.537	.510
	N	114	114	114	114	114
Age at MCT2	Spearman's rho	-.346[**]	-.427[**]	.053	1.000	-.197[*]
	Sig. (2-tailed)	.000	.000	.577	.	.035
	N	114	114	114	114	114
SES	Spearman's rho	.315[**]	.286[**]	.072	-.197[*]	1.000
	Sig. (2-tailed)	.001	.002	.446	.035	
	N	114	114	114	114	114

Notes. ** Correlation is significant at the .01 level (2-tailed). * Correlation is significant at the .05 level (2-tailed).

Homogeneity of regression. Last, the researcher assessed the homogeneity of regression testing the hypothesis that the slope of the regression of each dependent

variable (MCT2 language arts scale score and MCT2 math scale score) on each covariate
(age and SES) is equal across groups. The results are displayed in Table 7.

Table 7

Homogeneity of Regression

Dependent Variable	Source	Type III SS	*df*	*MS*	*F*	Sig.
MCT2 Language Arts	Pre-K x Age	93.900	1	93.900	.111	.294
MCT2 Math	Pre-K x Age	118.479	1	118.479	.199	.276
MCT2 Language Arts	Pre-K x SES	471.390	1	471.390	.505	.021
MCT2 Math	Pre-K x SES	352.918	1	352.918	.258	.074

A statistically significant result indicates a rejection of the hypothesis, concluding
that the homogeneity of regression assumption is not met. The interaction of the pre-K
and the SES yielded a statistically significant result. Therefore, the hypothesis is rejected,
concluding that the homogeneity of regression assumption is not met for the SES
covariate. Due to this violation, SES was not used as a covariate of the MCT2 language
arts scores.

Assumptions for Report Card Number Grades for Math and Language Arts for Grades One, Two, and Three

For research question three, independent sample *t* tests will be used to investigate
if the differences of the first, second, and third grade language arts report card number
grades for students who attended a public school pre-K program and students who did not
attend a public school pre-K program were statistically significant. For research question

43

four, independent sample *t* tests will be used to investigate if the differences of the first, second, and third grade math report card number grades for students who attended a public school pre-K program and students who did not attend a public school pre-K program were statistically significant. When running *t* tests, the results indicate if the variances of the groups are homogeneous. This is an assumption that should be considered when interpreting the results, and the correct *t* test statistics should be used whether or not equality of variances is assumed (Howell, 2010).

In Table 8, the results of the Levene's test of homogeneity of variance are displayed. These tests for language arts first and second grade report card grades were significant at the .05 alpha level, allowing the researcher to conclude that the variances of the groups who attended a public school pre-K program and those who did not attend a public school pre-K program were not homogeneous. However, the first, second, and third grade math report card grades and the third grade language arts report grade groups were not significant at the .05 alpha level, allowing the researcher to conclude that the variances of the groups who attended a public school pre-k program and those who did not attend a public school pre-K program were homogeneous.

Table 8

Levene's Test of Homogeneity of Variances

	Levene's Statistic	df1	df2	Sig.
MA1stGrRC Based on Mean	2.41	1	112	.124
LA1stGrRC Based on Mean	28.30	1	112	.000
MA2ndGrRC Based on Mean	.007	1	112	.935
LA2ndGrRC Based on Mean	4.40	1	112	.038
MA3rdGrRC Based on Mean	2.27	1	112	.135
LA3rdGrRC Based on Mean	1.25	1	112	.266

Note: MA = math, LA = language arts, Gr = grade, RC = report card

Summary of Assumptions. The assumptions of normality, homogeneity of variance, linear association of the dependent variable and the covariate, and homogeneity of regression, which are related to ANCOVA, were assessed for MCT2 language arts and math scale scores. Normality was met for the MCT2 math scale scores for students who did and did not attend a public school pre-K program but not for the MCT2 language arts scale scores who did not attend a public school pre-K program. Two outliers were removed from the MCT2 language arts scale scores of the group that did not attend a public school pre-K program, and the normality assumption was then met. However, by removing the outliers, the homogeneity of variances was violated.

