The Influence of Montessori-Based Literacy Instruction and Methods on Reading Achievement of Students in Grades 3, 4, 5, 6, and 7

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THE INFLUENCE OF MONTESSORI-BASED LITERACY INSTRUCTION AND METHODS ON
READING ACHIEVEMENT OF STUDENTS IN
GRADES 3, 4, 5, 6, AND 7

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Submitted in partial fulfillment of the requirements
for the degree of Doctor of Education

Seton Hall University

2013
INFLUENCE OF MONTESSORI LITERACY PROGRAMS ON READING ACHIEVEMENT

The Influence of Montessori-Based Literacy Instruction and Methods on Reading Achievement of Students in Grades 3, 4, 5, 6, and 7

Abstract

This study examines the influence of Montessori-based literacy curriculum and instruction on student achievement in Grades 3, 4, 5, 6, and 7. I studied 71 matched pairs of urban charter school students (n=142) to determine if there was a statistically significant difference in reading achievement, as measured by the Maryland School Assessment (MSA), between students who were instructed by their teachers in Montessori literacy methods and curriculum and students from a nearby charter school who were instructed by their teachers using a basal reading method. T-tests were used to compare the mean scores of the combined grade levels from each cohort on the 2011-2012 Maryland School Assessment (Reading section). The results of this study suggest that there was no significant difference in reading achievement between the two groups of students. There is very limited empirical research available examining reading achievement in Montessori public charter schools. Further research is recommended with similar groups of students from public Montessori school settings, or in this same setting with a different comparison group or a different evaluation tool.
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Dedication

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Table of Contents

Abstract........................................................................................................ii
Acknowledgments.......................................................................................iii
Dedication.....................................................................................................v
Table of Contents........................................................................................vii
List of Tables...........................................................................................ix

Chapters

I. Introduction
   Context.............................................................................................1
   Problem Statement........................................................................8
   Overarching Research Question......................................................9
   Purpose of the Study......................................................................9
   Hypothesis....................................................................................9
   Limitations of the Study..............................................................10
   Significance of the Study............................................................14
   Variables....................................................................................15
   Definition of Terms.....................................................................16
   Summary.....................................................................................19

II. Review of Related Literature
   Introduction....................................................................................20
   Purpose and Procedures of the Review..........................................20
   Inclusion and Exclusion Criteria for the Review...........................21
   Practical Significance................................................................21
   Overview of the Reviews of the Existing Literature......................22
   Literacy in Baltimore City.............................................................25
   Focus of the Review....................................................................27
   Theoretical/Historical Framework of Reading in America............27
   The Science of Reading.................................................................34
   Montessori-Based Literacy Curriculum and Instruction...............38
   Reading and Poverty....................................................................47
   Summary.....................................................................................62

III. Methodology
INFLUENCE OF MONTESSORI LITERACY PROGRAMS ON READING ACHIEVEMENT

Design.......................................................................................................... 64
Setting........................................................................................................... 65
Description of the Two Literacy Programs................................................. 69
Sample........................................................................................................... 72
Procedures..................................................................................................... 84
Instrumentation............................................................................................. 85
Threats to Internal and External Validity................................................... 93
Data Collection Methods............................................................................. 96
Data Analysis.................................................................................................. 98
Summary....................................................................................................... 101

IV. Analysis of Data
Introduction.................................................................................................. 103
Group 1 Analysis.......................................................................................... 105
Group 2 Analysis.......................................................................................... 106
Summary........................................................................................................ 107

V. Conclusions and Recommendations
Introduction.................................................................................................. 109
Summary........................................................................................................ 110
Summary of Research Question and Hypothesis....................................... 111
Conclusions................................................................................................... 113
Recommendations for Policy ....................................................................... 116
Recommendations for Practice ..................................................................... 118
Suggestions for Future Research................................................................. 120
Closing Remarks............................................................................................ 122

References.................................................................................................... 123

Appendices
Appendix A. Letter of Approval from IRB Board Seton Hall University................................................................. 140
Appendix B. Letter of Approval from IRB Board Baltimore City Public Schools, Department of Achievement and Accountability................................................................. 141
Appendix C. Memorandum of Understanding............................................. 142
Appendix D. Certificate of Completion for the NIH Web-Based Training Course “Protecting Human Research Participants” ................................................................. 148
Appendix E. Approval for Successful Defense.............................................. 149
List of Tables

Table 1. Participants/Matched Pairs...........................................................75
Table 2. Analysis of Matched Pairs for Prior Year’s Reading
Achievement in 2010-2011.................................................................83
Table 3. Research Matrix......................................................................100
Table 4. Analysis 1, Grades 4-7...............................................................106
Table 5. Analysis 2, Grades 3-7...............................................................107
Chapter I

Introduction

Context

Elementary school reading research over the last four decades has emphasized the importance of students mastering the basic reading skills of phonemic awareness, systematic decoding, fluency, and comprehension, by the end of third grade (J. Torgeson, 1998). The results of the Annie E. Casey Foundation study examining high school graduation rates for 4,000 children across the country, reported that students who did not reach the Proficient reading level by the end of Grade 3, were four times more likely to not graduate from high school (Hernandez, 2011). The report stated that when children did not reach the Proficient reading level and were also from low socioeconomic status (SES) families (as measured by free-lunch eligibility), they dropped out of high school at a significantly higher rate (22% compared to 6%) than those students with poor reading scores who were from higher SES backgrounds. Therefore, children with low reading scores at the end of the third grade who also live in poverty are considered to be in “double jeopardy” of not graduating from high school (Hernandez, 2011).

Teachers in different school systems use different methods to teach elementary school children how to read. Even within a given public school district, there may be different curricular options and methods for teaching reading from school to school or from classroom to classroom. There are many varieties of reading instruction available to students within school systems, particularly as a result of the explosion of charter schools, in which each school operates as an independent school district, allowing for more differences in curriculum (Hoxby, 2003). It is quite possible, that within a one-mile
radius, there could be many different methods being used to teach reading, even though there is empirical research on best practices in the teaching of reading, which demonstrates that some methods may be more effective than others.

**Reading Instruction**

During the last several hundred years, some educators have advocated for multisensory approaches to literacy, suggesting that students need to use more than just “eyes and ears” to learn reading-related concepts. Some educators, as far back as the 18th century, recommended that the child handle objects (“object lessons”) to increase meaning and comprehension (Pestalozzi, 1781). Children would learn to read the word *cup* after handling a cup and discussing its properties and then would learn to read and write the word. Pestalozzi was one of the first educators to advocate using a tactile, multisensory approach in order to enhance the linguistic meaning of a concept. Other multisensory reading approach advocates, like Dr. Samuel T. Orton and Anna Gillingham, recommended the tracing of letter forms while sounds are being simultaneously spoken, which adds tactile and kinesthetic memory channels into the learning of the letter sounds and forms (Orton, 1935). Maria Montessori suggested that children handle sandpaper and three-dimensional wooden letters while making letter sounds and that children would first write and then read word forms, for added tactile/kinesthetic memory of the words (Friend, 1907).

Understanding the philosophies and theories of literacy involves an overarching understanding of general educational philosophies in regard to the role of the child, the role of the teacher, and the role of culturally relevant beliefs during specific time periods in history (Tanner & Tanner, 2007). In the 1600s, Jan Amos Comenius, in
Czechoslovakia, developed the first children’s picture book called *Orbis Pictus (The World of Pictures)* in 1658. He felt strongly that children needed to learn at their own pace and that they learned by using their senses in active play (Scrivner, 1969).

In France, at about the same time period, in 1655, Blaise Pascal, a philosopher, mathematician, and physicist, was one of the first individuals to focus on the decoding process and introduced the use of a phonetic system into the teaching of reading. He advocated for children to segment words into component syllables and letter sounds for synthetic blending, one syllable or sound at a time (Rodgers, 2004). Pascal was given the credit for suggesting that students should first blend isolated sounds to figure out unknown words (Rodgers, 2004).

Jean-Jacques Rousseau created learning environments in France during the 1700s that promoted the idea that children’s natural, innate “goodness” would help them to flourish in learning environments and emphasized a child-centered curriculum. Rousseau believed that children would choose to learn to read when they felt ready to do so (Dent, 2005).

In the middle of the twentieth century, Jean Piaget, a Swiss psychologist working in France, initially studied his own three children and introduced the idea that young children first learned concepts in a concrete fashion and eventually used more formal operations for higher-level, abstract, conceptual thinking. His views on reading were child-centered, encouraging students to discover conceptual knowledge themselves, through spontaneous interaction with their environment, rather than being presented with “ready-made” materials. Piaget felt that children needed to be encouraged to act out stories and use “hands-on” materials to learn literacy concepts during the “concrete
operations” period between the ages of seven to eleven. He thought that children would benefit from reading books with a limited number of characters to enhance their comprehension, (LeFrancois, 2006).

Montessori Literacy

Maria Montessori developed a system of teaching children, at the turn of the twentieth century, which included many steps and phases beyond the aforementioned use of multisensory strategies. Her ideas focused on providing students with prepared literacy lessons, in which the child would be able to move at his or her own pace. Both public and private Montessori schools are using reading systems that incorporate many of the systematic and multisensory methods and strategies first introduced by Montessori in the early 1900s. Dr. Montessori developed her ideas working with poor children in Rome and Italy, many of whom were homeless and disabled (Montessori, 1964).

Montessori was among a group of educators who examined the reading process in an in-depth manner, focusing on the “how’s” of sound processing and decoding before teaching comprehension, as well as allowing the child to be an active participant in the literacy-learning process in order to enhance their motivation and interest in the reading process. Maria Montessori’s materials are self-correcting and encourage the child to work independently, using structured and hierarchical teacher-prepared “learning trays” (Montessori, 1964). With more opportunities for experimentation in charter schools, general educational philosophies like those of Montessori are rising to the forefront of literacy discussions (North American Montessori Teachers Association, 2011).
Neurological Perspectives on Reading

Over the past decade, a significant number of research studies have examined the reading process from a neurological perspective (Dehaene, 2009). According to Stanislas Dehaene, a French researcher, “the brain’s black box is cracked open and a true science of reading is coming into being” (2009, p. 1). Brain imaging reveals, through functional Magnetic Resonance Imaging (fMRI) studies, how the blood flows in the brain for normal and abnormal readers while they are engaged in the process of reading (Shaywitz, Lyon, & Shaywitz, 2006). The neuroscience of reading suggests that the human cortex did not specifically evolve for writing, but writing evolved to fit the cortex (Dehaene, Duhamel, Hauser, & Rizzolatti, 2004). As humans have developed alphabet systems, the human cortex has adapted over thousands of years to relay information from the visual region of the brain to the language regions of the brain (sound processing and processing of word meanings), suggesting that reading is not a “natural” process, unlike the acquisition of spoken language (Lyon & Chhabra, 2004). All humans who are not profoundly deaf or severely physically or cognitively impaired learn to listen and speak; not all humans, however, learn to read.

Reading in the Baltimore City Public Schools

Many of the children in the Baltimore City Public Schools represent the kind of “double jeopardy” students described by the Annie E. Casey Foundation in their report, Double Jeopardy: How Third Grade Reading Skills and Poverty Influence Graduation (Hernandez, 2011). Coleman (1966) discussed nearly 40 years ago that socioeconomic status (SES) is highly predictive in determining student achievement (Coleman, 1966). The poverty rate in Baltimore City from the 2010 census indicates that 22.4% of the
INFLUENCE OF MONTESSORI LITERACY PROGRAMS ON READING ACHIEVEMENT

The population is living below the poverty level as compared to the 8.2% of individuals living below the poverty level in Baltimore County, the largest suburban area surrounding Baltimore City (U. S. Census Bureau, 2010). A review of recent 2011-2012 Maryland School Assessment (MSA) test scores indicates that 67.3% of the children living in Baltimore City are performing in the Proficient, or better range, while 86.4% of the children in neighboring Baltimore County, 92.6% of the children in bordering Howard County, and 89.2% of the children in nearby Anne Arundel County are reading at the Proficient range or above (Maryland State Department of Education, 2012). Clearly, the percentage of students operating at the Proficient level and above in the Baltimore City Public Schools on the Maryland School Assessment (MSA) in the 2011-2012 school year is far below the percentages of students operating at that level in the surrounding suburban areas (Maryland State Department of Education, 2012).

It is a pervasive and troubling fact that student achievement in reading is generally lower when comparing the achievement of low SES students to high SES students in urban areas across the country (Bracey, 2000). The Baltimore City Public Schools use a variety of reading programs because each principal at each school is able to choose from a long list of options. Many of the schools use the Open Court Reading System (Imagine It!) published by the McGraw-Hill Company with elementary school students. Open Court (Imagine It!) is a basal reader program that, according to the program description, is designed to instruct children in decoding, comprehension, critical thinking, and written language skills (Needleman, 2007). Many of the charter schools in Baltimore City are using the Direct Instruction program (Baltimore City Public Schools, 2012a). The Direct Instruction program is a teacher-scripted decoding program that introduces highly regular
systematic phonics in leveled readers with limited time spent on comprehension skills (Baltimore City Public Schools, 2012a). Some charters, like the State Public Charter School (pseudonym) use the *Houghton-Mifflin* basal reading series as part of a “theme-based” curriculum, tying literacy to other content area subjects. Some charter schools, like the Maple Montessori Public Charter School (pseudonym) use other methods. The Maple Montessori Public Charter School uses a Montessori-based literacy curriculum and instruction.

A review of the *MSA* scores from 2011-2012 from all of the charter schools (38) that are located within the Baltimore City boundaries, are variable when compared to the traditional schools, with some evidence of better scores and some evidence of lower scores (MD State Department of Education, 2012). On the 2011 *Maryland State Report Card*, students at the two schools in this study, Maple Montessori Public Charter School and the State Public Charter School, scored higher than the average student in Baltimore City (Maryland State Department of Education, 2011a).

**Reading Instruction at the Maple Montessori Public Charter School**

The Maple Montessori Public Charter School (MMPCS) was established five years ago as a new alternative school for students living in Baltimore City, Maryland. The reading curriculum is different from that of the surrounding schools in Baltimore City, in that they use the Montessori-based literacy curriculum and instruction. The *Maryland State Report Card* indicates that the mean scores in Reading on the *Maryland School Assessment* for children scoring at the Proficient or Advanced levels in Grades 3, 4, and 5 was higher for each grade level at the Maple Montessori Public Charter School when compared to the mean scores of the Baltimore City Public School students, as a
whole, who were performing at the Proficient and/or Advanced levels (Maryland State Department of Education, 2012).

This study compared matched students from a Baltimore City public charter school, the State Public Charter School (SPCS), who were being instructed in the *Houghton-Mifflin* basal reading program, to students who attended the Maple Montessori Public Charter School (MMPCS) and received Montessori-based reading instruction, to provide a window into any differences that might exist in student reading performance on the Reading section of the *Maryland School Assessment*. Like the Maple Montessori Public Charter School, the State Public Charter School also had mean scores on the Reading Section of the *Maryland School Assessment* which were higher than the Baltimore City Public School students, as a whole, in Grades 3, 4, and 5 (Maryland State Department of Education, 2012).

**Problem Statement**

Many children living in poverty in this country are still not reading at grade level for a variety of reasons (Verhoeven, Reitsma, & Siegel, 2011). Impoverished children are more likely than children from higher socioeconomic status families to be reading below grade level (Teale, Paciga, & Hoffman, 2007). The recent test scores from the Maple Montessori School suggest that the Montessori literacy curriculum and instruction methods might be an effective alternative choice to consider for children in Baltimore City, many of whom are currently being taught to read with other reading programs (Maryland State Department of Education, 2012). There is little empirical research investigating the effectiveness of Montessori-based reading materials and practices with urban students living in poverty (Bagby & Jones, 2010). Studying matched groups of
children from the Maple Montessori School, who were being instructed in Montessori literacy curriculum and instruction methods, with children from the another public charter school, who were being instructed in the *Houghton-Mifflin* basal reading program, provided insight into potential differences in student performance.

**Overarching Research Question**

What differences exist, if any, between students in Grade 3, 4, 5, 6, and 7 in the Maple Montessori Public Charter School, whose teachers instructed them in reading with Montessori literacy curriculum and instructional methods, and students from a nearby charter school who were instructed by their teachers using a basal reading method, on the *Maryland School Assessment (MSA)*, during the 2011-2012 school year?

**Purpose of the Study**

My purpose for this study was to explain the differences, if any, in the *Maryland School Assessment (MSA)* results of students in Grades 3-7 who attended the Maple Montessori school and experienced Montessori reading methods compared to students in a charter school who received basal reading instruction during the 2011-2012 school year. Teachers, administrators, and curriculum supervisors in the Baltimore City Public Schools would benefit from knowing if the reading practices used at this Montessori school were efficacious and provided a valuable, alternative literacy plan for students in this Montessori-based urban charter school setting.

**Hypothesis**

The null hypothesis is that there will be no difference between (a) the scores on the Reading section of the *Maryland School Assessment (MSA)* for the cohort of students in Grade 3-7 who were instructed using Montessori literacy curriculum and instructional
methods and (b) the scores on the Reading section of the *Maryland School Assessment* (*MSA*) for the cohort of students in Grades 3-7 who were instructed in a basal reading program (H1: \(\mu_1 - \mu_2 = 0\)).

**Limitations of the Study**

The children from the State Public Charter School, who comprised the control group, received a different reading instructional program, *Houghton-Mifflin*, than the students in the Maple Montessori Public Charter School; however, there were other differences, besides the choice of reading methods, between the schools. When compared to Maple Montessori Charter School, during the year of this study, State Public Charter School had a different administrator, a different physical plant, a larger school size, and a different learning climate, with an emphasis on “theme-based learning” across the curriculum. These factors were a threat to internal validity and external validity, as they might have accounted for differences in student reading performance not directly related to the use of the *Houghton-Mifflin* literacy curriculum.

There was a limitation in the matching process in this study, due to the fact that the Grade 3 children did not take the *MSA* test until the end of their third grade year in school; therefore, there were no 2010-2011 *MSA* scores on the Reading section available for matching the Grade 3 students from both schools, on the prior year’s reading level. The Grade 4, 5, 6, and 7 students were matched for grade level, SES (as measured by free, reduced, or paid lunch status), race, and the prior year’s *MSA* score on Reading. The Grade 3 students were matched only for grade level, SES (as measured by free, reduced, or paid lunch status), and race. For this reason, the Grade 3 pairs
were not as “similar” to one another as the pairs in the other grades. Consequently, I measured the performance of the cohorts from the two schools, both including and not including the Grade 3 pairs, to observe if the presence of the students in Grade 3 had an effect on the total mean scores for both cohorts of children.

Furthermore, none of the student pairs were matched for gender. There are some researchers who claim that girls mature faster than boys and read earlier than boys but that these perceptual differences become less noticeable after the age of eight years old (Wolf, 2009). Most of the children in this study were older than eight years old, so differences in gender, according to Maryanne Wolf’s theory, would not have an undue influence on test outcomes for the majority of these students. However, the fact that gender was not included as a matching variable might reduce the similarity of the pairs of students in other respects because there are many other differences in the development of girls and boys, such as degrees of restlessness or differences in interactions with teachers, making this a limitation in this study (Sommers, 2000).