The researcher concluded that the homogeneity of variance assumption was more critical for the analysis than the normality assumption. Thus, the original data set was used to run all the tests for research questions one and two. The assumption of

homogeneity of variances was met for MCT2 language arts and math scale scores for both students who attended and those who did not attend a public school pre-K program.

Linear association of dependent variables and the covariates was investigated. For research questions one and two, SES, gender, and age of participants at the time of MCT2 were hypothesized as possible covariates. However, gender was found not to be linearly associated with MCT2 language arts or math scale scores. Age of participants and SES did have a linear association with MCT2 language arts and math scale scores. Homogeneity of regression is not met for the SES covariate, and it was not used as a covariate of the MCT2 language arts scale scores. Because the assumptions have been satisfied for the MCT2 language arts and math scale scores, ANCOVA can be used in answering the research questions one and two asked in this study.

For report card number grades for language arts and math for grades one, two, and three, the assumptions of homogeneity of variances were checked. Results of the Levene's test of homogeneity of variances were used to guide the researcher in selecting the appropriate t statistics value for the independent sample t tests used for research questions three and four. Only the first and second grade language arts report card number grades were not homogeneous.

Research Questions

There are four research questions guiding this study. Each question is answered below.

Research Question 1

1. Is there a statistically significant difference in the MCT2 scale scores for language arts for third-grade students who attended a public school pre-K program and students who did not attend a public school pre-K program?

In order to investigate if there was a statistically significant difference in the MCT2 scale scores for language arts for third-grade students who attended a public school pre-K program and students who did not attend a public school pre-K program, ANCOVA was used. Age at the time of the MCT2 was used as a covariate. As seen in Table 9, there was a statistically significant difference due to public school pre-K attendance on third grade MCT2 language arts scores. After adjusting for age, $F(1,111) = 8.36$, $MSE = 84.63$, $\eta^2 = .070$, $p = .005$.

Table 9

Tests of Between-Subjects Effects for Language Arts MCT2

Source	Type III SS	df	MS	F	p	Partial Eta Squared	Noncent. Parameter	Observed Power
Age at MCT2	969.090	1	969.09	11.45	.001	.094	11.451	.918
Pre-K	707.817	1	707.82	8.36	.005	.070	8.364	.818
Error	9393.844	111	84.63					
Corrected Total	11449.439	113						

R Squared = .180 (Adjusted R Squared = .165)
Computed using alpha = .05

Overall, the participants who attended a public school pre-K program (adjusted mean = 153.32, SE = 1.32, n = 49) had a higher third grade MCT2 language arts mean

score than the participants who did not attend a public school pre-K program (adjusted

mean = 148.20, *SE* = 1.15, *n* = 65). Results are displayed in Table 10.

Table 10

Third Grade MCT2 Language Arts Mean Scores

				95% Confidence Interval	
Pre-K	*N*	*M*	*SE*	Lower Bound	Upper Bound
DNA	65	148.202*	1.150	145.923	150.480
A	49	153.324*	1.328	150.694	155.955

Covariates appearing in the model are evaluated at the following values: Age at MCT2 = 9.3509

Research question one investigated if there was a statistically significant

difference in the MCT2 scale scores for language arts for third grade students who

attended a public school pre-K program and students who did not attend a public school

pre-K program. There was a statistically significant difference in MCT2 language arts

mean scale scores for students who attended a public school pre-K program. The students

who attended a public school pre-K program had a higher MCT2 language arts mean

scale score than students who did not attend a public school pre-K program.

Research Question 2

2. Is there a statistically significant difference in the MCT2 scale scores for

   math for third grade students who attended a public school pre-K program

   and students who did not attend a public school pre-K program?

In order to investigate if there was a statistically significant difference in the

MCT2 scale scores for math scores for third-grade students who attended a public school

pre-K program and students who did not attend a public school pre-K program, ANCOVA was used. As shown in Table 11, there was no statistically significant difference in MCT2 math scores for students who attended public school pre-K. After adjusting for age and SES, $F(1,110) = 3.91$, $MSE= 98.55$, $p = .051$.

Table 11

Tests of Between-Subjects Effects for Math MCT2

Source	Type III SS	df	MS	F	p	Partial Eta Squared	Noncent. Parameter	Observed Power
Age at MCT2	1429.00	1	1429.00	14.50	.000	.116	14.501	.965
SES	149.78	1	149.78	1.52	.220	.014	1.520	.231
Pre-K	384.82	1	384.82	3.91	.051	.034	3.905	.500
Error	10840.27	110	98.55					
Corrected Total	13606.07	113						

a. R Squared = .203 (Adjusted R Squared = .185)
b. Computed using alpha = .05

Overall, the participants who attended a public school pre-K program (adjusted mean = 154.69, $SE = 1.47$, $n = 49$) had a comparable third grade MCT2 math mean score with the participants who did not attend a public school pre-K program (adjusted mean = 150.75, $SE = 1.27$, $n = 65$). Results are displayed in Table 12.

Table 12

Third Grade MCT2 Math Mean Scores

Pre-K	*N*	*M*	*SE*	95% Confidence Interval	
				Lower Bound	Upper Bound
DNA	65	150.745*	1.265	148.239	153.251
A	49	154.686*	1.469	151.775	157.596

Covariates appearing in the model are evaluated at the following values: Age at MCT2 = 9.3509, SES = 1.37

Research question two investigated if there was a statistically significant difference in the MCT2 scale scores for math for third grade students who attended a public school pre-K program and students who did not attend a public school pre-K program. There was no statistically significant difference on MCT2 math scale scores. Overall, the MCT2 math mean scores of the students who attended a public school pre-K program and the MCT2 math mean scores of students who did not attend a public school pre-K program were comparable.

Research Question 3

3. Is there a statistically significant difference in the report card number grades for language arts for Grades 1, 2, and 3 for third grade students who attended a public school pre-K program and students who did not attend a public school pre-K program?

Table 13 displays the descriptive statistics for the mean of the report card number grades for language arts by grade level and the total mean for those who attended and those who did not attend a public school pre-K program. Overall, students who attended

public school pre-K programs had higher mean language arts report card number grade scores for each grade level.

Table 13

Descriptive Statistics for Mean of Report Card Number Grades for Language Arts by Grade Level

Grade Level	Pre-K	*N*	*M*	*SD*
1st	DNA	65	88.80	8.94
	A	49	93.20	4.15
	Total	114	90.68	7.57
2nd	DNA	65	86.23	8.75
	A	49	90.41	5.95
	Total	114	88.03	7.92
3rd	DNA	65	85.71	7.99
	A	49	89.18	6.48
	Total	114	87.20	7.55

To determine whether the differences of the first, second, and third grade language arts report card number grades for students who attended a public school pre-K program and students who did not attend a public school pre-K program were statistically significant, three separate *t* tests were run. Results of the first *t* test indicated a statistically significant mean difference between the first grade language arts report card number grades of the students who did not attend a public school pre-K program compared to the students who attended a public school pre-K program, $t(95.43) = -3.49$,

51

p = .001. Also, results of the second *t* test indicated a statistically significant difference between the second grade language arts report card number grades of the students who did not attend a public school pre-K program compared to the students who did attend a public school pre-K program, *t*(110.94) = -3.03, *p* = .003. Last, results of the third *t* test indicated a statistically significant difference between the third grade language arts report card number grades of the students who did not attend a public school pre-K program compared to the students who did attend a public school pre-K program, *t*(112) = -2.49, *p* = .014. Table 14 displays the results of each *t* test.

Table 14

Results of t tests for Language Arts Report Card Number Grades for Grades 1, 2, and 3

	Levene's Test for Equality of Variances		t-test for Equality of Means					95% CI of Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	SED	Lower	Upper
LA1stGrRC	28.30	.000*	-3.49	95.43	.001	-4.384	1.26	-6.88	-1.65
LA2ndGrRC	4.40	.038*	-3.03	110.94	.003	-4.18	1.38	-6.91	-1.45
LA3rdGrRC	1.25	.266	-2.49	112	.014	-3.48	1.40	-6.24	-.71

Note. * Equal variances not assumed

Research question three investigated if there was a statistically significant difference in the report card number grades for language arts for Grades 1, 2, and 3 for students who attended a public school pre-K program and students who did not attend a public school pre-K program. Students who attended a public school pre-K program had higher language arts report card grades compared with students who did not attend a public school pre-K program.