Although one of the strengths of this study was the fact that the Maple Montessori Public Charter School students were compared only to students from another public charter school, thereby reducing the impact of selection bias, it was still likely that the pairs of students would not be exactly alike. The students from the State Public Charter School, as well as the students
attending Maple Montessori, were from many areas of the city, as they were all selected from a charter school lottery system. Inherent differences in the children’s home communities may have influenced some of the factors related to their reading achievement, like safety variables in their communities affecting their quality of life, access to resources for meeting the social service needs of their families, and/or differences in their community values as they relate to academic achievement. This limitation affected the reliability of the study, as these results may not be generalizable to the same extent if the groups of children in these particular charter schools, during a different year, might come from different regions of the city (Curto, Fryer, & Howard, 2011). Therefore, readers should not generalize the results beyond the two schools in the study.

It is also noteworthy that it was unknown how long each student in either of the two schools had attended the schools. This is a limitation in that length of exposure to the methods in either school could have impacted the reading levels of the students.

In selecting a school for the control group, it was important to choose a school that used a reading method that was different from the Montessori methods. The *Houghton-Mifflin* approach was an appropriate choice for comparison because it contained many different features than those that are part of the Montessori methods and materials, even though both methods contained elements that are considered to be important in the current “science of reading” (Lyon & Chhabra, 2004). However, the two schools, Maple Montessori Public Charter School and State Public Charter School, were
quite different in the overall socioeconomic status of their populations. Maple Montessori had only 35% of its students receiving free lunch, while State Public Charter had 81% of its students in the free-lunch category. Consequently, even though the pairs of students were matched on many variables including socioeconomic status, there may have been differences in peer effects at the two schools. There are many models of peer effects, which have been developed to determine if racial, gender, socioeconomic, or religious differences in the populations of each classroom and each school have an effect on achievement outcomes for students. Hoxby and Weingarth make the case that peer effects matter and do affect student achievement (Hoxby & Weingarth, 2005). In a study of Black and Hispanic students in Texas, it was discovered that children in a lower-achieving cohort of students tended to score lower on achievement tests (Hoxby, 2000).

When I was selecting matches for each Maple Montessori Public Charter School child, there were 60 children in Grades 3-7 who were not included in this study because they were “paid lunch” students, and there were no available matches at the control school, State Public Charter School, for these students. It is possible that these differences in peer effects could have resulted in differences in reading achievement, unrelated to literacy techniques.

Another potential limitation was the fact that students instructed in the Montessori-based literacy methods were allowed to choose if they wanted to work on their reading lessons during their morning work time, from a selection of reading, writing, math, science, and/or geography lessons that the teacher had prepared for them; conversely, students at the State Public Charter School participated in daily reading and language arts activities for a prescribed amount of time when the teacher presented the
lessons. Therefore, it is possible that some or all of the students in the Montessori-based literacy school may have received considerably less time on reading instruction because they had a personal choice. The amount of time spent in instruction could have had a substantial impact on student performance in any subject, including the acquisition of literacy skills (Epstein, 1990).

**Significance of the Study**

Prior results from empirical studies demonstrated that there is a correlation between socioeconomic status (SES) and lowered reading achievement (Curto, Fryer, & Howard, 2011). There is a wealth of knowledge regarding the effectiveness of specific reading interventions (Wolf, 2009). Connecting the knowledge base about reading instruction to the actual solving of literacy issues for poor children in urban areas is crucial; basing these efforts on empirical data will result in more careful and efficacious solutions. The Montessori literacy curriculum and instructional methods merit further investigation as a potentially viable model for delivering an alternative reading program to children in need. The advent of uniform educational goals across the state and the country with the initiation of the *Common Core State Standards Initiative (CCSSI)* makes it imperative to examine successful curricular models, so that student differences will be addressed within an educational culture of “sameness” (MD State Department of Education, 2010). The science of reading and an understanding of evidence-based strategies have been strengthening in the last decade. Understanding how different models of literacy instruction influence student performance makes it possible for school districts to offer appropriate alternatives to children, so that a larger percentage of students will have the opportunity to develop strong and effective reading skills necessary
for later academic success (Moats, 2000).

Baltimore City, like most large urban school districts, has been engaged in multiple efforts to improve student achievement, especially in its poorest areas. In 2011, CEO Andrés Alonso, introduced four core concepts to repair student learning: “leadership, choice/competition, hard choices, and engagement of the community” (Huffington Post, 2011). Examining methods of literacy instruction that already exist within the school system will help to elucidate if some of the literacy methods being employed at some of the charter schools could be scaled up into other schools (Fowler, 2008). Comparing achievement of matched groups of children will be one step in determining if there are statistical differences in performance for the children who received reading instruction in the Montessori literacy curriculum and instruction methods. Due to the limitations in this study, these results need to be first applied within the context of these two schools within the structure of the Baltimore City Public Schools, as the results may not be generalizable to other situations.

**Variables**

The independent variable in this study is the combination of instructional practices used to teach Grade 3, 4, 5, 6, and 7 students at the Maple Montessori Public Charter School, which consists of Montessori literacy curriculum and instructional methods, such as the following: using multisensory sandpaper letters and 3-dimensional wooden moveable alphabet letters while making letter sounds; teaching the writing of words first and then the decoding of words; using only letter sounds and not alphabet names for letters; using color-coded vowels and consonants in words; and allowing the child to choose from a set of teacher-selected, leveled literature materials, with follow-up
teacher-made comprehension activities that focus on the grammatical and morphological structure of words.

The dependent variables in this study are the aggregate results from the 2011-2012 Reading Section of the Maryland School Assessment (MSA) for Grade 3, 4, 5, 6, and 7 students from the Maple Montessori Public Charter School and Grade 3, 4, 5, 6, and 7 students from the State Public Charter School.

**Definition of Terms**

Clarification of terms is necessary in order to fully understand this study.

**Charter School**: (in North America) A charter school is an independent school that depends on its funding from public (and sometimes private) sources that is established by teachers, parents or community groups under the terms of a charter, which may differ from state to state (Finn, Manno, & Vanourek, 2001).

**Montessori-based School Program**: A Montessori-based School Program is one that follows some or all of the teachings of Dr. Maria Montessori. Most Montessori-based schools in the United States are based on the American Montessori Society (AMS) guidelines, but some are based on the Association Montessori Internationale (AMI) guidelines, which are similar in many, but not all, respects. Most Montessori schools have an age span of at least three years in each classroom and are “child-driven” learning environments. Children pick their activities from choices that are prepared and provided by the teacher and then work independently or individually or in a small group of students, with the teacher, on those activities. Students use highly organized sets of graduated materials, which are mostly three-dimensional and/or concrete and have their teacher serving as their “mentor and model” for student discipline. Students primarily
work on all of their academic subjects during a three-hour instructional time, in which they are allowed to personally select from the teacher-prepared activities, according to their interests (Bagby & Jones, 2010).

**Traditional Public School:** These are schools offering “traditional education,” generally, but not always, including the following elements: one grade level per class; teacher-driven learning; teacher as the primary enforcer of discipline; instruction in each subject at a pre-assigned time period in large and small groups; approved curricular choices following county, state, or national guidelines; publicly-funded school buildings; and teachers who are trained and licensed in traditional university-certified educational institutions (Gee, 2004).

**Reading Achievement:** Basic, Proficient, and Advanced reading achievement, according to the *National Assessment of Educational Progress (NAEP)*, is defined as specific processes and reading behaviors that involve different and increasing cognitive demands from one grade and performance level to the next. Basic reading skills, at different grade levels, include a student being able to perform the minimum expectations in literacy to achieve the goal. Proficient performance, at different grade levels, means that the student is able to perform the reading task effectively at the intended grade level. Advanced skills, at different grade levels, indicate that a student can perform reading behaviors that are above the expected requirements of that grade. Most reading tests measure one or more of the following reading sub-skills: phonological awareness skills, phonetic knowledge of letters and sounds in isolation, phonetic and whole word decoding skills in isolation and in context, reading fluency skills, and competency in literal and inferential comprehension skills. Some reading achievement measures include all of the above-
mentioned skills, while others examine only one aspect of the reading process (NAEP, 2009).

**Lottery for Charter School:** The National Charter School Resource Center recommends in the application process for charter admission that a lottery system is put into place, to provide all students in a given locale access to this chosen educational opportunity. In the State of Maryland, it is mandatory to employ a lottery system in all charter schools. While students may not “qualify” for a specific charter school, all children are given the opportunity to apply; and barring specific requirements within each charter, any applicant will be considered for acceptance. Examples of requirements that might result in a lottery student being refused admission would include those students who need a service that is not available at that charter (i.e., specific special education services) or those students who would not be able to participate to the fullest extent in the charter offerings, such as an overnight charter that would require students to meet minimum health requirements for participation (Zimmer, 2009).

**Maryland School Assessment (MSA):** The MSA is a test of reading and math achievement that meets the testing requirements described in the federal No Child Left Behind Act. It is given every year in early March, over two school days, to Grades 3 (first year) through Grade 8, to most public school students living in the State of Maryland. Students who are handicapped are provided with an alternative form of the test. The Reading section of the test includes “Selected Response” items, which require the student to choose a correct answer from four responses and “Brief Constructed Response” items, which require students to write an answer consisting of a few sentences. An overall reading score is reported by proficiency level of Basic, Proficient,
or Advanced. The cut-off standards for each level are set by the Maryland State Department of Education. A score of Proficient on the MSA tells how well a child has learned the reading (or math) content that Maryland has determined all students should know. A preview of the 2010-2011 scores indicated that slightly over 50% of the students in the State of Maryland were performing at the Proficient range in reading (Maryland State Department of Education, 2011a).

Summary

Chapter I explored the history of reading instruction and the development of the science of reading as it pertains to providing effective literacy instruction for children who are living in poor, urban areas. There is little research on the effectiveness of Montessori literacy curricular materials. One school in the Baltimore City Public School System is using the Montessori-based literacy curriculum and instruction. A comparison of student reading achievement for children receiving this Montessori literacy instruction at a public charter school in Baltimore City was compared to student reading achievement for children receiving instruction in the Houghton-Mifflin basal reading series curriculum at another nearby public charter school. Children were matched on socioeconomic status, grade level, race, and the prior year’s reading achievement (Grades 4-7 only) so that the comparisons were made on similar groups of children. Chapter II summarizes and analyzes the literature on the history of methodological practices in literacy in the United States, the new science of reading, Montessori literacy curricular practices, reading achievement gaps for children living in poverty, and instructional literacy practices in other settings in the Baltimore City Public Schools.
Chapter II

Literature Review

Introduction

In the first chapter of this study, I discussed the purpose and significance of this study, as well as its limitations. Chapter II is an overview of the history of the reading debates in America in detail and demonstrates how recent research in reading has propelled the science of literacy into clearer focus. In Chapter II, I also discuss how a refined understanding of reading research suggests the need for further investigation of Montessori-based literacy practices and materials, which incorporate many of the observations gleaned from recent empirical studies of the reading process. The literature reviewed in this chapter delved into the profound connection between poverty and low reading achievement and directed me towards an investigation of the effectiveness of reading methods and materials being used in an urban, Montessori-based public charter school.

Purpose and Procedures of the Review

The purpose for this literature review is to identify empirical studies, books, reports, and classic works that present information and results about the influence of Montessori literacy curricular instruction on reading achievement, especially for children living in poverty.

I reviewed literature for this chapter via online databases including ProQuest, EBSCOhost, ERIC, and Academic Search Premier. I also reviewed online and print
editions of peer-reviewed, educational journals and books on literacy. Each of the
sections includes experimental, quasi-experimental, meta-analysis, and/or non-
experimental treatment/control group studies. I have followed Boote and Bell’s (2005)
framework for scholarly literature reviews.

Inclusion and Exclusion Criteria for the Review

Studies that met the following criteria were included in this review:

1. Studies that used experimental, quasi-experimental, non-experimental with
   control groups, or another design that would be considered to be causal-
   comparative.

2. Peer-reviewed articles and government reports. Articles published within the
   last 30 years, unless the work was historical or theoretical in nature.

3. Books including research relevant to this area of research.

4. Literature that met the listed design criteria found in reports by governmental
   bodies advocating the use of formative or interim assessments.

Practical Significance

Although the desired effect size for an intervention is 0.30 or larger in educational
studies (Cohen, 1977), this literature review includes research in which the effect sizes
are insignificant or not reported at all for the purpose of highlighting weaknesses in
existing studies. I have primarily included historical seminal works on the topics in my
literature review and empirical research, primarily but not exclusively, from the years
1983 to 2013. Articles on variables that might affect student achievement in reading,
other than those regarding the influence of specific reading methods and practices,
information from imaging studies related to the science of reading, and/or research
describing gaps in literacy in children from low socioeconomic situations were excluded from this review because they were not directly relevant to my particular study.

**Overview of the Reviews of the Existing Literature**

The study of reading in the United States has vacillated for hundreds of years between code-based methods and whole word/comprehension based methods (Adams, 1990). After years of studies, there seems to be consensus that the job of teaching a child to read involves systematic instruction in both decoding and comprehension and that there is a specific order that works most effectively, with strategies for “cracking the code” (decoding) which ultimately lead to text comprehension skills (Anderson, Hiebert, Scott, & Wilkinson, 2000; Lyon & Chhabra, 2004; Snow, Burns, & Griffin, 1998; Torgeson, Wagner, Rashotte, Burgess, & Hecht, 1997). A new and major addition to the previous knowledge base about the teaching of reading from research beginning in the 1980s is that the first step in preparing the child for reading includes oral phonological awareness skills, which involve deleting, categorizing, blending, and segmenting words into component sounds and syllables, without graphic letter forms. Many researchers have shown that phonological awareness is a primary and foundational part of the decoding process. Children mostly acquire these phonological awareness skills naturally during the toddler years at home through exposure to nursery rhymes, syllable clapping games, picture books which emphasize phonetic sounds associated with pictures, and through natural word play, like learning “Pig Latin,” but many children need to be taught these skills explicitly (Anthony & Lonigan, 2004; Brady, Shankweiler, & Mann, 1983; Dehaene, Duhamel, Hauser, & Rizzolatti, 2004; Elbro, 2004; Jobard, Crivello, &

Other recent findings suggest that becoming a more fluent reader (being fast and accurate) is a crucial step in the teaching of reading and leads to better comprehension skills (Norton & Wolf, 2012). Genetic studies investigating the heritability of a reading disability, from studies completed all over the world, have shown that there are at least six genes that have been identified that lead to developmental dyslexia, primarily defined as significant weaknesses in the phonological processing system, which primarily impact reading accuracy and fluency (Gilger, 2000). However, many students are not affected by genetically-based dyslexia but by environmentally-based reading deficits, in which they have not received appropriate reading readiness experiences before entering their formal schooling situations due to language and pre-literacy deprivation (Shanahan, 2013). It appears evident that low SES children entering the school environment with language limitations require more intensive work on phonemic awareness instruction and vocabulary instruction in order to be on a level playing field with other children who often come into school with their linguistic skills more intact due to early exposure to more conversational skills during their preschool years at home (Hart & Risley, 1995a). These same children from low SES backgrounds experience difficulties in their comprehension skills when they are in the higher grades because of limitations in syntax and/or a lack of background knowledge (Carlisle & Rice, 2002; Catts & Kamhi, 1999).

Much has been written about achievement gaps in early literacy skills for children living in poverty (Berliner & Biddle, 1995; Coleman, 1966; Coles, 2009; Kozol, 1985; Snow et al., 1998). Educators have been trying to provide the opportunity for
equalization in achievement for the advantaged and the disadvantaged child since the
inception of public schools, which in the optimistic words of Horace Mann would
ultimately become "the great equalizer" (Mann, 1848).

Given the importance of learning to read, a great deal of focus has been placed on
the acquisition of literacy skills across academic settings. Different researchers have
studied the impact of multiple variables on raising literacy skills, especially for children
living in poverty. Some studies have looked at (a) raising vocabulary and oral language
skills for the low SES child to improve long-term literacy skills (Nagy & Anderson,
1984), (b) improving the condition of the school itself to improve literacy (Teddlie &
Stringfield, 1993), (c) raising trust and efficacy among teachers, parents, and children to
increase reading achievement (Hoy, Tartar, & Hoy, 2006), (d) varying teaching practices
and reading methodologies to change reading performance (Verhoeven et al., 2011), (e)
altering a school system’s financial and budgetary priorities to improve reading
achievement through more training and innovative programming opportunities (Brimley,
Verstegen, & Garfield, 2012), and/or (f) focusing on the appropriateness of the teacher-
student match on reading achievement (Clotfelter, Ladd, & Vigdor, 2006). There are
many different directions and theories to take into consideration in trying to improve the
reading skills of children living in poverty.

Jacobs and Ludwig tried to identify methodological variables that made a
difference for children in poverty and determined, in their pessimistic review of the
research, that “nothing works” (Jacob & Ludwig, 2009). Many researchers believe that
poverty, in and of itself, is the culprit and that methodological interventions, in and of
themselves, are only able to go so far in improving the literacy skills in low SES children,
who have some or many of their personal, social, and familial needs unmet (Neuman, 2008). Abbott and Joireman (2001) disaggregated ethnicity from income levels to try to identify if the major causes for low achievement in reading and math among poor children was more evident in specific ethnic groups and found that "Across a variety of grades and tests, our results support the conclusion that low income explains a much larger percentage of the variance in academic achievement than ethnicity" (p. 13). There is stark evidence to suggest that across populations, poverty is associated with low achievement in literacy and in math.

**Literacy in Baltimore City**

The Baltimore City Public School System is a large, urban setting which consistently produces students who are achieving below their peers in literacy skills when compared to children from all of the surrounding counties (Rebok et al., 2004). There is a large percentage of students living in very poor communities who come to school with the burdens of poverty, such as limited access to linguistically-based households, substandard housing, parents who are impacted by limited financial and educational resources, higher levels of exposure to alcohol and drug abuse, and/or a higher chance of substandard pre-natal and post-natal care in infancy and childhood (Neuman, 2009). There have been multiple studies conducted in Baltimore in search of programs that would change the situation for these children, some resulting in modest changes; however, the literacy achievement of the students living in Baltimore City, on the whole, remains well-below that of their suburban neighbors (Aram & Korat, 2010).

There are five schools in the State of Maryland that use a Montessori-based literacy curriculum (Baltimore City Public Schools, 2012a). Maria Montessori, a
physician living in Italy at the turn of the twentieth century, developed a curriculum for
disadvantaged children that has many of the components currently identified as part of
the science of reading (Bagby & Jones, 2010). Dr. Montessori believed that play was the
work of children. She believed that children needed to freely choose from prepared
learning tasks, starting at age three, using three-dimensional and sandpaper letters to first
learn how to master early writing skills and then how to crack the code of reading. Dr.
Montessori believed that learning the letter sounds as opposed to the letter names enabled
children to more easily use these sounds to write words, and then to read phonetically-
regular words. Dr. Montessori developed intensive training programs for teachers to learn
how to instruct children in early literacy skills. The comprehension phase of
Montessori’s literacy training did not come to fruition until many years later and was
mostly introduced as part of learning to read content in science, geography, and social
studies. Books were made available to the children after they became competent
decoders (Koh & Frick, 2010). There has been little research conducted on children in
Montessori-based literacy programs, who, until the last ten years, have mostly been
instructed in private Montessori schools. Montessori teachers in private schools usually
test their students informally on their skill competencies and do not, for the most part, use
standardized tests (Chattin-McNichols, 1983).