52

Research Question 4

4. Is there a statistically significant difference in the report card number grades for math in Grades 1, 2, and 3 for students who attended a public school pre-K program and students who did not attend a public school pre-K program?

Table 15 displays the descriptive statistics for the mean of the report card number grades for math by grade level and the total mean for those who attended and those who did not attend a public school pre-K program. Overall, students who attended a public school pre-K program had higher mean math report card number grade scores for each grade level.

Table 15

Descriptive Statistics for Mean of Report Card Number Grades for Math by Grade Level

Grade Level	Pre-K	N	M	SD
1st	DNA	65	87.63	7.80
	A	49	90.24	6.78
	Total	114	88.75	7.47
2nd	DNA	65	85.58	8.26
	A	49	89.35	7.92
	Total	114	87.20	8.29
3rd	DNA	65	85.97	7.88
	A	49	89.35	6.42
	Total	114	87.42	7.45

To investigate if the differences of the first, second, and third grade math report card number grades for students who attended a public school pre-K program and students who did not attend a public school pre-K program were statistically significant, three separate *t* tests were run. Results of the first *t* test indicated a non-statistically significant difference between the first-grade math report card number grades of the students who did not attend a public school pre-K program compared to the students who did attend a public school pre-K program, $t(112) = -1.87$, $p = .064$. Results of the second *t* test for the second grade indicated a statistically significant mean difference between the math report card number grades of the students who did not attend a public school pre-K program compared to the students who did attend a public school pre-K program, $t(112) = -2.45$, $p = .016$. Last, results of the third *t* test for the third grade indicated a statistically significant mean difference between the math report card number grades of the students who did not attend a public school pre-K program compared to the students who did attend a public school pre-K program, $t(112) = -2.44$, $p = .016$. Table 16 displays the results of each *t* test.

Table 16

Results of t tests for Math Report Card Number Grades for Grades 1, 2, and 3

	Levene's Test for Equality of Variances		t-test for Equality of Means					95% CI of Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	SED	Lower	Upper
MA1stGrRC	2.41	.124*	-1.87	112	.064	-2.61	1.40	-5.38	.15
MA2ndGrRC	.007	.935*	-2.45	112	.016	-3.76	1.54	-6.80	-.72
MA3rdGrRC	2.27	.135*	-2.44	112	.016	-3.38	1.38	-6.11	-.64

Note. * Equal variances assumed

Research question four investigated if there was a statistically significant difference in the report card number grades for math in Grades 1, 2, and 3 for students who attended a public school pre-K program and students who did not attend a public school pre-K program. Students who attended a public school pre-K program had higher mean math report card number grades compared to students who did not attend a public school pre-K program, although not at the statistical level for grade one.

Summary of Results

Research question one investigated if there was a statistically significant difference in the MCT2 scale scores for language arts for third grade students who attended a public school pre-K program and students who did not attend a public school pre-K program. There is a statistically significant difference in the MCT2 language arts mean scale scores. The students attending the public school pre-K program had a higher MCT2 language arts mean scale score than students who did not attend a public school pre-K program.

Research question two investigated if there was a statistically significant difference in the MCT2 scale scores for math for third grade students who attended a public school pre-K program and students who did not attend a public school pre-K program. There was no statistically significant difference. Overall, the MCT2 math mean scores for the students who attended a public school pre-K program and the MCT2 math mean score for the participants who did not attend a public school pre-K program were comparable. The math scores were lower than language arts scores.

Research question three investigated if there was a statistically significant difference in the report card number grades for language arts for Grades 1, 2, and 3 for

students who attended a public school pre-K program and students who did not attend a public school pre-K program. Students who attended a public school pre-K program had statistically significant higher language arts report card grades compared with students who did not attend a public school pre-K program.

Research question four investigated if there was a statistically significant difference in the report card number grades for math in grades one, two, and three for students who attended a public school pre-K program and students who did not attend a public school pre-K program. There was a non-statistically significant difference between the first grade math report card number grades of the students who did not attend a public school pre-K program and students who did not attend a public school pre-K program. Students who attended a public school pre-K program had higher mean math report card number grades compared to students who did not attend a public school pre-K program, although not at the statistical level for grade one.

Findings and Discussion

This research was a causal-comparative study with a repeated measures approach and a between-within design to examine if attending a public school pre-K program had an impact on academic achievement including language arts and math report card grades for grades one, two, and three and for scale scores achieved on the third-grade language arts and math portions of the MCT2. There were four research questions to be answered.

The results of this study may be compared to previous studies on the long-term effects of attending a public school pre-K program. The studies on the long-term effects of attending a public school pre-K program are limited. However, studies targeting long-

term effects of pre-K attendance in private day cares and Head Start programs provide some data and insight as to the results of attending or not attending a pre-K program.

A study reported by Zehr (2010) was conducted by the U.S. Department of Health and Human Services on children who entered a Head Start program at the ages of 3 and 4. The children were tracked until the completion of first grade. When the four-year-olds who began at Head Start had completed the first grade, it was found that they were ahead only in the area of vocabulary of the children who had not attended Head Start. Most of the learning attained by students who attended Head Start had faded by the time they finished the first grade. This is in contrast to the results of the current study. Although the students in the current study attended a public school pre-K, the effects of attending this type of program have been proven to be longer lasting than the results of attending the Head Start program in the study reported by Zehr (2010).

A study was conducted by Hull (2011) on the effects of students who attended a full-time pre-K program and a half-day kindergarten program and students who attended no pre-K program and a full-day kindergarten program. This study examined reading skills achievement for this population. The results of this study revealed that the students who attended a full-time pre-K program and a half-day kindergarten program had higher reading skills by the third grade than those who attended only a full-time kindergarten program. When compared with the current study, it is observed that students who attended full-time public school pre-K made higher gains in the area of language arts on their report card number grades in the area of language arts and on MCT2 mean scale scores in the area of language arts.

Lipsey et al. (2012) conducted a study using the Tennessee Voluntary Pre-Kindergarten program (TN-VPK). This program was set in the Tennessee public schools, and it was conducted in conjunction with the Tennessee State Department of Education Division of School Readiness and Early Learning. This study examined the effects of the TN-VPK and the progress of the students who attended this program. For the first cohort, it was found that the students who attended the TN-VPK significantly outperformed those who did not attend the program at the end of the school year on all assessments. According to teacher ratings of readiness skills in kindergarten, the students who attended the TN-VPK outperformed those students who did not attend. The positive gains in all areas of readiness skills could be seen for the students who attended the TN-VPK. The current research includes more longitudinal data and also indicates that those students who attended a public school pre-K program outperformed those students who did not attend a public school pre-K program on MCT2 mean scale scores for language arts and math at the end of third grade and on language arts report card number grades in grades one, two, and three.

In the area of math, Jung et al. (2013) studied participants from a public school half-day pre-K program in which number relationships were taught to one group of students (intervention group) but not to another group (control group). The teachers utilized a combination of both computer-based software and hands-on activities to teach number relationships to the intervention group. The results revealed that those students in the intervention group who were taught number relationships scored significantly higher on a posttest at the end of the 12-week treatment period than those students in the control group who did not receive instruction in number relationships. Although this study is not

longitudinal in scope as is the current study, it supports the importance of teaching number relationships in pre-K programs. The gains made in number relationships by the intervention group could be seen very quickly.

Takanishi and Kauerz (2008) reported that although children who had attended pre-K programs gained knowledge, their knowledge could fade away in higher grades for numerous reasons. Some of these reasons could be if their kindergarten through third grade programs were not of high quality and if their elementary schools lacked low teacher/student ratios and high-quality experienced teachers.

This research study used quantitative data with a repeated measures approach with a between-within design to examine if attending a public school pre-K program had an impact on academic achievement including language arts and math report card grades for grades one, two, and three and for scale scores achieved on the third-grade language arts and math portions of the MCT2. There was a statistically significant difference in MCT2 language arts mean scale scores for students who attended a public school pre-K program. These students had a statistically significantly higher MCT2 language arts mean scale score than students who did not attend a public school pre-K program.

There was no statistically significant difference on MCT2 math scale scores. Overall, the MCT2 math mean scores for the students who attended a public school pre-K program were comparable to the MCT2 math mean score for the participants who did not attend a public school pre-K program.