There has been little formal data available on student literacy in private
Montessori schools. There are now many public Montessori schools (450 public
Montessori schools in the United States), mostly in the form of magnets and charters,
which use standardized testing because it is required by the public school systems in
which they are located (Edwards, 2002). School systems with high rates of poverty are
seeking alternatives to traditional educational models in an effort to help more children to read proficiently; Montessori-based curriculum is one of many options available to children in these kinds of public settings (Edwards, 2002).

**Focus of the Review**

There is a body of research informing educators about appropriate ways to teach literacy concepts to children. Children living in poverty-stricken urban areas suffer more than their suburban counterparts who consistently perform at higher levels in literacy at all levels of instruction. There is a school in Baltimore City that now uses Montessori-based literacy curriculum in which the children appear to be performing somewhat better, according to statewide, standardized test scores, than many of the children in other nearby public schools in Baltimore City. Many of the literacy concepts developed in the early 1900s by Dr. Maria Montessori include variables identified as successful methods and techniques in recent reading research.

I matched students in Grades 3, 4, 5, 6, and 7, who received Montessori-based literacy curriculum over the 2011-2012 school year to students who were instructed in a more traditional, basal reading approach, the *Houghton-Mifflin* basal reading series, to see if there were significant differences in reading skill performance as measured on the Reading section of the *Maryland School Assessment* test. There is a dearth of empirical literature on the effectiveness of the Montessori literacy curricular techniques. The Montessori literacy practices used with this selected group of students may warrant further investigation.

**Theoretical/Historical Framework of Reading in America**
During colonial times in America, children were expected to identify the letters of the alphabet and then study their “syllabaries,” which were groups of syllables that connected to the information in those lessons. Students mastered letter names, syllables, and then words and sentences (Robinson, 1977). The early primers read by children reflected the Christian values of the time. “Spellers” were then introduced, alternating between tables of syllables and reading selections, and encouraged students to place marks above groups of letters, to accent specific syllables for improved decoding accuracy. In 1817, Noah Webster developed a formal system of phonics, in which students were encouraged to approach words sound-by-sound and then syllable-by-syllable, emphasizing the articulation and pronunciation of the words on the page (Unger, 1998). Webster’s work was the first introduction of “synthetic phonics” in this country, in which students were taught to put sounds together as opposed to being given whole words and being asked to take them apart (Flesch, 1955). Teachers read sentences to their students, who then repeated the sentences over and over again until they were accurately decoded, a system that was actually the precursor to repeated reading methodology in oral reading fluency practice today (Wolf, 2009).

Horace Mann and others around the same time period, the middle of the 19th century, felt that this repetition of information was meaningless and that children needed readers that would encourage thinking rather than rote repetition of phrases and sentences. Mann’s followers developed textbooks with pictures and stories that would be of interest to children, representing the beginnings of the first whole word basal readers (Mann, 1848).
In 1837, William Holmes McGuffey created a reading series, known as The McGuffey Readers that emphasized the reading of whole words and stories, followed by comprehension questions. These McGuffey Readers provided the model for many of the basal readers developed in the 1930s. In the First Eclectic Reader (Revised Edition, 1879), teachers were informed that the book was “especially adapted to the Phonic Method, the Word Method, or a combination of the two” (Eclectic Educational Series, 1879, p. ii).

In the late 1800s, Francis Parker, the creator of the Quincy School, borrowed some of Horace Mann’s ideas and introduced the premise that literacy was based on the connection of oral language, reading, and writing, presented in meaningful contexts, developing the foundation for the whole language movement in the 1980s. John Dewey, in the early 1900s, incorporated Parker’s ideas into his Laboratory School at the University of Chicago, in which reading lessons were child-centered, literature-based, and focused more on comprehension and the meaningfulness of the texts read by the children and less on the acquisition of phonetic knowledge for the decoding of words. Dewey felt that literacy activities needed to be composed of providing the children with reading materials that they found interesting, rather than with text that was gradually more difficult from a decoding perspective. Dewey, in contrast to educators like Maria Montessori, thought that children should not be taught to read before the age of eight, as he felt that it could be “harmful” for them to learn to read too soon (Dewey, 1898).

In 1930, the Scott-Foresman Company developed the Dick and Jane series, which expanded basal readers by combining elements of phonetic decoding with a “look-say” approach to reading words. Words were
frequently repeated in the stories to enhance student memory. Scott-Foresman added in colorful pictures to aid in decoding.

While the basal readers primarily encouraged memory of whole words, there were also some connected supplemental workbook lessons using “analytic phonics,” in which whole words were phonetically analyzed into component parts as opposed to “synthetic phonics,” in which individual sounds and/or “chunks of sounds” would be combined to decode words (Johnston & Watson, 2003). Basal readers also included prescribed comprehension questions throughout each story (which were often associated with pictures) and follow-up written experiences (mostly in workbook formats) to extend the reading process into the writing process (Beck, 1984). America went from a primitive alphabet method composed of reading and recitation of religious texts to comprehensive basal reader instruction, in which explicitly prescribed lessons instructed teachers about what concepts to teach and how to teach them during daily reading lessons.

A backlash to the basal movement entered the picture in the mid-1950s, when Rudolf Flesch wrote his book *Why Johnny Can’t Read*, recommending a return to phonics. Flesch believed that teaching children whole words, even when they were frequently repeated, with limited instruction on the letters and sounds in those words (through “analytic phonics”) was not an efficient or successful way to teach an early reader how to decode (Flesch, 1955).

In 1966, Jeanne Chall, a professor at Harvard, wrote *Learning to Read: The Great Debate*, arguing that phonics, especially “synthetic phonics” was the best place for early readers to start in the literacy process, which solidified the “return to phonics” movement, particularly as the beginning stage of teaching young children how to read (Chall, 1967).
Chall reviewed research from 1912 to 1967 in her book, demonstrating the effectiveness of phonics instruction at the start of a child’s reading instruction. She did not feel that use of a “code-emphasis” program would prevent a child from reading for meaning and explained that after a child was decoding effectively, it would then be appropriate and important to work on comprehension. Fifteen years later, in 1975, Chall wrote in the National Institute of Education (NIE) report that using either phonics or “look-say” approaches would do the whole job of teaching a child to read; she explained that there was a logical order to teaching phonics for decoding and comprehension skills and that phonics instruction needed to be taught first (NIE, 1975). Mentioned in her book were the results of the Cooperative Research Program (CRP), which studied 27 different projects examining the results of reading methods in first-grade classrooms and concluded that systematic phonics instruction, when combined with reading of meaningful text, was the ideal method for teaching children in the first grade to read (Bond & Dykstra, 1967).

The pendulum swung again, in the mid-to-late 1980s with a return to whole word and meaning-based approaches. Ken Goodman and his colleagues at the University of Arizona (Goodman, 1986) re-introduced the concepts related to a “whole language approach.” This method professed that oral language was learned naturally, through modeling and meaningful context, as described in the work of Noam Chomsky and that the learning of print was a similarly natural process (Putnam, 1987). Whole language proponents also believed that a strong reading program needed to connect oral language, reading, and writing, similar to Francis Parker’s ideas in the mid-to-late 1800s, one hundred years earlier (Tanner & Tanner, 2007). The whole language movement endorsed
exposing children to fine literature rather than to “stilted” basal readers to motivate children to want to read (Goodman, 1986). Any phonics instruction in whole language lessons was organically embedded in the text and not taught in a systematic manner; if a child was having difficulty pronouncing a word and was unable to figure it out by a contextual or a pictorial cue, then it was suggested secondarily to analyze the letters and sounds in the word, using “analytic phonics.” Phonics instruction was not sequential but situational, and whole language professionals imparted the idea that children would “intuit” the rules of phonics by practicing reading and being exposed to these recurring phonetic patterns as they occurred in text (Hempenstall, 1997).

Marilyn Adams in 1990 was in the forefront of swinging the debate back to a more sound-based approach. She stated that Jean Chall had already shown that systematic and phonetically-based word recognition strategies were imperative and that it was important for teachers to give children all of the possible and necessary supports needed towards the intended purpose of learning to read, which was ultimately a matter of comprehension (Adams, 1990). Dr. Adams was also intrigued by the fact that Bond and Dykstra had discovered in 1967, during the Cooperative Research Project, that one of the key ways to predict who would be a strong reader was to assess their performance on an auditory discrimination task, in which they were presented with similar word pairs and asked to decide if the pairs were alike or different (Bond & Dykstra, 1967). Adams then delved into studying phonological awareness, building on the work of others in Sweden and in this country (Brady et al., 1983; Catts, 1986; Liberman & Shankweiler, 1985; Lundberg et al., 1980), suggesting that understanding the sound structure of language without print (discriminating sounds, segmenting words into phonemes, deleting and/or...
adding phonemes to words without graphic representations of letters) might be an important, first factor in the teaching of reading (Adams, 1990). Adams also stated that children who did not know how to manipulate and segment phonemes were generally children who were failing to learn to read (Adams, 1990, p. 328). Keith Stanovich suggested that there might be a time at which certain types of instruction in phonological awareness were no longer useful (Stanovich, 2000). Weiner studied first grade students to see if there was a difference between lower-achieving and middle-achieving children who received phonemic awareness training. He found that the treatment group who received the phonemic awareness training, did better on only one subtest of segmenting words into component parts (Weiner, 1994). He felt that some students might not need this kind of training because they had already mastered these skills at home or in preschool. He also stated that all of these students were being instructed in a phonics program, and that there might have been enough embedded phonological awareness in the phonics program, perhaps making it unnecessary to teach these concepts as separate skills (Weiner, 1994).

The 1998 National Reading Council (NRC) editors concurred that phonological awareness, phonics (explicitly teaching the “alphabetic principle”—that letters make sounds), and meaning (developing strong vocabulary as well as factual and inferential comprehension skills) should be integrated (Kim, 2008). The 2000 Becoming a Nation of Readers report recommended shifting the debate away from “either/or” models, just as Jeanne Chall had recommended twenty-five years earlier in the 1975 NIE report (Adams, 1990). In the year 2000, the National Reading Panel (NRP) did a meta-analysis of 100,000 articles on reading, and after eliminating any studies that did not follow standard
scientific methods, they subsequently recommended that reading instruction needed to include, in sequence, five components: phonemic awareness, systematic phonics ("synthetic" phonics for children having difficulty learning to read), oral fluency, oral vocabulary, and text comprehension (McCardle & Chhabra, 2005). While this report has been challenged by many for the way in which the information was analyzed, it did have, nevertheless, a big influence on textbook companies, who engaged in expensive rewriting of their basal series in order to include all five components of the reading process, as laid out in the NRP report (Pressley, Allington, Wharton-McDonald, Block, & Morrow, 2001). The National Reading Panel report is controversial because it was a meta-analysis of many studies, each of which had its own strengths and weaknesses. The differences in the designs, demographics, and educational environments of the many studies in the meta-analysis are considered by many to be threats to the validity of the results (Pigott, 2012). The National Reading Panel purportedly included only 37 of the studies, which followed strong scientific methodology (all of the studies that did not follow strict experimental research guidelines were not included in the meta-analysis); however, the results are not universally accepted, partially because of the questionable interpretation of the data (Allington & McGill-Franzen, 2004). The reading wars kicked in again: whole word versus phonics proponents developed programs aligning with their competing philosophies.

**The Science of Reading**

There continues to be ongoing, extensive research in the area of reading. A young science has emerged as educators and neuroscientists continue to explore the relative importance of each stage of the reading process; however, most do concur that phonemic
awareness activities precede systematic decoding strategies, which are then followed by activities in fluency and automaticity, leading up to understanding the linguistic components of reading (morphology, syntax, vocabulary) and finally ending in the ability to comprehend text (Brady, Braze, & Fowler, 2011; Ehri et al., 2001; Elbro, 2004).

Research from Penner-Wilger (2008) indicated that there is a relationship between strong decoding skills, reading fluency, and comprehension (Penner-Wilger, 2008). The current field of researchers have moved beyond the premise that a simultaneous approach to the introduction of reading skills, in which all activities co-occur, is as helpful to the child, as when the various aspects of the reading process are taught in a sequential fashion. The sequence of skills in learning to read suggests introducing a conceptual framework that teaches the sub-skills of reading in order from phonological awareness to the phonetic processing of letters, to fluency (rate plus accuracy), and last to linguistic comprehension (oral and print-based) (Shankweiler, Lundquist, Katz, Studebing, Fletcher, Brady, Fowler, Dreyer, Marchione, Shaywitz & Shaywitz, 1999; Wiederholt & Bryant, 2012).

However, there are still varying opinions about the importance of each step in the reading process, the ages at which formal reading skills should be introduced, and the need for multisensory input to enhance memory. Many question to what extent “decodable” text needs to be controlled (Cheatham & Allor, 2012); others question the timing aspects of each of the reading processes; e.g., whether phonological awareness instruction should primarily take place only in preschool, Kindergarten, and/or first grade because those are the years that most children are naturally developing those skills (Brady, Gillis, Smith, Lavalette, Liss-Bronstein, Lowe, North, Russo, Wilder & Brady, 2010). Many researchers believe that the establishment of phonological awareness
skills, in which students build their sound knowledge (orally deleting, categorizing, blending, segmenting, and sequencing sounds and syllables without graphemes), provides the most important foundation for reading accuracy and must be firmly established to ensure more effortless learning of systematic phonics (Schneider, Ennemoser, Roth, & Kuspert, 1999). Still other reading researchers are focusing on the role of fluency, which has disappeared from many programs, as children rarely engage in the “round-robin reading” of the basal era in the 1960s and 1970s, which used to compel many students to do oral reading practice from their basal readers on a regular basis (Kuhn & Schwanenflugel, 2006). Some educators are investigating the connection between oral vocabulary and text comprehension versus the impact of strong and accurate decoding on text comprehension (Bell, 2010; Penner-Wilger, 2008). However, most do agree with the fact that phonological awareness and systematic phonics instruction precede instruction in text comprehension, which has been a point of controversy for hundreds of years, as noted in the historical section of this study. Neuroscience supports this theory as well, providing a fresh perspective in regard to the reading process by examining brain functions through various imaging procedures while people are reading (Dehaene, 2009). Many of the neurological studies do not support the whole language framework, as the constructs of whole language do not mirror the flow of blood in the brain while children read (Larson, 2004). The whole language movement was opposed to the systematic teaching of phonics because it considered that this training detracted from meaning aspects of the text, which the proponents felt was the primary goal of reading instruction (Allington, 2002). Whole language advocates placed emphasis on text comprehension by initially giving children access to meaningful stories. The claim was that children found
it more interesting to discover phrases rather than memorizing phonics rules, single words, spelling rules or “tedious” sound/letter decoding. The whole language educators believed that children would be empowered if they could build their own learning environments and spontaneously discover what reading was all about (Moats, 2000). If a child being instructed in a whole language program read “the puppy is hungry” when looking at a picture of a little dog in front of a bowl of dog food, instead of “the dog ate the dog food,” it was not considered to be an issue, because it was felt that the child would see the words dog, ate, and food repeatedly in text, over time, and would learn to recognize those words through self-corrections, which would occur because of incoming contextual and/or pictorial clues and ongoing repetition of those words in other contexts (Brady et al., 2011).

Several researchers have studied the teaching of a new writing system to students using a whole language method versus a phonics-based approach and compared the performance, which indicated that the phonics-based approach was superior and more efficient (Yoncheva, Blau, Maurer, & McCandless, 2006). Researcher Joseph Torgeson believes that reading performance is more efficient when children are directly and systematically taught the mapping of letters onto speech sounds (J. Torgeson, 1998). Regardless of their social background, children who do not learn letters and graphemes may suffer from reading delays (Dehaene, 2009; Share, 1995; Share, 1999).

The field of brain imaging is rather young. In most traditional reading studies, student performance on various reading skills has often been measured in randomized, double-blind studies, in which students’ reading skills were measured after the use of different methods or placement in different academic settings. Many of these studies
have reported value in using phonological awareness and systematic phonics before moving into fluency, vocabulary, and comprehension. Information from imaging studies of the human brain is used to presume that certain teaching approaches are superior to others, as neuroscientists examine the structural and biochemical differences in brain function obtained from Functional Magnetic Resonance Imaging (fMRI), Electroencephalogram (EEG), Positron Emission Tomography (PET), and Magnetoencephalography (MEG) scanning procedures. This data may be refined or reconsidered in a new light as more sophisticated imaging techniques are developed and utilized. There is consensus among neuroscientists, based on hundreds of studies examining brain function while children and adults are reading, that the sequence of the reading process entails first learning the code followed by the processing of meaning (Eden, 2011).

A comparison of the information from current imaging studies to recent traditional, non-neurological research during this same decade by Linnea Ehri (2005), Marilyn Adams (2004), and countless others, shows that there is agreement regarding the premise that memorizing whole words does not provide students strategies for figuring out new words independently, and that sounding out letters or clusters of letters and blending them into words is more efficient than predicting an unknown word based on context and/or letter clues (Cheatham & Allor, 2012). There is controversy regarding how to teach comprehension skills, but most do agree that comprehension is at the end of the line and more successfully taught after a child is decoding fluently and automatically (Lyon & Chhabra, 2004).

Montessori-Based Literacy Curriculum and Instruction
In the early 1900s in Italy, Dr. Maria Montessori, a trained physician, started to become interested in educating children with difficulties. She believed that children learned through “hands-on” activities and that critical brain development occurred in the early years of a child’s life; consequently, she structured children’s “work” activities to follow their “sensitive periods,” those times when specific skills were naturally developing, even in the preschool classes (Shute, 2002). A Montessori-based school program is one that follows some or all of the teachings of Dr. Maria Montessori. Many schools use the philosophical guidelines of Dr. Montessori and employ only teachers trained in those methods, but there is great variability from school to school. Most Montessori schools have the following characteristics: (1) an age span of at least three years in a classroom; (2) “child-driven” classrooms in which the child picks activities from prepared and leveled choices provided by the teacher and often works independently or with the teacher or a small group of students on those activities; (3) highly organized sets of graduated materials which are mostly three-dimensional and/or concrete; and (4) teachers who serve as mentors to each student, guiding each one through his or her own personal learning discoveries. The concept of the prepared environment encourages children to choose activities for themselves and pace themselves, using materials that are leveled and structured.