The study further investigated the data on report card number grades for math and language arts in Grades 1, 2, and 3. The research revealed that for students who attended a public school pre-K program, the mean was higher for language arts report card number

grades at all three grade levels as compared with the mean for students who did not attend a public school pre-k program. The research also revealed that for the area of math, students who attended a public school pre-K program had higher mean scale scores for math report card number grades for all three grades when compared to the mean for math report card number grades for students who did not attend a public school pre-K program. There was not a statistically significant difference for math in grade one.

This study investigated the effects of attendance on academic achievement at a public school pre-K program, as measured by MCT2 scale scores for math and language arts and report card number grades for math and language arts for Grades 1, 2, and 3. Overall, the results of the study revealed that attending a public school pre-K program does have an effect on academic achievement, as measured through third grade. The results of students attending a public school pre-K program indicate higher academic achievement, though limited to the end of third grade by this study, compared to students who did not attend a public school pre-K program.

Summary

In order to examine whether attending a public school pre-K program has an impact on academic achievement including language arts and math report card grades for Grades 1, 2, and 3 and for scale scores achieved on the third grade language arts and math portions of the MCT2, a causal-comparative study with a repeated measures approach and a between-within design was used. The four research questions were investigated and answered.

The answer to research question one indicated a statistically significant difference in MCT2 language arts mean scale scores for students who attended a public school pre-

K program. The answer to research question two indicated that there was no statistically significant difference in the MCT2 mean scale scores in math for students in third grade who attended a public school pre-K program.

The answer to research question three revealed that the students who attended a public school pre-K program had higher mean language arts report card grades when compared to students who did not attend a public school pre-K program. The answer to research question four indicated that students who attended a public school pre-K program had higher mean report card grades when compared to those students who did not attend a public school pre-K program.

Overall, the results of the study indicate that students who attended a public school pre-K program achieved higher mean scale scores on the MCT2 language arts and higher report card number grades in language arts and math than those students who did not attend a public school pre-K program. The results of this study imply that public schools should consider funding and housing pre-K programs within their elementary schools so that the students attending these programs may receive early academic instruction, which will enhance further academic achievement.

CHAPTER V

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

Summary

This chapter is a summary of the results of the study. The summary begins with the introduction to the study, contains a summary of the literature review and the research methods, and concludes with the findings of the research.

Early childhood education has consistently been at the forefront of the educational forum in states and school districts. Students are now educated at an earlier age through a variety of methods and in a variety of environments. Many young children may attend church day-care programs, private day-care facilities, Head Start programs, or pre-K programs located in public schools.

Many states have implemented pre-K programs in public school districts, and many are in various stages of implementing these programs in public school districts. These public school districts are accountable for student achievement, generally measured with state test scores. The state test for Mississippi is the MCT2. School districts receive a rating based on the scale scores that students achieve in the areas of language arts and math. Another way student achievement accountability may be measured is through report card number grades in the areas of math and language arts. Report card grades inform parents of how students are progressing on skills in math and language arts in specific grade levels.

The MCT2 scale scores and report card number grades for language arts and math for students who attended and students who did not attend a public school pre-K program were analyzed. This study provides accountability results regarding the effectiveness of a public school pre-K program that was implemented in the RSD. School districts, including RSD, are accountable for all programs that are funded and implemented by their districts. Results of this study are valuable in assisting school district administrators in planning for additional programs and curricula to better educate four-year-old pre-K students. In addition, the results may serve to assist school district administrators in determining whether to fund pre-K programs. Parents will also have more information to determine whether to enroll their children in public school pre-K programs.

The history of early childhood education is familiar to many educators. Providing young children with instruction in structured settings has changed in its role through the years based on changes in the social, political, and economic contexts of the educational system (Kagan & Reid, 2008). The phrase "early childhood education" has come to represent a variety of settings for pre-K instruction. Some of these environments include Head Start centers, church day cares, private school pre-K programs, and privately run day-care facilities. Many of these programs charge a fee for attendance.

Whether pre-K programs should be mandatory or voluntary is also debated. Many parents believe that pre-K programs should be located within public school buildings (Bushaw & McNee, 2009). The goals of any pre-K program should always be quality instruction and care for children, and the program should prepare the children for kindergarten. Some studies have shown that pre-K attendance has a temporary effect on

student achievement and serves to ease the transition into the early elementary grades (Entwisle, 1995).

A study by the U.S. Department of Health and Human Services and reported by Zehr (2010) was conducted on three- and four-year-olds who attended Head Start. Children who entered Head Start as four-year-olds showed more progress in vocabulary, letter-word recognition, spelling, color identification, and letter naming as compared with four-year-olds who did not attend Head Start. However, these results did not last over a long period. These students in Head Start were ahead of children not in Head Start only until the end of the first grade. Also, many of the gains made by attending a pre-K program could fade away if kindergarten and first, second, and third grades are not of high quality (Takanishi & Kauerz, 2008).

The studies measuring the later academic success of students who attended and did not attend a public school pre-k program are limited. This study provides more information regarding the effectiveness of public school pre-K attendance on later academic achievement.

This study was a causal-comparative study using repeated measures approach with a between-within design. The dependent variables in this study included MCT2 mean scale scores for language arts and math and the mean report card number grades for students in Grades 1, 2, and 3 for language arts and math. The independent variable for this study was attendance in a public school pre-K program. The two aspects of the independent variable were attendance and non-attendance.

The two groups of attendance and non-attendance were from the 2005–2006 and 2006–2007 school years. Longitudinal data were collected as the two groups attended

first, second, and third grades. The student records of 49 de-identified students who attended a public school pre-K program were matched with 65 de-identified student records of students who did not attend a public school pre-K program. The MCT2 mean scale scores for language arts and math and mean report card number grades for language arts and math for Grades 1, 2, and 3 were used as the instrumentation. Permission to gain access to de-identified records was obtained from the superintendent of the school district. Identification numbers were assigned to the students by the principal of the school. There were originally 117 students in the sample for this study; however, three students were removed.

The data from this study were analyzed using a t-test for differences in means. ANCOVA was also used in data analysis. The assumptions of normality, homogeneity of variance, linear association of the covariate and the dependent variable, and homogeneity of regression lines were checked.

All assumptions were met for the use of ANCOVA for the first two research questions. There was a statistically significant difference in the MCT2 scale scores for language arts for third-grade students who attended a public school pre-K program and for students who did not attend a public school pre-K program. There was no statistically significant difference in the MCT2 scale scores for math for third-grade students who attended a public school pre-K program and students who did not attend a public school pre-K program.

For the last two research questions, the *t*-test was used. Overall, students who attended a public school pre-K program had higher mean language arts and math report

65

card number grade scores for each grade level than students who did not attend a public school pre-K program.

Implications

The MCT2 language arts mean scale scores for students who attended a public school pre-K program were statistically significant in the area of language arts. The overall mean report card grades for grade levels one, two, and three in the areas of language arts and math were also statistically significant. Based on these findings, it can be implied that public school pre-K attendance is effective for these areas.

The MCT2 math mean scale scores for those students who attended a public school pre-K program and those who did not attend a public school pre-K program were low compared with the language arts scale scores. This finding may imply that there was not a focus on math in the public school pre-K program. In addition, it may be that the subject of math may not be taught as it is tested. A further implication may be that some math teachers may not be effective in teaching in this area. The implication is both sets of students did not do as well in math as they did in language arts and the reason cannot be determined.

In addition, these results could aid parents in making the decision to place their four-year-old children in the public school pre-K programs for educational purposes. The children enrolled in these programs would receive instruction with certified teachers on a standardized curriculum and therefore would be exposed earlier to the structured public school environment. This instruction and exposure would give the students an earlier start to learning opportunities.

Recommendations

Given the implications of the findings that students who attended a public school pre-K program had higher MCT2 language arts mean scale scores and overall higher mean report card grades for grade levels one, two, and three in the areas of language arts and math, it is recommended that public school pre-K programs continue to be funded and implemented for four-year-old students in this school district. The area of language arts should continue to be taught using differentiated instruction for pre-K students. It is also recommended that public school pre-K programs be funded and implemented in school districts across the state of Mississippi, as well as nationwide.