There is a dearth of empirical literature on Montessori programs, partly because the majority of Montessori educators do not believe in assigning grades or giving tests to children to measure progress (Zimmer, 2009). Consequently, there has been little data
collected over the roughly hundred years that Montessori schools have existed, both here and internationally. Dr. Maria Montessori based some of her views of children on the Jean-Jacques Rousseau philosophy from the Romantic Period in the late 1700s-early 1800s, on the “nobility of the child” (Tanner & Tanner, 2007). However, there are many who believe that Montessori had a very different philosophy regarding children’s play and the structure of their learning environments (Soundy, 2003). Rousseau and other educators from the Romantic Period believed in allowing children to engage in unstructured play activities based on what they wanted to learn. Montessori felt that children needed to complete specific tasks, even though the children were allowed to choose what they wanted to work on from a selection of prepared and leveled tasks, during specified time periods; Dr. Montessori enforced the strong belief that the completion of “work” would make the children better and stronger citizens (Lillard & Jessen, 2003). One of the problems in measuring the effectiveness of Montessori schools is that they are often quite different not only from traditional school programs but also from one another. Also, Montessori did not believe in testing children in a formal way but rather in an ongoing diagnostic-prescriptive process. She believed that the teacher needed to observe children’s mastery of skills and help to move them forward when they were ready to do so based on their actual performance rather than on test scores. It is only recently that the public Montessori schools have engaged in standardized testing because it has been required by the school districts in which the schools are located (Paul Epstein, 1990).

Private and public Montessori schools are affiliated with either the American Montessori Society (AMS), the Association Montessori Internationale (AMI), or both in
some cases. These Montessori organizations are similar but not exactly the same in their teacher training programs and/or in their instructional practices (Chatten-McNichols, 1983). There is no “copyright” or “patent” for the Montessori approach, so each School Director uses the parts of the philosophy that fit with the goals and objectives of that individual school.

There are some Montessori schools which rigorously apply the educational principles as set forth by Maria Montessori and others that may offer multi-age groupings but choose to use traditional learning materials (Dohrmann, 2003). There are a multitude of formal Montessori teaching materials, but many schools opt to use similar materials or to teach certain concepts using other materials, some of which are multisensory in nature but have not been designed according to the authentic Montessori guidelines. Teacher training often varies as well because most Montessori schools in the United States insist that the teachers are trained and certified in the state, as well as jointly certified by one of the Montessori associations: Association Montessori Internationale (AMI), or American Montessori Society (AMS).

The Montessori literacy curriculum follows a specific sequence from early systematic phonics to repeated practice with whole words in controlled and repetitive readers leading to comprehension of text, including both fictional and non-fictional reading materials. Some of the features that are unique to the Montessori literacy curriculum are the following: (1) starting to teach children to write and then to read beginning at age three, which is considered to be part of the “sensitive” period for learning language, when children are fascinated with their mouths and their voices; (2) using a game (I Spy) in which children must identify an object’s beginning sound, ending
sound, or all three sounds in a three-letter word and then think of their own words with similar sounds, which teaches students how to orally analyze and discriminate sounds in words and fosters phonological awareness; (3) teaching children to ask questions in conversational activities with the teacher, using “who,” “when,” “what,” “where,” “how,” and “why” questions to expand and enhance vocabulary knowledge; (4) using systematic phonetic patterns in the “Word Game” and in reading folders, with an emphasis on letter sound rather than letter name, which enhances phonological discrimination of the sounds in the words; (5) using multisensory input to enhance student memory of sounds, with sandpaper letters which children trace while saying the sound of the letter; (6) using three-dimensional wooden, moveable alphabet letters so that children can “write” without a pencil if they are not ready to handle a writing instrument; (7) presenting consonant sounds in blue and vowel sounds in contrasting red on sandpaper letters and other reading materials to help children to visually discern the differences between making “open mouth” vowel sounds and “closed mouth” consonant sounds, which are phonologically and motorically different; (8) introducing puzzle words for common sight words that cannot be sounded out; (9) using object boxes with three-letter words at first, and then words with consonant and vowel digraphs to practice reading and writing common phonograms in increasingly more difficult phonetic patterns; (10) conducting oral and silent reading practice of functional phrases in the classroom; (11) providing limited use of systematically-controlled text once the child is decoding simple words; (12) after the age of six, providing student-leveled literacy tasks highlighting the grammatical and morphological aspects of words in text for reading and writing; (13) introducing pre-selected, classic children’s literature, to enhance student motivation for reading as they
move into learning higher level comprehension skills; and (14) using non-fiction reading materials for comprehension, which are connected to concepts being learned simultaneously in geography, science, or social studies (Lopata, Wallace, & Finn, 2005).

The Montessori literacy curriculum, endorsed by the Association Montessori Internationale (AMI) and the American Montessori Society (AMS), recommends exposing students to the sandpaper letters and the wooden alphabet starting at the age of three because that is the “sensitive period” when children are interested in the sounds that they are making (phonological awareness) and are motivated to communicate their words and ideas with others. Prepared reading lessons for students are available to students during the three-hour academic exploration session each day. Children are allowed to move at their own rate, at their own level, and to make choices in how often they repeat prepared learning tasks. The emphasis is not on how quickly children can achieve but rather on providing time for them to gain mastery of literacy skills at their own individual rates of learning.

Students in the Maple Montessori Public Charter School meet individually and in small groups with their teachers throughout the day as they complete self-selected “leveled” independent tasks provided to them in learning “trays,” created and displayed on shelves by the teacher (Dohrmann, 2003). It is noteworthy that in a Montessori classroom, children have a choice as to whether or not they pursue teacher-prepared reading, math, science, geography, or social studies tasks during the three-hour block of academic exploration time.

It is also noteworthy that reading is generally taught as part of a “language arts” block in public school, while in a Montessori school, reading is woven into a three-hour
child investigation session each day, which includes teaching of other subjects during the same period, like math, science, and geography (Lillard & Else-Quest, 2006). For the purposes of this study, the focus of interest was on the actual literacy materials and practices rather than on the self-selection process in a Montessori classroom environment. I am interested in the impact of the actual materials and methods on student achievement in reading rather than on the environmental aspects of a Montessori classroom. These environmental variables may be important and worthy of future investigation; however, the focus in this study was on the literacy techniques, not on the environment. Future regression studies may be useful in determining the impact of the environmental variables that are present within a Montessori classroom.

The research on achievement in Montessori settings is limited and conflicting. Research by Duax (1995) showed significant strengths in achievement in both reading and language arts for students enrolled in a Milwaukee Magnet Montessori school. In that study, it was reported that 85% of the students scored above the 50th percentile on the *Iowa Tests of Basic Skills*. The problem with Duax’s study is that the sample size (36 students) is so small that the conclusions may not be generalizable. Also, in his study there was no control group to address confounding variables. Duax’s work is quoted in many of the books about Montessori education in spite of its weaknesses because there are so few empirical studies available to review.

Research conducted by Dawson (1987) showed that minority students in the Magnet Montessori program in Houston, Texas, in the Houston Independent School District, scored significantly higher on the *Iowa Test of Basic Skills* than the averages computed for other minority students in the district. The study concluded that 88
Hispanic and African-American students enrolled in a Montessori magnet for a year or more were at a true advantage; however, the greatest benefit was to Hispanic students. While all of the students’ scores were higher in all subtest areas, they were still discrepant from non-minority students in the school district. A t-test was used to analyze if the Montessori students’ scores were significantly different from the other students, which has rarely been conducted in studies of Montessori programs over the last 30 years. There was no control for prior achievement, gender, or socioeconomic status; therefore, the results are inconclusive.

Lopato’s research group in 2005 showed conflicting data among public Montessori students in an urban setting in which Grade 4 students outperformed traditional school students in math achievement and Grade 8 Montessori students performed lower than their traditional school counterparts in language arts. Other findings at other grade levels showed no significant differences in achievement. This study had a large sample size (543 students) but had some serious flaws, especially because it was not clear how long any of the students had been in either program and there was no information regarding the prior achievement levels of the students before they entered these programs. It is quite possible that students who appeared to do better in math from the Grade 4 Montessori settings had actually been stronger math students before the study was initiated.

There have been many successful Montessori schools that have been recognized for their high levels of achievement. In Denver, the Education Trust named the Denison Montessori Schools as one of the top 20 performing schools in Colorado. The school performed in the upper third of test scores of all of the schools in Colorado (Dohrmann,
INFLUENCE OF MONTESSORI LITERACY PROGRAMS ON READING ACHIEVEMENT

2003). The Sedona Montessori Charter School has received recognition for being one of the best performing schools in Arizona and has consistently demonstrated academic superiority on the Stanford 9 standardized tests (Lopata, Wallace, & Finn, 2005). Four Cincinnati Montessori magnet schools were named “Best Practice” schools based on low suspension rates, safe environments, successful student achievement, and economic stability (Dohrmann, 2003). Unfortunately, there have been very few empirical studies demonstrating the effectiveness of Montessori practices in which confounding variables have been taken into consideration. Most of the studies have not been controlled for mobility factors, so it is possible that students coming into the programs were from traditional schools or from other Montessori schools. Achievement is cumulative; therefore, the positive results may be representing educational skills that the children received before entering those schools.

In general, children in traditional public schools have been exposed to many kinds of tests in the classroom (spelling tests, math speed tests, social studies tests) often on a weekly basis, even in the primary grades (Kohn, 2000). Children in Montessori environments are generally unfamiliar with test-taking skills. Dr. Montessori believed that testing was “one-dimensional” and could not truly separate a child’s actual knowledge or skills from the child’s exposure to concepts in their prior experiences (Montessori, 1964). Kripalani (1990) believes, however, that Montessori children are not at a disadvantage when they are compared to children who have had more experience with test-taking skills because the children in Montessori settings are encouraged to think deeply about subjects, which results in strong scores on objective tests, simply because they are knowledgeable and have learned the conceptual information using multisensory,
INFLUENCE OF MONTESSORI LITERACY PROGRAMS ON READING ACHIEVEMENT

developmentally-appropriate methodologies. However, whenever students from Montessori classrooms are compared to students from traditional classroom settings, it is possible that their differences in test-taking experiences could affect the comparability of their scores.

**Reading and Poverty**

Children living in poverty exhibit deficits in literacy skills for a variety of reasons. Some believe that the biggest reason for this discrepancy is related to the fact that poor children enter school with deprived linguistic skills, as described in the influential and frequently cited Hart and Risley study of parent-child communication (Hart & Risley, 1995b). The researchers observed and recorded parents communicating with their very young children (seven to nine months of age) in their homes for a two-and-one-half year time period from lower class, working class, middle-class, and upper middle class families. The researchers discovered that by the age of three, low SES children were significantly delayed in the number of vocabulary words that they heard and were more limited in the words that they expressed. On an hourly basis, children from poor families heard about 616 words per hour, children from working class families heard approximately 1,251 words per hour, and children from professional families heard about 2,153 words per hour (Hart & Risley, 2004). The researchers concluded that within the first four years of life, the poorest children would have listened to approximately 30 million fewer words from their parents than those from the wealthier homes. The authors decided to follow up with these 42 families to ascertain if at the age of ten, these differences in vocabulary and language-based skill development were still part of their learning profiles. Only 29 of the 42 families participated in the later study when the
children were in the third grade; the findings indicated that on a variety of vocabulary, language, and reading comprehension tests, there were still apparent and significant differences between the groups in terms of linguistic competency (Hart & Risley, 1995b).

Linguistic Deprivation in the Early Years

Hart and Risley theorized that the lack of vocabulary exposure, as well as differences in the grammatical and stylistic elements of communication in the lower SES homes, created a distinct disadvantage for poor children in all forms of oral and written communication and would impact their degree of success in the linguistically-based tasks of reading and writing. The study is useful and rare in that it examined children with their parents during everyday communication experiences at a very young age in their natural home environments. The study examined these children over a long period of time at the crucial period when language is developing, during the preschool years (Alexander & Entwisle, 1989).

The home-school connection is often assumed as an important variable in children’s successfulness in school, but Hart and Risley observations of in vivo communication differences established a case for the necessity of providing universal preschool for disadvantaged children who have not been introduced in their early years to sophisticated language models in their home environments. Hart and Risley provided an explanation of how early language differences might truly impact an impoverished child’s ability to keep pace with higher level SES counterparts in language arts achievement in later school years (Neuman, 2003). Todd Risley stated in a conversation in the online series Children of the Code, “Talkative parents produce talkative children. Taciturn parents produce taciturn children. So when children begin to talk, they end up
being either talkative or taciturn depending on how much ‘language dancing’ there is going on in the home” (Risley, 2004). The original study included 30,000 pages of taped conversation with children and their parents and is considered to be one of the most comprehensive pictures of a young child’s early language experiences.

There are several problems with the Hart-Risley study in spite of its widespread acceptance. One criticism is that sweeping generalizations were made about the differences in word counts and its profound impact on children, even though there were only 42 Kansas City families that participated in the study. Kraemer and Thiemann pointed out that observing and making broad-based and predictive conclusions about the impact of more limited parent communication on children’s linguistic competencies, considering the small sample size, was unacceptable (Kraemer & Thiemann, 1987). The fact that all of the poor families were Black and the twelve wealthier families in the study were White is considered to be a serious flaw as well in that families living in poverty are ethnically, linguistically, and racially diverse; and this study reinforced stereotypes about Black culture versus White culture in a country where, at the time, only 25% of the 33 million families living below the poverty line were Black (U.S. Census Bureau, 2003).

Another criticism of the study is that even though the observations of the parents and children from the different homes were observed in the same contextual situations (and the parents were able to choose what those situations would be), it is unclear if the observed interactions during those structured times were actually comparable. For example, if two families were being observed during mealtime, it is possible that in one household the young child might be sitting at the table in a booster seat and in another the child might be in a separate high chair, facing in a different direction or further away.
from the communication partners (the parents), which could affect verbal and non-verbal communication opportunities. Also, there were no controls regarding how the food was served during the meal. In one family, it might be possible to simply reach for the food, while in another it might be necessary to verbally request the food. Subtle differences in physical placement and cultural/behavioral expectations during mealtime activities between and among the groups, particularly in a small sample size, could have resulted in differences in the numbers of words listened to or spoken by parents or children.

Another criticism of this study is related to the potential cultural bias in the researchers’ perspectives, as they stated that the language of the professional families was “positive…polite… promoted problem-solving…and recall,” and taught the children “to take responsibility for social behaviors” (Hart & Risley, 1995, p. 104). Hart and Risley have been criticized for the fact that they were making sociocultural judgments about the linguistic characteristics of a non-dominant culture when looking at the lower SES families (Gee, 2004); however, the work of other researchers indicate that these same linguistic characteristics that were lacking in the lower socioeconomic homes of Black children in the Hart-Risley study are a significant part of the formal language of books, fiction and non-fiction, and are a pre-requisite for positive literacy outcomes in school-aged children (Catts & Kamhi, 1999).

Additionally, there is an assumption that the parents and children were not affected by the presence of an observer (Gee, 2004), especially because the families were given the opportunity to give feedback to the authors early in the study about their comfort level with the observer; however, if there were cameras (without an observer) recording the behaviors, the outcomes might have been different.
A study examining the linguistic behaviors of 380 sets of seven-year-old twins indicates that over half of the variance in children’s conversational language skill is related to genetic effects, with no evidence of significant influence from environmental factors. These findings suggest that children’s spontaneous conversational skills are not just “context-dependent” but neurologically “hardwired.” If linguistic traits are inherited, environmental findings might only explain part of the picture in understanding language deficits in poor children. Nevertheless, if a child enters school with lowered language abilities, these deficits will potentially result in long-term literacy issues, whether the reasons are environmental or genetic or both; there is evidence that language deficits do exist in many low SES populations, and these findings have been well-documented in many studies (Olson & Jerald, 1998; Foster & Miller, 2007; Eden, 2012).

In the ten years following the “30 million word gap” premise, language research on the relationship between language and reading confirmed many of Hart and Risley’s original conclusions, indicating that differences in phonemic awareness, syntactical knowledge, background knowledge, vocabulary, and semantic complexity directly influence reading decoding and comprehension skills (Lyon & Chhabra, 2004). Phonemic awareness skills, which are well-researched as a foundational marker of early literacy success, are also more limited in children from poor backgrounds (Adams, 1990; Pugh et al., 2000). Marilyn Adams reported that preschool children from higher SES families, whose parents read to them for approximately 1,700 hours before they entered school, were far more successful in the acquisition of literacy skills than children who were not read to as frequently in lower SES families (Adams, 1990). Middle-class and upper-middle-class parents might, for example, read *Mother Goose* poems or Dr. Seuss
books to their children when they are infants and toddlers, which exposes them to rhyming skills, which many educators consider to be one of the important oral phonological skills to precede decoding of text. The act of rhyming requires the child to orally delete an initial sound, substitute a new sound in the initial position of the word, and re-blend the new sound with the original, remaining sounds in the word. Rhyming is one of many early behaviors believed to be necessary in learning to read. Many children from poor environments are less exposed to storybook reading at home and therefore may come to school less phonologically aware, creating a phonological gap that persists throughout the child’s literacy education unless the exposure is provided in an enriched preschool and/or elementary school experience (Ferguson, 2007).

**Environmental Deprivation**

Some educators propose that the social and health issues related to poverty, have a far more devastating effect on a child’s readiness to learn how to read, than simply the “language deficit” explanation (Kozol, 1985). Children who are not receiving proper nutrition, not living in safe and secure housing, and/or suffering because of the impact of parents being unemployed or underemployed might not come to school ready to learn (Burney & Beilke, 2008). Programs like the Harlem Children’s Zone have attempted to mitigate those factors by providing “wraparound” social services, so that children will be on a more level playing field (Curto, Fryer, & Howard, 2011).

Children from higher SES backgrounds have access to information, not just during school, but after school and especially during the summer months, when many children experience a “summer slide” (Borman & Dowling, 2006). Most children experience a regression in literacy skills over the course of the summer, which is
ameliorated to an extent for high SES students through summer reinforcement activities such as enrichment tutoring, travel, or camp experiences (Cooper et al., 2000). However, children in poverty, who often do not receive this reinforcement due to limited availability of finances for enrichment activities, may lose ground and essentially never get the opportunities to make up those lost skills (Tienken, 2012). Even during the school year, children in impoverished situations do not have access to the lessons and enrichment classes, which impacts their academic confidence, background information, and their ability to learn how to learn (Eccles, Barber, Stone, & Hunt, 2003).

Many researchers have shown that poverty is related to lower achievement levels on every possible educational outcome (Orland, 1990). The rate of students who get free lunch is a higher predictor of early and late achievement in a school district than the population breakdown in terms of race or ethnicity (Olson & Jerald, 1998). Readiness for kindergarten is also considered by some to be the strongest predictor of long-term academic success (Hodgkinson, 2003). So many children in poverty have difficulty at “the starting gate” in kindergarten because they have had limited access to enriched preschool programs (Lee & Burkham, 2002). Only seven states in the United States (Vermont, Georgia, Maine, New York, Oklahoma, Pennsylvania, and Wisconsin) offer extensive opportunities for universal preschool, which is free but not mandatory, in which disadvantaged students have the chance to recoup some of the aforementioned language deficits and to increase their readiness for literacy activities (Lohman, 2003). Until universal preschool is regulated and mandated, it is up to the parent to investigate opportunities and get their children to the programs; consequently, the most needy of the disadvantaged children in those states are still not in many cases being served. Universal
preschool is a politically-charged issue and was mentioned as a budgetary necessity in President Obama’s 2013 agenda during the State of the Union address; he suggested the importance of expanding preschool opportunities for children in every state and recommended that it would be paid for in the budget by increasing taxes on tobacco products (Herman & Lazarin, 2013). Even in states like Vermont, which has the highest number of preschoolers in state-funded preschool programs, less than half of the state’s three- and four-year-old children are enrolled in preschools (Herman & Lazarin, 2013).