The results of this study found that MCT2 math scale scores for students who attended a public school pre-K program were comparable to the scores of those who did not attend a public school pre-K program. For math report card number grades, it was found that students who attended a public school pre-K program had higher mean math report card number grades compared to students who did not attend a public school pre-K program, although not at the statistical level for grade one. Therefore, the curriculum for the pre-K classroom should include an equal amount of emphasis on the instruction of math as it does for language arts for pre-K students. The certified teacher in the classroom should be able to differentiate math instruction for the pre-K students.

Other school districts should review the results of this study and make a determination to fund and implement public school pre-k programs for four-year-old students in their districts. Other public school districts should include an emphasis in language arts and math in the curriculum for these students.

The districts funding and implementing the public school pre-K programs for four-year-old students should consider keeping data on the academic achievement of students who attended the public school pre-K program and those who did not attend the public school pre-K program. The academic achievement data should include report card number grades for language arts and math for grades one through eight for both groups of students. In addition, MCT2 overall mean scale scores for language arts and math from grades third through eighth should be tracked for both groups of students. This would allow educators to determine the effects of attending a public school pre-K program.

Additional research should be conducted to determine the long-term effects of attending a public school pre-K program. These studies should target students who attended a public school pre-K program and those students who did not attend a public school pre-K program. The academic achievement of these students including MCT2 mean scale scores in the areas of language arts and math, as well as report card number grades at grade levels one through eight for the areas of language arts and math, should be analyzed for these students. A longitudinal study analyzing MCT2 mean scale scores for language arts and math for grade levels third through eighth for students who attended and those who did not attend a public school pre-K program would reveal academic achievement results. The data should be kept on a computer so that the information is more accessible for analysis.

The longitudinal study would also analyze report card number grades in the areas of language arts and math for Grades 1 through 8 for students who attended a public school pre-K program and those who did not attend a public school pre-K program. This analysis would reveal academic achievement for both groups of students. The results of a

longitudinal study would provide researchers with valuable information regarding long-term academic achievement of students who attended and students who did not attend a public school pre-K program and would also provide valuable information for educators and parents regarding the effectiveness of attending a public school pre-K program.

In conclusion, further research should be conducted to determine the reason that math scores are lower than language arts scores. A possible reason may include that teachers do not like to teach math because they do not know how to teach math to pre-K students. Professional development may be implemented for teachers to assist them in skills to instruct pre-K students in the area of math. Teachers with a strength in teaching math may be assigned to teach pre-K.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL

Study 12-026: Effect of Public School Pre-Kindergarten Attendance

☆   Thu, Mar 15, 2012 at 7:48 AM

cwilliams@research.msstate.edu
        <cwilliams@research.msstate.edu>
        To: skn27@msstate.edu
        Cc: cwilliams@research.msstate.edu
        Reply | Reply to all | Forward | Print | Delete | Show original
        March 15, 2012

Susan Johnson
Curriculum & Instruction
Mailstop 9698

RE: IRB Study #12-026: Effect of Public School Pre-Kindergarten Attendance

Dear Ms. Johnson:

This email serves as official documentation that the above referenced project was reviewed and
approved via administrative review on 3/15/2012 in accordance with 45 CFR 46.101(b)(4).
Continuing review is not necessary for this project. However, any modification to the project
must be reviewed and approved by the IRB prior to implementation. Any failure to adhere to the
approved protocol could result in suspension or termination of your project. The IRB reserves the
right, at anytime during the project period, to observe you and the additional researchers on this
project.

**Please note that the MSU IRB is in the process of seeking accreditation for our human
subjects protection program. As a result of these efforts, you will likely notice many
changes in the IRB's policies and procedures in the coming months. These changes will be
posted online at http://www.orc.msstate.edu/human/aahrpp.php.**

Please refer to your IRB number (#12-026) when contacting our office regarding this application.

Thank you for your cooperation and good luck to you in conducting this research project. If you
have questions or concerns, please contact me at cwilliams@research.msstate.edu or call 662-
325-5220. In addition, we would greatly appreciate your feedback on the IRB approval process.
Please take a few minutes to complete our survey at
http://www.surveymonkey.com/s/YZC7QQD.

Sincerely,

Christine Williams, CIP
IRB Compliance Administrator

cc: Dwight Hare (Advisor)