**Phonemic Awareness Differences in Poor Children**

There are many literacy studies investigating if there are differences in how children from low-income urban environments respond to specific reading methods. Direct instruction in phonemic awareness and the alphabetic principle (the basic concept that letters have sounds) made a significant difference in reading performance in a large scale study of 285 first- and second-grade students in urban schools in Texas (Foorman et al., 1998). The researchers found that students who received direct and explicit instruction in understanding the phonological and alphabetic code performed better on word recognition tasks and to a lesser extent on comprehension tasks (Foorman et al., 1998). All of the children in the study were disadvantaged and at-risk for reading failure. Three different methods were used to instruct the children, which differed in the degree of explicitness for teaching phonics. There are several problems with this study. First of all, while the three groups were all randomly assigned to “reading” programs, these programs were not completely comparable. One reading method was a highly structured commercial program (*Open Court*), another consisted of an informal set of materials comprised of literature books that were selected to correspond with a set of specific
influence of montessori literacy programs on reading achievement

phonetic units, and the third method was a child-centered whole language approach, with children picking their own books. The two more phonetically-oriented approaches, both of which yielded stronger test results on word recognition, were not only methods with more specific adherence to the alphabetic code but were also more structured, which may have been another variable influencing student achievement gains in reading skills.

There were no real controls on what the whole language students were reading, which is reflective of a typical whole language system; but it would have been a stronger study if there had been a specific set of books for students to pick from, thereby narrowing the students’ selections. The researcher mentions that there were four teachers in the study who were entirely non-compliant and did not follow any of the programs with fidelity; however, it was decided to include the data from the children in those classrooms, which may have skewed the results. This study only spanned October to April, which is a short time to measure the effectiveness of these methods being used, particularly since all of the children were disadvantaged and most likely entered the educational arena at various levels of linguistic competency. Also, the reading sessions were in some cases conducted one-to-one (one teacher and one student) and in others, one-to-many (numbers varying across situations); not controlling for that variable could have affected the degree of personal attention received by the children, which might have influenced the results as well. This study aimed to prove that explicit code instruction is more effective in predicting word recognition skills (and to a lesser extent, comprehension skills); however, given all of the weaknesses, the results might not be valid or reliable.

There have been many other studies which have indicated similar outcomes to the Foorman study, many of which have been more controlled (Adams, 1990; Blachman et
al., 1999; Brady et al., 2011; Torgeson, 1998). Nevertheless, Foorman’s sample size was large and the population of urban students was diverse (60% African-American, 20% Hispanic, 20% Caucasian), making it one of the few large studies with a diverse urban population that showed marked differences in performance based on the explicit nature of the alphabetic code in reading methods (Lyon & Chhabra, 2004). In 2006, Foorman conducted another study on 4,872 children in kindergarten classes, from 114 classrooms, and discovered that systematic phonics without phonological awareness training was not as effective in producing successful early readers as children who were in programs that included both elements. This study was lauded as exemplary in that two of the large population groups were from Texas and one from Washington, DC, suggesting that in addition to being such a large sample size, the results were similar for the urban children in both settings. Also, the teachers were trained for thirty hours before using the phonemic awareness activities with the children, which Dr. Foorman felt was important in that it stressed the importance of teacher expertise and its impact on the quality of the delivery of the Lundberg-based phonemic awareness program (Lundberg et al., 1980). Foorman professed that teachers need to be well-trained in how to use these instructional approaches so that they are better able to “differentiate instruction based on skill differences among students” (Foorman et al., 2003, p. 24).

Another frequently-cited study by Coyne, Kame’enui, Simmons, and Harn (2004), showed that high-risk readers, who participated in seven months of phonological awareness and direct-code phonetic instruction in Kindergarten were performing in the average range like their low-risk peers, who did not receive the intervention, when measured on word recognition, fluency, and comprehension the following year in the first
grade. This study suggested that providing these interventions early on could change the trajectory of failure for high-risk students (Coyne, Kame’enui, Simmons, & Harn, 2004). The problem with this study was that the conclusions were drawn on the small sample size of only 59 students, as well as the fact that the children were picked for the study because they had been identified as at-risk for reading failure based only on test scores, with no control for socioeconomic status. Additionally, only one student was African American, nine were Hispanic, and the rest were Caucasian, which might mean that the results would not be generalizable to minority populations. The authors cautioned that children who are at-risk for reading problems not only require explicit and systematic instruction in kindergarten in order to be more competent readers in the first grade, but that this kind of intervention should just be viewed as a first step, as these students will most likely need aggressive and ongoing interventions in later school years to reduce their vulnerability to additional reading problems in the higher grades (Coyne et al., 2004).

In 2003, another study of Head Start programs investigated whether or not using phonological awareness activities made a difference in students’ readiness for reading (Yeh, 2003). Yeh found that discrete individual phoneme segmentation, phoneme blending, phoneme substitution, phoneme deletion, and phoneme blending activities were more effective in preparing these children for successful reading than simple rhyming activities. This was an important point because many researchers felt that children would come to school phonologically aware if they had been sufficiently exposed to nursery rhymes and rhyming books read to them by their parents at home (Adams, 1990). Since the sample size was small (only 44 children), these results were not considered to have
broad applicability. However, Yeh joined forces with Connell five years later and conducted another pre-literacy study on Head Start children, this time randomly assigning the children to three different pre-reading interventions with a much larger sample size of 128 children from 16 Head Start classrooms and once again found similar results (Yeh & Connell, 2008). In the new study, it was discovered that competence in phoneme segmentation, phoneme blending, and letter-sound awareness activities was a better predictor of early reading success, than vocabulary instruction or simple rhyming instruction in isolation (Yeh & Connell, 2008). One notable difference in Yeh’s second study is that the group who received the phonemic awareness tasks also worked on letter-sound awareness, which was not part of the initial investigation. It is unclear if that variable, which is not part of classical phonological awareness training because it involved letter symbols, is the one that positively impacted student performance. The work of other researchers (Lundberg et al., 1980; Blachman et al., 1999; Brady et al., 2011) strongly supports the value of phonological awareness activities, but it is not totally clear which phonological awareness activities are the most effective.

The Haskins Institute, affiliated with Yale University, did a longitudinal study with children starting at age three and ending at age ten and determined that the most effective of the phonemic awareness activities on later decoding skills in reading was the children’s ability to clap syllable boundaries in words (Liberman & Shankweiler, 1985). This detail is relevant in assessing the best literacy methods for children. It is a widely held premise that phonemic awareness and systematic decoding instruction are important components of early literacy programs, particularly for children living in poverty; but
more research is needed to specify which elements are the most important ones in predicting student literacy outcomes (Yeh & Connell, 2008).

**Reading Fluency Deficits in Low SES Children**

Reading fluency is often defined as “the ability to read rapidly with ease and accuracy, and to read with appropriate expression and phrasing. It involves a long incremental process and text comprehension is the expected outcome” (Grabe, 2010, p. 72). Students from impoverished backgrounds do not have as many oral reading opportunities at home to practice their reading. This continual practice aids in more automatic word recognition and ultimately in better fluency and comprehension (Adams, 1990). Klauda and Guthrie (2008) assessed 278 Grade 5 students and theorized that there were three levels of reading fluency: one involving the individual word, the second involving the syntactic unit, and the third involving the whole passage, all of which lead to adequate reading comprehension skills. They used hierarchical regression to reveal that reading fluency at each level affects students’ reading comprehension skills. This study discussed the importance of automaticity on recognizing words and grammatical structures and highlights the premise that fluency is affected by doing more reading in and of itself. Their findings suggest that when looking at fluency skills in young children, it is important to focus at the word level in that young readers need a great deal of practice on isolated words to improve their speed and accuracy (Klauda & Guthrie, 2008).

Becoming a fluent reader requires automatic word recognition (Laberge & Samuels, 1974). Automatic word recognition leads to increased speed and accuracy, particularly if students do multiple oral readings of the same information in succession
INFLUENCE OF MONTESSORI LITERACY PROGRAMS ON READING ACHIEVEMENT

(Felton, 2011). Fluency leads to better comprehension because the reading of text is more effortless, allowing the reader to focus on meaning (Penner-Wilger, 2008). Children from disadvantaged situations have difficulties with phonemic awareness, decoding, fluency, vocabulary knowledge, and text comprehension. The more experience that a child has with books, the higher his or her automaticity with words and the higher the chance that they will build the necessary lexical-orthographic connections necessary for smooth and rapid reading (Stanovich & West, 1989).

**Discrepancies in Background Knowledge and Exposure to Books**

Reading comprehension is adversely affected by lack of background knowledge (Anderson & Pearson, 1984). Identifying what kinds of background knowledge are the most important for reading comprehension and providing opportunities for children living in poverty to gain those experiences may help to improve their understanding of text. Pearson and Anderson (1984) did research to suggest that there were three ways that background knowledge affected reading comprehension: the student was able to make inferences, the student was better prepared to direct attention to important versus unimportant knowledge, and the student was ready to develop a plan for recall. Older students need these skills to comprehend higher level text, even though the development of these processes takes place when students are very young (Stahl, Hare, Sinatra, & Gregory, 1991). Hiebert (1994) explained that low SES students who depended on school for vocabulary and background knowledge continued to show comprehension patterns like those seen in younger children in the higher grades because they did not know how to deeply interpret text; however, Hiebert optimistically noted that when the teacher structured the task for the child, even those children with little background
knowledge or limited vocabulary skills, could be stimulated to think differently (Hiebert, 1994). After evaluating the reading comprehension performance of 188 Grade 5 students, Anderson, Wilson, and Fielding (1988) discovered that the amount of time children spent reading was the best predictor of reading comprehension. These researchers controlled for the students’ prior reading levels from Grade 2 and shared that early reading proficiency related to the amount of time that students spent reading in Grade 5 (Anderson, Wilson, & Fielding, 1988).

Many hours in Montessori-based literacy programs are spent teaching preschool-aged children about the parts of a book, the left-to-right progression of the reading process, the interrelationship of the pictures to the print, and the care of books (Montessori, 1949). According to Maria Montessori, a child who enters school who has had little experience with books at home needs to become comfortable with the concept of handling a book. There is documented evidence that children who grow up in active literacy environments at home tend to have higher reading achievement (Bus & van Ijzendoorn, 1995; Sonnenschein & Munsterman, 2002; Scarborough, Dobrich, & Hager, 1991). For many children living in poverty, school is the first place that they might encounter books. Those students will need more time to catch up to the children who have extensive experience being read to by their parents as well as the time they spent “reading” themselves, even if they have just been “reading” pictures.

Some researchers look at literacy skills for children living in poverty from a perspective of how to best prepare the child for school; other researchers look at how to prepare the school for the child (Swadener, 2010). While both of these perspectives are necessary, my study examined the latter to determine if there are interventions and
methods which might lessen the impact of poverty and provide the disadvantaged children with a better chance of acquiring sufficient literacy skills during their years in school.

Summary

A great deal of focus has been placed on the acquisition of literacy skills across academic settings. Different researchers have studied the impact of multiple variables on reading achievement, especially for children living in poverty. For centuries, academicians have argued over the value of whole word approaches versus phonetic approaches, often referred to as the “reading wars.” School systems with high rates of poverty, like Baltimore City, are experimenting in charter school settings with alternatives to traditional educational models in an effort to help more children to read proficiently. A Montessori-based literacy curriculum is one of many options available to children in the Baltimore City Public Schools. This dissertation study examined the influence of Montessori-based literacy approaches on reading achievement for children in Grades 3 through Grade 7.

Most of the large scale empirical studies in the area of literacy over the last 15 years concur that phonemic awareness activities precede systematic decoding strategies, which are then followed by activities in fluency and automaticity, leading up to understanding the linguistic components of reading and ending in the ability to comprehend text (Lyon & Chhabra, 2004). The biggest addition to reading research over the last 15 years has been the discovery that phonemic awareness leads the instructional reading path, which helps children to understand the structure of the language without print in activities like rhyming, segmenting, and blending sounds and syllables (Brady et
al., 2011). Many of the studies also indicate that synthetic phonics approaches, in which children blend sounds in a word together, sound by sound, as opposed to analytic phonics approaches, in which children learn a word as a whole unit and then break it down into its component phonetic parts, are more effective in helping children learn how to decode new words, especially when instructing disabled readers (Johnston & Watson, 2003).

The new science of reading, in which researchers use brain scanning devices to measure cognitive activity while children are reading, confirms much of the information previously learned in traditional reading research studies of how children acquire literacy skills (Dehaene, 2009). By measuring blood flow and electrical activity in the brain while an individual is reading, neurologists have been able to map the parts of the brain being activated during the reading process. These studies indicate that the pathways that are activated in the brain reflect the sequence of steps that have been discussed in the major studies for many years (Dehaene, Duhamel, Hauser, & Rizzolatti, 2004).

Very young impoverished children exhibit differences in phonemic awareness, grammatical structures, vocabulary, and background knowledge as early as the age of three (Hart & Risley, 1995b). Consequently, these children are significantly behind their higher socioeconomic peers when they are learning to read. The impact of these variables affects their literacy skills throughout the course of their schooling. Research suggests that early intervention to build these skills is a necessary part of helping impoverished children to ultimately be successful in literacy activities. This study examined whether Montessori-based interventions and methods influenced student reading achievement for children in urban settings.
Chapter III
Methodology
Design

My purpose for this study was to identify and explain the differences, if any, in the Maryland School Assessment (MSA) results of students in Grades 3-7 who attended the Maple Montessori school and experienced Montessori reading methods when they were compared to students in a different charter school who received traditional reading instruction during the 2011-2012 school year. The Baltimore City Public Schools would benefit from knowing if the reading practices used at this Montessori school were efficacious in meeting the literacy needs of students in an urban charter school setting. I analyzed whether the independent variable of a specific Montessori-based reading approach used to instruct a selected sample of students impacted the dependent variable of reading achievement as measured by test results for the 2011-2012 Reading Section of the Maryland School Assessment (MSA). This research sought to examine the influence of the Montessori reading methods being used within this Baltimore City charter school on student achievement as measured by student performance on the state's reading test.

I chose to use an explanatory, non-experimental, cross-sectional design, using data that already existed, to shed light on the effects of Montessori-based reading curriculum and instruction on literacy (Johnson, 2001). I chose not to manipulate any of the variables and examined information at one single point in time. In his description of classifications of non-experimental research, Johnson (2001) asked, “Were the researchers trying to explain how the phenomenon operates by identifying the causal factors that produce change in it? If the answer is ‘yes’ (and there is no manipulation)
then the term explanatory, non-experimental research should be applied” (Johnson, 2001, p. 90). I did not have control over (a) the selection of teachers who taught the children in the Montessori-based curriculum or the *Houghton-Mifflin* basal reading curriculum, (b) the class grouping decisions at either of the schools that the children attended, (c) the execution of reading instruction presented in any of the classrooms, (d) the actual reading books, games, and/or activities selected by the teachers, or (e) the testing conditions that children experienced during the administration of *Maryland School Assessment* (*MSA*), which was given in March of that year to evaluate the students’ reading performance.

The *Maryland School Assessment* (*MSA*) test results used in this study were obtained from the Baltimore City Public Schools after instruction had already taken place, and were analyzed in retrospect. I was limited by the availability of testing information, as the *MSA* was the only test used to measure reading achievement for both groups of children in the study. The null hypothesis for this study states that there are no differences in reading performance on the Reading section of the *MSA* in the cohort of children instructed in the Montessori-based reading curriculum when compared to the cohort of children instructed in the *Houghton-Mifflin* literacy materials.

**Setting**

Baltimore City is 92.052 square miles and has a total population of approximately 626,664 (U.S. Census Bureau, 2010). In the 2011-2012 school year, the Baltimore City Public School system educated 44,380 students in Grade pre-K to Grade 5, 16,996 students in Grades 6 to 8, and 23,372 students in Grades 9 to12 (Baltimore City Public Schools, 2012b). There are currently 56 elementary schools, 72 elementary/middle schools, 12 middle schools, 17 middle/high schools, 31 high schools, 6 special education
schools, 33 charter schools, and 18 “transformation” schools (schools which will serve Grades 6 through 12 and are operated by independent education entities, each with a specific theme and focus on college, career, or an alternative program) (Baltimore City Public Schools, 2012b). The demographic breakdown of students attending the Baltimore City Public Schools is as follows: 84.7% African-American, 8.0% White, 5.4% Hispanic/Latino, 1.0% Asian, and 0.4% Native American or Alaska Native (Baltimore City Public Schools, 2012b). There are 84.1% of the Baltimore City school students who are from low income families, based on eligibility for free or reduced-price meals (Baltimore City Public Schools, 2012b). There are 4% of the students in pre-Kindergarten to Grade 12 who are classified as Limited English Proficient (LEP) learners (Baltimore City Public Schools, 2012b).

The population at the Maple Montessori School during the 2011-2012 school year consisted of 242 students. The demographics at the school that year included the following population breakdown: 46% Caucasian, 37% African American, 7% Biracial, 5% Hispanic, and 4% Asian. The population of 622 students at the State Public Charter School in 2011-2012, some of whom served as the control group in this study, had a population breakdown as follows: 11% Caucasian, 66% African American, 3% Biracial, and 19% Hispanic. In this study, the race categories have been subdivided into White and Non-White for matching of students. In the 2011-2012 school year, Maple Montessori had 35% of its children receiving free and/or reduced-price meals. In that same year, 81% of the children received free and/or reduced-price meals at State Public Charter School. In this study, students were matched on three socioeconomic subcategories: free, reduced, or paid lunch. There were obvious differences in
demographics at the two schools as a whole, particularly in terms of SES, as measured by the percentage of students who received free and/or reduced-price lunch and the percentages of White versus Non-White students. In this matched-pairs study, each pair of students was matched for free, reduced, and/or paid lunch status (SES), making it possible to compare the pairs of students who formed the two cohorts, even though the percentages of students needing free and/or reduced-price lunch at the schools, as a whole, were quite different. Likewise, the students were matched with White or Non-White partners to make the groups more comparable.

The reasons for selecting State Public Charter School to form the control group were as follows: (a) it was a nearby charter school in the same school district, thereby reducing selection bias, as all of the children’s families from both schools chose to send their children to a lottery-based charter school, and (2) they used a traditional *Houghton-Mifflin* basal approach to reading, which was different in many respects from the Montessori-based reading curriculum. The cohorts of student pairs from each school were comparable on SES and race, even though it is noteworthy that there were many more “paid lunch” students attending the Maple Montessori School, for whom there were no “paid lunch” student matches at the State Public Charter School, which substantially limited the sample size.

Ten percent of the students at Maple Montessori Public Charter School received special education services during the 2011-2012 school year. Nine percent of the students at State Public Charter School received special education services in that same year; thus, the two schools were similar in terms of the percentage of students who received special services, even though none of those students were included in this study.
Less than one percent of the students at Maple Montessori received services as English Language Learners (ELL). Fourteen percent of the students at the State Public Charter School received services as English Language Learners (ELL). Despite that difference, none of those students were included in this study.

The classroom structure in a Montessori program differs from the structural elements common in a regular classroom setting, like the ones at State Public Charter School. In Maple Montessori, the students move at their own pace and complete pre-prepared “hands-on” materials, usually meeting in one-to-one or in small groups with their teachers during instructional time. In the classroom settings at State Public Charter School, teachers mostly meet with the children in small (5 to 10 children) or large groups (25-30 children) throughout the day. Therefore, the adult-to-student interactions with students during instructional time are quite different in these two school settings.

The Maple Montessori Public Charter School (MMPCS) was established five years ago as a new alternative school option for students living in Baltimore City, Maryland. The curriculum is quite different from the surrounding schools in Baltimore City, as the methods presented to children in the classrooms are based on the teachings of Dr. Maria Montessori. At both of these schools, parents entered their children’s names into a lottery system, which were then randomly selected to attend these schools by the Charter School Division of the Baltimore City Public Schools. Children who were not selected were placed on a Wait List.

Each of the general education students in Grades 3-7 from the State Public Charter School was matched to a general education student in Grades 3-7 who attended the Maple Montessori Public Charter School during the 2011-2012 school year. Students
were matched according to their grade level, their prior reading level (except for students in Grade 3), their socioeconomic status, and their race. The State Public Charter School has a theme-based curriculum and uses the *Houghton-Mifflin* basal reading series. Like the children in the Maple Montessori Public Charter School, the children in the State Public Charter School live in many different neighborhoods in the city. I was not able to control for class placements of students, but I was able to match pairs of students from each of the two schools, who then formed the two cohorts by the following variables:

a. Participation in a lottery-based charter school,

b. Grade level during the 2011-2012 school year

c. Socioeconomic Status (SES) based on eligibility for free lunch, reduced lunch, or paid lunch

d. Race (two categories of White or Non-White)

e. Reading Level (Basic, Proficient or Advanced) for the prior year (2010-2011) on the Reading section of the *Maryland School Assessment* (available for students in Grades 4, 5, 6, and 7)

f. Non-participation in special education services

g. Non-participation in programs for students with Limited English Proficiency (LEP)

**Description of the Two Literacy Programs**

The students in Grades 3-7 who attended the Maple Montessori Public Charter School were instructed in Montessori-based curriculum and instruction literacy methods which included the following: a synthetic phonetic approach which taught them letter names instead of letter sounds; sandpaper letters which they traced while making the
associated letter sound and teachers used to model techniques for decoding unknown words in a sound-by-sound fashion; a system of learning to write before learning to decode using a three-dimensional moveable alphabet before they were able to record letters with a writing instrument; and books which were initially phonetic in nature and then eventually comprised of both phonetic and non-phonetic words in fictional and non-fictional “trade” books (many of which were deemed as classic or prestigious works of literature through nationally-recognized book awards). The Montessori literacy instruction and curriculum methods at the Maple Montessori Public Charter School followed many of the recommendations discussed in the literature on literacy during the last decade related to the new “science” of reading (Lyon & Chhabra, 2004). The children were first exposed to phonological awareness activities; they were then instructed in systematic, synthetic phonics training; they were then provided with ample practice time to read aloud for fluency; and then were finally instructed in strategies for text comprehension, with an emphasis on vocabulary and syntactical word structure. One notable difference was that the children were taught to write with the moveable alphabet before they were taught to read. The materials and methods used in this Montessori literacy program were multisensory in nature. In the Maple Montessori School, the teachers also supplemented the reading program with Science Research Associates (SRA) leveled story boxes, so that students were able to receive additional reading practice at their individual grade level, in decoding, fluency, and comprehension. The classroom teachers were trained and certified in the Montessori philosophy and taught how to use Montessori materials according to the guidelines of the American Montessori Society (AMS) or the Association Montessori Internationale (AMI) teacher-training programs.
All but four of the teachers at this Montessori school had also graduated from approved university programs and were certified by the State of Maryland to teach Elementary or Middle School Education. They were not provided with formalized teacher manuals or lesson plans but were encouraged to apply the philosophy and methodologies as originally developed by Maria Montessori and used a combination of commercially-prepared and teacher-made materials designed for individualized and small group activities (Montessori, 1949). Children had the option of completing pre-prepared literacy tasks during their morning instructional time or they could choose to work during that time on pre-prepared math, science, social studies, or geography tasks.

The Grade 3-7 students attending the State Public Charter School were instructed in the *Houghton-Mifflin* comprehensive reading series. These materials and methods included lessons in phonological awareness; systematic analytic phonics (in which each letter sound has an associated picture or object, and new words are not generally decoded in a sound-by-sound fashion but rather by identification of beginning and ending sound knowledge, chunks of letters, or repeated whole word recognition); and books of stories, which initially contained mostly decodable words with some non-decodable words. After exposing the children to letter names and their associated sounds, as well as to frequently-used sight words, the program gradually led the children into basal readers which contained a combination of decodable and non-decodable words, in fictional and non-fictional short stories, written at individual grade levels. Teachers were provided with specific teacher manuals for each grade level that they taught, which explained what concepts to be covered in each lesson and how those concepts were to be presented to the children. Students were provided with basal readers and corresponding workbooks,
which contained follow-up decoding and comprehension activities for each lesson. The instructional methods and materials were mostly print-based and not multisensory in nature for the most part. The State Public Charter School used a “theme-based” curriculum at all grade levels so that the reading program was often woven into larger conceptual platforms. Teachers at the State Public Charter School were prepared to teach reading in undergraduate and/or graduate level reading courses at approved university programs and were certified to teach Elementary and/or Middle School by the Maryland State Department of Education. Most lessons in the State Public Charter School classrooms were taught in small and large groups of children, based on test scores, which were used to measure the students’ reading levels. Students participated in daily literacy directly from their teachers in their reading groups or while they completed assigned independent reading tasks during a structured Language Arts period.

Sample

The sample for this study included 71 students in Grades 3-7, selected from the MMPCS, and 71 students in Grades 3-7, selected from the SPCS, none of whom were classified as special education students with Individual Education Programs (IEP’s) or were classified as Limited English Proficiency (LEP) learners. All of the students were matched for attendance at a charter school, grade level, race, socioeconomic status (SES) (according to free lunch, reduced lunch, or paid lunch eligibility); and for the students in Grades 4-7, the prior year’s MSA Reading section score of Advanced, Proficient or Basic level (prior testing information was not available on Grade 3 students, who took the test for the first time in the 2011-2012 school year).
By controlling for selection bias in that all of the children came from families who chose to have their children participate in a voluntary charter school experience, the results from the two cohorts are more comparable and less likely to be due to differences in levels of a family’s engagement with the educational process. Families who choose public charter schools have to investigate the situations, attend multiple meetings to assess the differences in the educational environments between their traditional public school and the chosen charter school, and are required to fill out extensive paperwork to enroll their students in the charter school. The characteristics of a family who chooses to send their child to a charter school might influence the child’s educational environment at home; therefore, both schools used in this study were optional lottery-based charter schools which required the same degree of parental effort in terms of application and acceptance (Curto, Fryer, & Howard, 2011). Students from all over Baltimore City attend these charter schools, making both school populations rather diverse in nature, as they include children from many different Baltimore City neighborhoods.

In Table 1, there is a description of the student pairs that were formed to create the two cohorts. Table 1 Indicates the student from the Maple Montessori School that was matched to a student from the State Public Charter School to form a pair. Descriptive information about each student in the pair is included in the table to show how the student from State Public Charter School is similar to the student from Maple Montessori Public Charter School. After the Student Identification Number (SIN), the child’s grade (Gd) and MSA score in 2010-2011 is listed, as well as the Level (Lvl) on the Reading Section in 2010-2011 (for all but Grade 3 students, where there is an n/a for the previous year’s MSA information). Then the child’s socioeconomic level (SES), as
described by free, reduced, or paid lunch, is listed, as well as the child’s race (five categories). I eventually divided the children by race (Re) into two categories of White and Non-White, when forming the groups. The chart then lists the child’s gender (Gdr), even though that variable was not used in the formation of the groups. Then the Limited English Proficiency (LEP) rating follows, explaining the student’s level of proficiency with English, which on the charts was listed as an “F” for Full proficiency, for all but two of the students, who were erroneously assigned a designation of “n/a” on the MSA score sheets. I checked with the Baltimore City Public School Office of Achievement and Accountability (OAA) to determine if those two students were not proficient in English because they did not have an “L” beside their names, like the students who were listed with Limited English Proficiency. The representative from the OAA stated that the two students with “n/a” next to their names in this category were not considered to be “LEP” or Limited in their English Proficiency and could be included in this study as students with Full proficiency. Finally, Table 1 lists the child’s score and Reading level on the 2011-2012 MSA, which was later used for t-tests to assess if the mean scores for one group were significantly better than the mean scores for the other group at the .05 level of significance.
Table 1

Participants/Matched Pairs

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<th>'11 Lvl</th>
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### Influence of Montessori Literacy Programs on Reading Achievement

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I also conducted an analysis of the matched pairs for the prior year’s (2010-2011) reading achievement to be sure that these pairs were comparable before conducting the study of their 2011-2012 scores on the Reading section of the MSA.

Table 2
Analysis of Matched Pairs for Prior Year’s 2010-2011 Reading Achievement

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<th>Grade in 2011-2012</th>
<th># of Pairs</th>
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The results of the 2010-2011 t-tests for the matched pairs indicated that there were no statistically significant differences in their scores. Information on Grade 3 students from the 2011-2012 school year was not available because those students took the MSA for the first time in the third grade and had attended second grade in 2010-2011. Therefore, the t-test for the entire group of matches does not include the Grade 3 students, who were included in the 2011-2012 investigation after they took the MSA at the end of that grade. The mean scores from the previous year in 2010-2011 for the students in Grades 3-7 from the two cohorts, one from MMPCS and the other from SPCS, were very similar, and there were no significant differences on the two-tailed level of significance tests (p ≤ .05). Therefore, in addition to these students being paired on many different characteristics, it is also evident that both groups were performing in the same ranges of
achievement, with no significant differences in their scores before the formal examination of the groups in 2011-2012.

**Procedures**

I verbally presented my study proposal to the Maple Montessori Public Charter School Board of Directors on February 17, 2012. The Baltimore City Public Schools granted me formal permission to conduct this study with a Memorandum of Understanding (M.O.U.) letter on May 15, 2013, signed by the C.E.O. of the Baltimore City Public Schools.

Participants’ scores used in this study were from (1) Lower Elementary Classrooms consisting of Grade 1, 2, and 3 students (only Grade 3 students were used in this study), Upper Elementary Classrooms consisting of Grade 4, 5, and 7 students, or Middle School Classrooms consisting of Grade 7 and 8 students (only Grade 7 students were used in this study) who attended the Maple Montessori Public Charter School during the 2011-2012 school year, or (2) from a Grade 3, 4, 5, 6, or 7 classroom at the State Public Charter School during that same year. Both schools were registered as approved charter schools and served as public options available to children who lived anywhere within the boundaries of the Baltimore City Public Schools.

I accessed the 2011-2012 MSA data on students from both Maple Montessori Public Charter School and from the State Public Charter School in Excel files that were anonymized by the Baltimore City Public Schools Office of Achievement and Accountability and presented to me, in person, in a “Read Only” CD, on May 27, 2013. I analyzed the data by conducting t-tests of significance, using the Excel program (Microsoft Office 2010).
**Instrumentation**

The *Maryland School Assessment (MSA)* is a criterion-referenced standards-based test with a multiple-test-item format. The *MSA* measures reading, math, and more recently (for only Grade 5 and Grade 8 as of 2010), science achievement. It meets the testing requirements of the federal No Child Left Behind Act and is given every year in early March over two school days in Grade 3 (first year) through Grade 8, to every public school student in the State of Maryland. Students who are unable to take the test due to severe handicapping conditions take an alternative version of the test called the *Alt-MSA* (Maryland State Department of Education, 2005).

The scores generated from the Reading section of the *MSA* were gathered for this study. The Reading section of the *MSA* test includes “Selected Response” items, which require the student to choose a correct answer from four responses and “Brief Constructed Response” items, requiring students to write an answer consisting of a few words, a few sentences, or a paragraph. The *MSA* has norm-referenced items from the *Stanford Achievement Test (Tenth Edition)* and criterion-referenced items, based on and adapted from the *Maryland Reading Standards*, which are part of the voluntary *Maryland State Curriculum* standards (Maryland State Department of Education, 2010). The *Maryland State Curriculum* standards are now being aligned with the *Common Core State Standards*, but test items on the *MSA* do not yet reflect those changes (Foster, 2013). Adequate Yearly Progress (AYP) for each school year, in accordance with the No Child Left Behind requirements, is determined by the percentage of students in each school and each school district who score at the Proficient and Advanced levels on each section of the test.
An overall level of Basic, Proficient, or Advanced on the Reading section of the MSA is provided for each student. These cut-off standards are set by the Maryland State Department of Education. A score of Proficient tells how well a “child has learned the reading (and math) content that Maryland has determined all students should know” (Maryland State Department of Education, 2012).

The parents are sent a report of their child’s scaled scores on the MSA, which range from 0 to 800. Student scores may also be reported as individual or group percentile ranks, stanines, grade equivalents, norm curve equivalents, achievement/ability comparisons, content cluster and process cluster performance categories, and performance standards. Each student receives a Norm-Referenced and a Criterion-Referenced score. The Norm-Referenced scores are generated from the *Stanford Achievement Test (Tenth Edition)*. The Criterion-Referenced score is generated from both the *Stanford Achievement Test (Tenth Edition)* and from items that are based on objectives from the Maryland Reading Curriculum. The test developers created a rubric with maximum values between 0 and 3 for scoring these “Brief Constructed Response” items. Representatives from the Harcourt Association Incorporated, employees of the Maryland State Department of Education, and teachers, administrators, and content specialists from local school systems developed the MSA test (Harcourt Assessment, Inc., 2004). The *Stanford Achievement Test (Tenth Edition)* items on the MSA were originally sampled in the spring of 2002 on 250,000 students in the State of Maryland and then again in the fall of 2002 on another 110,000 students living in Maryland. The schools selected for the sampling procedures were selected in a stratified cluster sampling design.
by geography, region, socioeconomic status, urbanicity, and ethnicity (Harcourt Assessment, Inc., 2004).

Skills measured by the Reading section of the MSA include phonics; using context to determine the meanings of words; using word structure to determine the meaning of words; identifying or explaining the main idea of a text; identifying and explaining what is directly stated in text; drawing inferences from what is not directly stated in text; drawing conclusions based on text and prior knowledge; making predictions from text; paraphrasing the main idea of text; summarizing information from text; using graphic aids to understand information in text; using informational aids such as introductions and overviews to understand text; analyzing the organization of texts; identifying and using words associated with organization of information in text; identifying and explaining the purpose of the author or the opinions of the author in text; identifying and explaining relationships between and among ideas in text; explaining specific words or phrases in the text; identifying and describing the setting, mood and characters in narrative text; identifying and explaining the literal versus figurative meaning of words; and identifying and explaining universal themes in text. It is noteworthy that most of the measured reading objectives involve comprehension, with a limited number of items measuring phonic skills (Maryland State Department of Education, 2011b). There are no items assessing phonological awareness, reading fluency, or decoding of whole words in isolation.

The standard for receiving a Proficient score on the Reading section of the MSA is a minimum score of 388 at the third-grade level; the minimum standard for Advanced in Reading is 456 at the third-grade level. All scaled scores below 388 are listed in the
Basic range for third-grade students. Students who score between 388 and 456 meet the minimum criteria for the Proficient range, while those who score higher than 456 are in the Advanced range. Each grade level has similar but slightly different scores for Basic, Proficient, and Advanced. Maryland has one of the lowest cut-off rates for Proficient in the United States according to *The Proficiency Illusion* report, which explains that every state under the No Child Left Behind Act (NCLB) was allowed to set their own standard for the cut-off point for Proficient, and Maryland ranked in the bottom third of the 26 states that were studied in that report (Cronin, Dahlin, Adkins, & Kingsbury, 2007). Therefore, it is “easier” to be Proficient in Maryland than in many other states, which might artificially inflate the percentages for Proficient and Advanced for Maryland students on the *MSA*. Not all of the reading objectives in the 2011-2012 *Maryland State Curriculum* (which has been deemed as a voluntary but recommended curriculum guideline for all of the school systems in the state) have an associated assessment item on the test (Glazer, 2006).

**Validity**

In Maryland, and specifically in Baltimore City, there are many different reading methods employed in both traditional and public charter schools, increasing the likelihood that the test items may not reflect the content learned in some of the classrooms. The *Maryland Reading Curriculum* is voluntary; some students may have been taught a particular concept that appears in an item on the *MSA*, while others would not have been exposed to that topic, which threatens the internal validity of the *MSA*. This is a content validity issue since the content of the items on the test do not always align with the curriculum being taught; similarly, the skills being taught in classes are not
always reflected on the test. The voluntary nature of the *Maryland State Curriculum* makes the *MSA* a more vulnerable instrument than many other state tests in this respect because the items have not been aligned with a mandatory state curriculum; each local educational entity may choose different curricular goals and objectives for instruction. All of the children in the State of Maryland are being given the same *MSA* test, even though they have been instructed in a variety of reading approaches from the voluntary Maryland State Curriculum. W. James Popham stated the following in 1999:

In view of the nation's substantial curricular diversity, test developers are obliged to create a series of one-size-fits-all assessments. But, as most of us know from attempting to wear one-size-fits-all garments, sometimes one size really can't fit all. The designers of these tests do the best job they can in selecting test items that are likely to measure all of a content area's knowledge and skills that the nation's educators regard as important. But the test developers can't really pull it off. Thus, standardized achievement tests will always contain many items that are not aligned with what's emphasized instructionally in a particular setting (Popham, 1999, p.1).

Correlations between the *Tenth Edition* and the *Ninth Edition* of the *Stanford Achievement Tests* indicated strong convergent validity. Therefore, this particular edition that was used to create the *MSA* appears to be consistently measuring the same or similar concepts that were measured in the earlier version of this test (Harcourt Assessment, Inc., 2004).
There was a test blueprint and development process to measure content validity for the Norm-Referenced items on the MSA. Blueprints aligning the items with the *Maryland State Voluntary Curriculum* were used to align the content of the items with the state’s *recommended* curricular goals. They examined internal structure validity by conducting inter-correlations for the items in General Reading, Literary Reading, and Informational Reading. Moderately strong inter-correlations existed among the three areas, ranging from .67 to .73. Unidimensionality was determined by use of principal component analysis. Eigenvalues of a minimum of three times larger than the second factor met the assumption of unidimensionality. The review of the *Stanford Achievement Tests (Tenth Edition)* in the *Sixteenth Mental Measurements Yearbook* indicated that it is also necessary for each school system to assess the content validity of the test items on statewide tests in relation to how well those items actually align with the specific goals and objectives in each local curriculum (Carney, 2005).

There are other test validity issues that need to be considered on the *Maryland School Assessment (MSA)* in that it only measures specific areas of reading. This limitation affects the content validity because the test may not be measuring critical elements of the reading curriculum that might account for differences in the two cohorts. One of its weaknesses in the Reading section of the *MSA* is the paucity of items measuring decoding skills (only a limited number of items measuring phonics and no items measuring isolated word identification). Reading achievement includes phonological awareness, systematic decoding, reading fluency, vocabulary development, and text comprehension (Lyon & Chhabra, 2004). The *MSA* test is mostly measuring text comprehension; thus, the results do not provide a comprehensive look at the totality of
the elements that comprise reading instruction, which means that certain differences in literacy skills between the two groups, may be undetected by this measure (Adams, 1990).

External validity explains the extent to which each student’s performance demonstrates their actual knowledge of the subject as a whole and whether or not it is the same as the knowledge of others answering the same question. It is hard to design a statewide measure that truly represents the concepts that were taught to each public school child, considering the fact that each school system may use different reading programs. The MSA is vulnerable in this respect because of the voluntary rather than mandatory curriculum standards in the State of Maryland. Also, it is cost-prohibitive to design measures that are truly valid and reliable (Madaus & O'Dwyer, 1999).

Reliability

One of the main threats to reliability on a test like the MSA is based on the differences in the individuals who are assigned to score the tests, who may or may not be experienced in the subject of reading or objective when scoring the content. Two major errors that occur on standards-based measurements leading to a lack of reliability are random errors and leniency errors (Raymond & Viswervaran, 1993). Even when there is a set rubric for scoring, as on the MSA “Brief Constructed Response” items, different raters might assess the information differently. Random errors occur, which means that two different people scoring might not assign the same value to the answers, especially on items that are open to interpretation. Systematic errors are present on standardized tests because of “leniency,” which occurs when pieces of data are consistently regarded as positive (Haladyna & Rodrigues, 2013). This may be due to a scorer’s tendency to be
too positive when scoring items that are subjective in nature due to personal biases or because the scorer is hoping that the results will lead to a positive interpretation of the data. In the development of the *MSA*, the first two raters’ scores were assessed to measure inter-rater reliability on the Reading Section of the *MSA*. There was 95% agreement among raters for all grade levels of the Reading section for adjacent agreement rates.

If any “Selected Response” or “Brief Constructed Response” items were rated more difficult for a group of students, they were flagged as DIF (differential item functioning). The referent group consisted of Caucasian males, and the other groups were either females or African-Americans (Harcourt Assessment, Inc., 2004).

Although the Reliability Coefficient and the Differential Item Functioning yielded positive results, there are other threats to reliability in this study. The reliability of this study is still compromised to an extent because of the limitations in the *MSA* instrument in and of itself, particularly on the “Brief Constructed Responses,” which are subjective in nature and vulnerable to random and/or systematic errors. The student responses might result in different outcomes during test-retest procedures because of differences in new raters’ interpretations of the responses due to different personal biases or a lack of content knowledge that might be present in each new group of raters. Even though Harcourt formally trains the raters to score these items, their prior knowledge before becoming scorers of this test may well influence their depth of understanding when assigning students a number on the rubrics for the “Brief Constructed Responses” (Harcourt Assessment, Inc., 2004).
The KR20 Reliability Coefficients for the *Stanford Achievement Test* have been assessed multiple times during the 1990s and have been in the mid-.80’s to the .90’s range, which is considered to be strong. This measure applies only to the items on the *MSA* that are part of the *Stanford Achievement Test*.

**Threats to Internal and External Validity**

In any research study, it is necessary for the researcher to evaluate any of the possible threats to validity, both internal and external. There are several possible threats to validity in this study.

There was a population validity issue in relation to the fact that the children who constituted the control group were from a different charter school that possessed other differences beyond the difference in the reading approach, which could have impacted student reading performance. This is a threat to internal validity, as there may be other causes for differences in performance besides the differences that are related to the use of the Montessori reading-related materials and activities or the use of the *Houghton Mifflin* literacy curriculum. I tried to overcome some of these differences by selecting children in the control group from a lottery-based charter school, thereby reducing the impact of selection bias. In fact, the reduction of selection bias is one of the strengths of this study and enhances the validity of this study. However, the students from the State Public Charter School, as well as the students at Maple Montessori, were from many different areas of the city. Inherent differences in the children’s communities may influence some of the factors related to the child’s reading achievement, like safety variables in the community affecting their overall quality of life, access to resources for meeting the social service needs of their families, and/or differences in community values related to
academic achievement. This limitation affects the validity of the study, as the community characteristics of this particular set of children may not be entirely comparable to children from a different set of neighborhoods. By systematically matching the students on grade, SES, race, and the prior year’s MSA score (with the exception of the Grade 3 students who were not tested on the MSA in Grade 2), they were still quite similar to one another, in spite of these geographical differences. These geographical differences are present in every charter school within the Baltimore City Public Schools; therefore, this issue would be present in any comparisons of charter schools within this public school system.

One strength in the sampling validity in this study is based on the fact that no special education students with Individual Education Programs (IEP’s) were included in the population samples. Therefore, all of the children took the standard form of the test rather than the alternate form used with students with special needs. There were also no students with Limited English Proficiency (LEP) included in this sample. Children with English as their second language would have very different reading profiles and therefore, would not be comparable to children with English as their first language.

Matching Grade 4, 5, 6, and 7 students on the reading level of the prior year’s MSA score, created groups that were far more comparable in regard to literacy levels, increasing the strength of the comparisons between the two groups. However, there is no prior year’s achievement available on the Grade 3 students, as the testing takes place for the first time at the end of that year; consequently, I decided to analyze the total group data from each school, with and without the Grade 3 students, to be sure that those student pairs did not skew the overall reading test results. The results with and without
the Grade 3 students were not markedly different; however, the comparisons for Grades 4, 5, 6, and 7 are more robust because the student pairs were matched on prior reading achievement.

Threats to ecological validity were present due to the fact that the children receiving the Montessori-based literacy programs were in a charter school with three grades in each classroom and were instructed by teachers who had Montessori certification and training, with all but four of the teachers possessing additional state certification credentials. The teachers in the State Public Charter School were certified in the state certification credentials and taught the children in individual, single grade classrooms, with 25-30 children in each room. Differences in classroom structure and teacher preparation could account for differences in student achievement regardless of methodological differences.

The MSA test is limited in scope, as described in the Instrumentation section of this report. It primarily measures comprehension and omits measurement of other significant areas of reading, including phonological awareness, word identification, and fluency. Many state performance-based assessments have inherent problems with measurement validity and reliability. The construction, content, administration, and scoring of the tests might produce information that does not always measure what it has purported to measure (Bracey, 2009). Daniel Koretz, a psychologist at the Harvard University Graduate School of Education, explains in his studies on tests and measurements that standardized tests often do not measure many of the educational skills that are actually learned in the classroom, which is often a violation of content validity (Koretz, 2008). Measurement validity examines the extent to which each question
actually measures the concept that it was intended to measure. It is unclear if the questions on many statewide tests are actually evaluating the concepts that were presented to or learned by the children (Bracey, 2009). This problem of test items aligning to the curriculum is particularly relevant in using the MSA scores in this study, to compare achievement among these groups of students. These students were predominantly instructed in elements of alternative literacy programs at charter schools in the State of Maryland, which were not part of the Maryland State Voluntary Curriculum goals and objectives used to develop and select test questions on the MSA.

Due to differences in the poverty levels of children attending these two schools, there could be peer effects impacting the validity of the scores on the MSA. I tried to use multiple variables to match the students from both schools so that the pairs would be more “similar” in recognition of the fact that I couldn’t control for the differences in peer effects. Choosing a different control group school with more similarities in overall population characteristics would improve the validity of the comparisons of the two groups.

Data Collection Methods

All of the students in both cohorts in this study took the MSA test during March of 2012. This study only examined information based on the Reading section of the test, which was given on the first day of the two-day testing period. Each student received a Test Booklet and an Answer Booklet. Each school reported to the Baltimore City Public Schools Office of Achievement and Accountability that their tests were kept in a secure, locked cabinet before and after the test administration. The Office of Achievement and Accountability provided test manuals to all of the schools in advance to ensure proper
execution of the tests. When the tests were completed, they were sent to Harcourt, Inc. for scoring. Raters at Harcourt, Inc. publishing company scored the “Brief Constructed Response” items. “Selected Response” items were scored by machine. Harcourt, Inc. scanned the Answer Books into an electronic imaging system to capture the information for scoring the responses and then converted the data into an electronic format. An alphanumeric format was used to code students’ identification school and demographic information. Handwritten answers on the “Brief Constructed Response” items were captured in a digital image format at Harcourt’s headquarters in San Antonio, Texas (Harcourt Assessment, Inc., 2004).

Harcourt, Inc. sent the scored tests to the Maryland State Department of Education Central Office. The Baltimore City responses were then sent to the Main Office of the Baltimore City Public Schools for distribution to each school. The Maryland State Department of Education then prepared responses for every school in the state on the public Maryland State Report Card website (www.mdreportcard.org). The Baltimore City Public Schools provided me with this data, with numbers instead of names, so that all of the students’ scores remained anonymous. Institutional Review Board (IRB) procedures for the Baltimore City Public Schools were formally waived in a letter to me from the Department of Achievement and Accountability, dated August 6, 2012, because the data were provided in an anonymous format.

Data Analysis
An independent sample t-test \( t = \frac{(x_1 - x_2 - d)}{SE} \) was conducted for the total group of students in Grades 3-7 who took the Reading section of the MSA test in the spring of 2012. A second independent sample t-test was also conducted for the total group of Grade 4, 5, 6, and 7 students, omitting the Grade 3 students from the sample. This additional t-test without the Grade 3 students was conducted to assess if the Grade 3 students’ scores would skew the results for the whole group’s t-test score, as the Grade 3 pairs were matched on all of the variables except for the prior year’s MSA reading level.

Independent sample t-tests were performed in the Excel program, to determine if there was a significant difference between the means of the reading scores of the students who received Montessori-based literacy curriculum and instruction versus the children who were instructed in the Houghton-Mifflin basal reading series. An independent sample t-test was selected to analyze the data, as opposed to a paired samples t-test, because the two data sets were different from one another. When performing the t-tests, all tests were evaluated for statistical significance at the .05 significance level, or the 95% confidence level, which is used in educational research. The results were reported as two-tailed t-tests because it was important to show the distribution of MSA scores in either direction. While it is easier to obtain a score of significance when the scores are only evaluated in one direction on a one-tailed t-test, a two-tailed test of significance was chosen for this study because it provided information about the two groups in two directions and captured a more complete picture of the differences between the groups. The differences in these two groups on the MSA score could be higher or lower, both of which are meaningful; use of a two-tailed test allowed me to explain any differences that might have occurred between the two groups of students in either direction.
The systematic matching of pairs increased the possibility that any statistically significant differences in mean reading achievement would be due to the treatment or the lack of treatment rather than to other extraneous factors. This design was chosen to mediate some of the threats to validity so that the results would demonstrate a cause/effect relationship between the independent variable of reading approach on the dependent variable of test performance on the Reading section of the MSA.

The purpose of this process was to establish a control group with similar characteristics to the students in the experimental Montessori program. The paired matching increased the possibility that any statistically significant differences in mean reading achievement would be due to the treatment or the lack of treatment rather than to other extraneous factors. The study used the framework of inferential statistics to extrapolate information about the parameters of the data’s underlying distribution. The Maple Montessori’s methodology for determining admission to its school is based on a lottery system, so a random process dictated the selection of the students from the applicant pool in Grade 3, Grade 4, Grade 5, Grade 6, and Grade 7 who were chosen to attend the Maple Montessori Public Charter School. Students in the control group at State Public Charter School were selected by a matching process and therefore were not randomized.

An independent samples t-test with matching of subjects was chosen to make the groups more comparable to one another in consideration of the influence of the reading method used on student reading achievement. They were matched on grade level, socioeconomic status, race, their attendance at a charter school, and their previous reading levels (in Grades 4, 5, 6, and 7). Even though they were matched on multiple
variables, so that the two groups would be more comparable, the students in each pair were not identical, even on the matched variables. For example, both students might have attained a Proficient reading level on the MSA test, but they would not have received exactly the same score. Both students might have been in the same grade, but they would not be exactly the same age and could be as far as a year or more apart from each other. Both students might be classified as “free lunch” students, but one child could come from a family with a single parent earning $20,000 per year and the other child could be living in a homeless shelter. Matching the students helps to make the groups at each school more comparable, but the two children and the two cohorts are not identical in nature.

Table 3

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Statistical Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influence of Montessori Curriculum on Reading Achievement in Grades 4,5,6,7</td>
<td>Independent t-test</td>
</tr>
<tr>
<td>Influence of Montessori Curriculum on Reading Achievement in Grades 3,4,5,6,7</td>
<td>Independent t-test</td>
</tr>
</tbody>
</table>

This study is cross-sectional, as it only examines one point in time, which eliminates the impact of temporal factors which could change the effects of the reading methods on reading achievement over time. However, the disadvantage of only examining information at one point in time is that the day that the children were tested might have been a difficult day for some of the children for any number of unknown reasons; there could have been an environmental factor that might have influenced the testing environment making that day non-representative, which could have resulted in an
inaccurate appraisal of the children’s actual literacy abilities. Also, examining the results of only one year’s time in Grade 3, 4, 5, 6, or 7 might not be as informative about any differences in reading achievement that exist due to instruction in Montessori-based literacy curriculum and methods, as the impact of the reading curriculum might be more of a cumulative process, and data collected at the end of high school, after the children have been exposed to the Montessori curriculum for many years, might be a more valid reflection of differences in student literacy skills.

Summary

I matched 71 pairs of students from a Montessori public charter school to students in another public charter school to determine if the mean scores on the Reading section of the 2011-2012 *Maryland School Assessment* were significantly different from one another. My overarching research goal was to assess the influence, if any, of Montessori-based literacy and curriculum methods on reading achievement on the 2011-2012 *MSA Reading* section results, when students receiving these methods were compared to students instructed in a *Houghton-Mifflin* reading approach. This study focused on eliminating extraneous variables that might account for differences in student achievement, other than the actual reading methods employed. Despite disadvantages of using a matched-subjects design, in that the two cohorts of students are never exactly alike, this design allowed me to conduct focused research on this topic with an acceptable degree of validity. This research is based on historical data, which may shed light on the influence of Montessori-based literacy instruction on students who attend Montessori charter schools that are affiliated with the Baltimore City Public School System, now and in the future.
Chapter IV

Analysis of Data
Introduction

The purpose of this study was to analyze the impact of Montessori-based reading methods of students in Grades 3-7 at a public Montessori charter school when they were compared to students in a nearby charter school who received traditional reading instruction during the 2011-2012 school year. The Baltimore City Public Schools may benefit from knowing if the reading practices used at this Montessori school contributed to positive reading outcomes, as measured on the Reading section of the Maryland School Assessment for the students who attended this urban charter school. This quantitative study used an explanatory, non-experimental, cross-sectional design, using data that already existed to study the influences of the Montessori literacy methods and materials on reading achievement. I analyzed if the independent variable of a specific Montessori-based reading approach used to instruct a selected sample of students impacted the dependent variable of reading achievement, as measured by test results for the 2011-2012 Reading section of the Maryland State Assessment (MSA). The purpose of this research was to provide an understanding of the efficacy of current literacy practices and policies in this Montessori charter school setting.

This data analysis compared the 2011-2012 MSA Reading section test scores for children in both the Maple Montessori Public Charter School and State Public Charter School groups. Two-tailed t-tests were used to identify mean scores, standard deviations, and levels of significance for each of the groups being studied. No children with Individualized Education Programs (IEP’s) or students with Limited English Proficiency (LEP) were included in the sample. I matched the students in Grades 4, 5, 6 and 7 on the
following variables to create groups that were similar, from each of the two schools, Maple Montessori Public Charter School and State Public Charter School:

a. Participation in one of the two charter schools which was selected as a voluntary choice by the parents of the students

b. Student grade level

c. The students’ prior year’s (2010-2011) score on the Reading section of the MSA (for Grades 4, 5, 6, and 7)

d. Race (White or Non-White)

e. Socioeconomic Status (measured by free, reduced, or paid lunch)

I matched the students in Grade 3 on the following variables to form a similar group of children from each school:

a. Participation in one of the two charter schools which was selected as a voluntary choice by the parents of the students

b. Student grade level

c. Race (White or Non-White)

d. Socioeconomic Status (measured by free, reduced, or paid lunch)

Students do not take the MSA test until Grade 3 in the State of Maryland; therefore, there were no prior year’s MSA test score available when matching this group of students. For that reason, I chose to examine the levels of significance on the total group of students without the Grade 3 pairs (Grades 4, 5, 6, and 7) known as Group 1 and the total group of students (Grades 3, 4, 5, 6, and 7) known as Group 2.

**Group 1 Analysis**
I matched all of the students from Grades 4, 5, 6, and 7 and formed two groups of each of the students from the matched pairs, one from the Maple Montessori School and one from the State Public Charter School. I conducted a t-test on the two sets of students. The means were 404.26 at Maple Montessori (Standard Deviation 33.34) and 414.23 at State Public Charter (Standard Deviation 46.80). The means at State Public Charter were higher (10.17 points); however, the two-tailed independent samples t-test revealed that the difference was not statistically significant (p ≤ 0.19). The results indicate that there is no significant difference in reading achievement between the Montessori-based literacy methods and curriculum and the *Houghton-Mifflin* basal reading series, when examining these 54 pairs of students (n=108) in the two cohorts of children.

Table 4 indicates the total number of pairs studied at Grades 4, 5, 6, and 7. The table then lists the mean score with the standard deviation for the children in the Maple Montessori Public Charter School and the State Public Charter School. The last column in the chart lists the level of significance for each group after completion of the two-tailed t-test. The information was evaluated, using the standard of p ≤ .05, the conventional standard for assessing levels of significance for social science and educational research.
INFLUENCE OF MONTESSORI LITERACY PROGRAMS ON READING ACHIEVEMENT

Analysis I Comparison of MSA Scores for Students in Grades 4-7 in 2011-2012

<table>
<thead>
<tr>
<th>Grade Level &amp; # of Pairs</th>
<th>Mean Montessori</th>
<th>Std. Dev. Montessori</th>
<th>Mean State Pub.</th>
<th>Std. Dev. State Pub.</th>
<th>2-Tailed Level of Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-7 54 pairs</td>
<td>404.26</td>
<td>33.34</td>
<td>414.43</td>
<td>46.80</td>
<td>0.1967</td>
</tr>
<tr>
<td>4 15 pairs</td>
<td>411.60</td>
<td>36.40</td>
<td>396.80</td>
<td>54.17</td>
<td>0.3883</td>
</tr>
<tr>
<td>5 16 pairs</td>
<td>398.06</td>
<td>34.12</td>
<td>428.81</td>
<td>38.91</td>
<td>0.0242</td>
</tr>
<tr>
<td>6 15 pairs</td>
<td>409.33</td>
<td>31.55</td>
<td>414.47</td>
<td>47.61</td>
<td>0.7307</td>
</tr>
<tr>
<td>7 8 pairs</td>
<td>393.38</td>
<td>29.82</td>
<td>418.63</td>
<td>42.22</td>
<td>0.1911</td>
</tr>
</tbody>
</table>

Group 2 Analysis

I matched all of the students from all of the grades including Grade 3 (no prior reading assessment used for Grade 3 pairs) and created two groups of each of the students from the matched pairs, one from the Maple Montessori Public Charter School and one from the State Public Charter School. I conducted a t-test on the two sets of students. The means were 407.97 at Maple Montessori (Standard Deviation 35.04) and 418.66 at State Public Charter (Standard Deviations 46.42). The mean score at State Public Charter was higher by 10.69 points; however, the two-tailed t-test revealed that the difference was not significant ($p \leq 0.12$). The results indicate that there is no statistically significant difference in reading achievement between the Montessori-based literacy methods and curriculum and the *Houghton-Mifflin* basal reading series when examining the 71 pairs of students ($n=142$) students who formed the two cohorts of children.

Table 5 indicates the total number of pairs from Grades 3-7, as well as the students and number of pairs studied at Grades 3, 4, 5, 6, and 7. The table then lists the mean score with the standard deviation for the children in the Maple Montessori Public
INFLUENCE OF MONTESSORI LITERACY PROGRAMS ON READING ACHIEVEMENT

Charter School and the State Public Charter School. The last column in the chart lists the level of significance for each group after completion of the two-tailed t-test. The information was evaluated, using the standard of $p \leq .05$, the conventional standard for assessing levels of significance for social science and educational research.

Table 5

*Analysis 2 Comparison of MSA Scores for Students in Grades 3-7 in 2011-2012*

<table>
<thead>
<tr>
<th>Grade Level &amp; # of Pairs</th>
<th>Mean Montessori</th>
<th>Std. Dev. Montessori</th>
<th>Mean State Pub.</th>
<th>Std. Dev. State Pub.</th>
<th>2-Tailed Level of Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-7 71 pairs</td>
<td>407.97</td>
<td>35.04</td>
<td>418.66</td>
<td>46.42</td>
<td>0.1239</td>
</tr>
<tr>
<td>3 17 pairs</td>
<td>419.76</td>
<td>38.68</td>
<td>432.12</td>
<td>43.80</td>
<td>0.3900</td>
</tr>
<tr>
<td>4 15 pairs</td>
<td>411.60</td>
<td>36.40</td>
<td>396.80</td>
<td>54.17</td>
<td>0.3883</td>
</tr>
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</tr>
</tbody>
</table>

**Summary**

This chapter described the specific analysis of the data comparing the mean scores on the *MSA* Reading section for 2011-2012 for both cohorts of children. The results for the group of 108 students from Grade 4, 5, 6, and 7 (without the Grade 3 pairs who were formed with no prior year’s reading achievement scores) showed no significant differences in reading achievement in that school year. The results for the entire group of 142 students from Grade 3, 4, 5, 6, and 7 showed no significant differences in that school year. The results for Grades 3, 4, 6, and 7, in isolation, showed no significant differences
in reading achievement in the 2011-2012 school year. The results for Grade 5, in isolation, showed a significant difference in reading achievement; however, the group of 16 participants represents a very small sample of students and therefore is not a generalizable conclusion. The results for the total groups of Grades 4 through 7 and Grades 3 through 7 support the acceptance of the null hypotheses that there was no statistically significant influence of the Montessori reading methods and materials on student achievement in reading for the 2011-2012 school year as measured by the combined results of the *Maryland School Assessment* Reading section test scores.

In examining these results of “no significant difference,” it is important to understand that these conclusions are based on one test measure (*Maryland School Assessment*) from one specific year (2011-2012). It is noteworthy, though, that the results for this same set of paired students from these same two schools with the same reading programs in place also did not score differently on the Reading section of the *MSA* in the 2010-2011 school year, suggesting that these findings are consistent for both of these years.

It is possible that there were differences in student literacy achievement on other measures of reading skills during the 2011-2012 school year. It is also possible that in years preceding 2010-2011, there might be have been differences in student achievement on this measure. This study is narrow in that it is only examining specific parameters of reading achievement during a specific time period. In the next chapter, I present conclusions and recommendations for policy, practice, and future research.
Chapter V

Conclusions and Recommendations

Introduction

My purpose for this study was to determine the influence, if any, of Montessori-based literacy methods and curriculum on the reading achievement of students in Grades 3, 4, 5, 6, and 7 in a public Montessori school in an urban area. I aimed to produce empirical data to explore the influence of these Montessori methods in a matched-pairs study by comparing the achievement of students receiving these methods in a public Montessori charter school to children in another public charter school in the same city who received their reading instruction using the *Houghton-Mifflin* approach. My study was guided by my quest to discover if there were statistically significant differences in reading achievement on the *Maryland State Assessment (MSA)* during the 2011-2012 school year, between a group of Grade 3, 4, 5, 6, and 7 students who were being instructed in Montessori-based literacy methods when compared to a matched group of students who received instruction in the *Houghton-Mifflin* approach. The results of this study indicated that there was no statistically significant difference in reading achievement for the combined cohort of children in Grades 3 through 7 who were being instructed in Montessori-based literacy methods and curriculum over a one-year period of time during the 2011-2012 school year when their mean scores were compared to the combined cohort of matched students in Grades 3 through 7 who were being instructed in the *Houghton-Mifflin* literacy program. The t-tests of significance indicated that the group of students instructed in the Montessori methods did not achieve higher mean scores than the students in the control group. Therefore, the results of this study indicate
no statistically significant differences in achievement for the two groups of children from these two schools during the 2011-2012 school year at these grade levels. These findings are similar to those of Lopato et al. (2005), whose study also resulted in no statistically significant difference in reading achievement at these grade levels in the Montessori groups in his study but are different than the results gathered by Duax (1995), who did see a change in a small group of public Montessori school children in reading achievement. There exists little empirical research on the influence of Montessori-based literacy instruction and curriculum because there is so little formal testing of Montessori children. Future research may result in significant differences if new studies are conducted in similar schools with similar sets of children during a different year or group of years or if a different kind of standardized test is used to assess the students’ reading achievement.

Summary

In this study, I analyzed whether the independent variable of a specific Montessori-based reading approach used to instruct a selected sample of students impacted the dependent variable of reading achievement as measured by test results for the 2011-2012 Reading section of the *Maryland State Assessment* (*MSA*). The purpose of this research was to provide an understanding of the efficacy of current literacy practices and policies in this Montessori charter school setting. The results indicated that there was no significant difference in reading achievement in the students who were instructed with the Montessori-based reading approach.

With a small sample size, caution must be applied in making sweeping policy or practice implications, especially when there is no significant difference in the test results
between the two groups. Nonetheless, there are policies and practices that emerged from elements of this study that are worthy of consideration.

Even though this study attempted to study the impact of Montessori-based literacy methods on reading achievement and students from the Montessori charter school were matched on multiple variables to elicit an objective comparison, there may have been any number of major confounding variables that could have affected student literacy skills that were not taken into account like gender, the number of years each of the students attended their schools, or the fact that the students in the study came from many different communities from all over the city, making them less comparable to one another. The variables used for matching may have been sound and logical but may not have been the only key variables that mattered when comparing the two cohorts. With many Montessori public charter schools opening up every day in this country (there are now 450), additional research is necessary to ascertain the effectiveness of these practices on student literacy outcomes. Children in large, poor urban areas deserve access to empirically sound reading approaches. This study did not produce statistically significant differences to suggest that this Montessori-based literacy program had an influence on reading achievement; however, there were issues raised in conducting this research that elucidated ideas for practices and policies that could possibly enhance student literacy skills in this urban setting.

**Summary of Research Question and Hypothesis**

The original research question posed in the beginning of this investigation stated the following: What differences exist, if any, between students in Grade 3, 4, 5, 6, and 7 in the Maple Montessori Public Charter School, whose teachers instructed them in
reading with Montessori literacy curriculum and instructional methods and students from a nearby charter school who were instructed by their teachers using a basal reading method, on the *Maryland School Assessment (MSA)* during the 2011-2012 school year?

The results did not suggest that the Montessori literacy curriculum and instruction methods resulted in statistically significant differences in student reading achievement, as measured by the *Maryland School Assessment*. It is of interest, however, that both the Montessori-based literacy practices and the *Houghton-Mifflin* approaches follow many of the steps that are laid out in the new “science of reading,” even though these practices are implemented in different ways (Lyon & Chhabra, 2004). It is possible that these results suggest that literacy approaches that follow the ideas laid out in Chapter II of this study, in regard to “the science of reading” (a set of procedures which include phonological awareness, systematic phonics, oral fluency, oral vocabulary, and text comprehension) are reasonable literacy approaches to consider for students attending school in a large urban area rather than demonstrating that either of these programs specifically leads to positive reading achievement.

The null hypothesis proposed was that there would be no difference between (a) the scores on the Reading section of the *Maryland School Assessment (MSA)* for the cohort of students in Grade 3-7 who were instructed using Montessori literacy curriculum and instruction methods and (b) the scores on the Reading section of the *Maryland School Assessment (MSA)* for the cohort of students in Grades 3-7 who were instructed in a traditional reading program ($H_1$: $\mu_1 - \mu_2 = 0$). I will accept the null hypothesis statement that there were no differences between the two groups in Grade 3-7 or in the two groups combined in Grades 4-7.
Conclusions

T. L. Russell’s *No Significant Difference Phenomenon* presents a positive view of equivocal findings in his studies of the effects of distance learning (Russell, 2001, p. xiii). A finding of “no significant difference,” according to Russell, suggests that the approach or question being studied is neither detrimental nor advantageous. Russell noted in his empirical research on distance education that despite the apparent lack of improvement on objective outcomes, there were elements raised in his study that were worthy of consideration (Russell, 2001).

These findings will potentially lead to future studies with modified variables, which may further investigate the value of these methods and practices. The Montessori literacy materials and instruction perhaps represent one of several effective literacy approaches to be considered in this large, urban school system, which continues to have many students languishing in reading performance. Further study is warranted so that the effectiveness of both the Montessori-based literacy practices and the *Houghton-Mifflin* literacy program can be better understood.

There are certainly noteworthy likenesses and differences between the two literacy approaches in this study, suggesting that either approach may be a viable method worthy of consideration (Torgeson, 1998). Examining the repeatability of these results in future studies will provide insight into an important question: What are the most critical elements in teaching a child to read?

It is well-documented that synthetic phonic programs (like those found in a Montessori-based literacy curriculum) generally produce better results than analytic phonic programs, even though the Montessori students in this study did not demonstrate
better achievement on the MSA (Johnston & Watson, 2003). The children in the Montessori classroom have a choice in how much time they spend working on their reading skills during their two-to-three hour academic time in the mornings, which may actually reduce the amount of time spent on using any of the Montessori literacy tools, including synthetic phonics (Cossentino, 2006). In other words, children in the more traditional classroom settings who received the *Houghton Mifflin* instruction may have received more instructional time on reading skills and strategies because the teacher, not the student, decides what will be accomplished during the language arts block, which might result in students spending more time working on reading skills.

Another variable that may have affected the outcome of this study would be that the State Public Charter School in which the students received the *Houghton-Mifflin* approach is a “theme-based” learning environment. There is a body of research on “theme-based” learning that suggests that it improves vocabulary and conceptual understanding, which contribute to reading comprehension skills. In 2008, H. Lynn Erikson discussed the superiority of concept-based learning on student achievement (Erickson, 2008). It is conceivable that this extraneous variable of school-wide “theme-based” learning might have affected student performance on the MSA reading section, with or without the *Houghton-Mifflin* literacy instruction.

One of the threats to validity in this study was the fact that the *Maryland School Assessment* is not a well-rounded assessment of reading skills in that it primarily measures comprehension skills and has very few items which measure phonological awareness, single word reading, phonics, or reading fluency. When students miss a reading comprehension item, it is often assumed that they are not able to comprehend the
information: however, many so-called “comprehension” errors are really errors based on faulty word reading, slow reading speed, or poor phonetic decoding (Wiederholt & Bryant, 2012). This test is not always sensitive to the nuances of why children are misreading in that it simply reveals whether a multiple-choice reading comprehension answer is correct or not. A more definitive, explanatory reading measurement might have yielded critical differences in the students’ reading skills. Furthermore, test items on the MSA were not necessarily aligned with the elements present in these two literacy programs; thus, students may not have been tested on what they actually were taught.

Inclusion of additional formal and/or informal assessments of the children’s reading abilities would have captured a more complete picture of reading achievement, when comparing the effectiveness of the literacy methods in this study. Supplemental test results with items aligned to actual classroom instruction might have provided a more specific and precise view of student learning.

One limitation of cross-sectional studies is that the research question is being studied at only one point in time. It might be that in a different year the results could be quite different; however, the MSA test results from the year before, used in determining if these groups were comparable, were quite similar to the 2011-2012 results with no significant differences in reading achievement for the same cohorts of children.

It is also a possibility that the rate of improvement in literacy in examining either of these two reading approaches is only recognizable over many years of exposure to the curricular methods and materials. In this study, it was not known how long each of the 142 participants had spent in either of these charter schools. A different group of children over a longer period of time might have performed differently. It would be
helpful, in future research projects, to know how long each student has been exposed to
the reading methodologies.

In the current climate of low literacy rates in some of the poorer cities in America, any and all models of literacy that are producing results need to be studied and considered. In a system like the Baltimore City Public Schools, where both of these charter school programs exist, it is up to the individual principal at every school, at both the charter and traditional school programs, to select which instructional materials will be used to instruct the children in reading. It would be prudent to inform principals of national and local test research findings so that their choices, whenever possible, will be based on empirical data.

One of my aims for this study was to contribute to the knowledge base regarding the use of Montessori-based literacy instruction in an urban charter school. I hoped to gather information about what kind of methods move the needle forward in helping children in poor school districts so that they have access to effective, evidence-based reading methods. One of the more obvious points to emerge from this study is that the equivocal results suggest that either of these approaches may be worthy of consideration, in examining the reading scores from this particular time period with this group of students because both the Montessori-based literacy approach and the Houghton-Mifflin approach follow many of the basic skills that are described in the “science of reading” (Lyon & Chhabra, 2004).

**Recommendations for Policy**

There are relevant policies that emerged from my literature review and from the test results in this investigation despite the fact that there was no significant difference in
reading achievement between the two cohorts of children.

1. These results support the idea that it would be worthwhile to modify the policy in the Baltimore City Public School System, which currently allows school principals the freedom to select the literacy methods to be used with the children in their schools. The literature on effective literacy practices is quite voluminous and indicates that some methods and materials include what we know and understand at this point in time about the teaching of reading, while others do not. While the Montessori-based literacy practices and the *Houghton-Mifflin* reading program were not significantly different from one another, both followed guidelines recommended in empirical reading research studies, suggesting that both might be credible choices. There are still many students who are performing poorly in reading in the Baltimore City Public Schools. It is advisable for principals to choose their language arts programs from a menu of empirically-tested, evidence-based methods, to reduce exposure of students to substandard literacy models.

2. The fact that both groups of students, from both of these charter schools, were engaged in literacy methods that followed the concepts laid out in the “science of reading” suggests that well-run charter schools may offer alternatives to children that might not otherwise be available to them in their neighborhood public schools (Hoxby, 2003). Many charters have not achieved results better than the traditional schools in the districts in which they reside (Finn, Manno, & Vanourek, 2001). Charter schools have become a highly politicized issue which, in addition to uneven academic performance, have also, in some cases, provided lower quality schools in poor areas with empty promises of improvement (Zimmer, 2009). At the outset, the charter school movement,
was developed to provide “innovation tanks” for children, where new and different models of instruction could be explored (Zimmer, 2009; Nathan, 1996). These two charter schools are examples of that original premise in that they both use empirically-sound literacy methods, which are not currently available to students attending the nearby local public schools. Monitoring student literacy results in public charter schools and comparing their progress to children in the surrounding traditional public schools would be a worthwhile policy to adopt in the Baltimore City Public Schools, where large numbers of students continue to perform poorly in the acquisition of literacy skills.

3. Another critical policy implication from this study is the need to offer literacy programs to urban children as early as possible, given the vast amount of literature indicating that literacy skills begin with the introduction of early phonological and vocabulary skills. Children living in poverty experience lower rates of long-term success in reading because of their disadvantaged linguistic environments, (Eden, 2012; Burney & Beilke, 2008; Ferguson, 2007). Establishing policies that provide opportunities for universal preschool instruction which emphasize phonological awareness and vocabulary instruction would be valuable to students living in the impoverished areas of Baltimore City (Hart & Risley, 2004; Dehaene, Duhamel, Hauser, & Rizzolatti, 2004; Elbro, 2004; Anthony & Lonigan, 2004; Jobard et al., 2003).

**Recommendations for Practice**

There are implications for educational practices that emerge from elements in this study.

1. Currently, students in both charter schools are evaluated by the *Maryland School Assessment (MSA)* to determine if they are proficient readers. This is problematic from a
diagnostic-prescriptive perspective in that it is not clear why a child is not Proficient or Advanced, but only that the child is not performing at minimum levels of proficiency, primarily in comprehension skills. Each child, beginning in his or her first year of school, should be evaluated informally and/or formally by the classroom teacher on other reading measures that are connected to actual content presented to the children and include multiple aspects of the reading process. In this way, each child’s specific reading needs will be pinpointed and addressed in a targeted fashion.

2. In my attempts to compare literacy practices from one charter school to another, within the same school system, it was clear that each school truly operated in a vacuum, knowing only what practices were used in their school. Even at the district level, there was little available comparative information beyond the MSA test scores at the end of the year on the Maryland State Report Card regarding the effectiveness of literacy practices within each school. It would be suggested practice for each of these charter schools to internally examine which parts of their literacy programs are efficacious and to share their findings on a regular basis with the district level office and with other nearby charter and traditional schools. Both of these charter schools were established to provide educational settings that would be able to use different methodologies and curricula than those that previously existed in the traditional public schools. These literacy practices need to be internally and externally examined, evaluated, discussed, and shared with other schools in the Baltimore City Public School System on an ongoing basis.

3. Teacher training at the college level generally offers a limited selection of courses in the teaching of oral language skills to the young learner. The literature on young children living in low socioeconomic settings indicates that receptive and expressive vocabulary
knowledge has a profound impact on reading achievement (Hart & Risley, 1995b; Catts & Kamhi, 1999). The development of workshops for teachers which emphasize strategies for advancing vocabulary skills for young impoverished children would enhance emerging and long-term literacy skills. The speech-language pathologists in the building are generally well versed in this area and could be utilized to lead teacher training workshops as well as to offer in-class consultations and demonstrations of techniques for boosting vocabulary knowledge.

**Suggestions for Future Research**

Further research is necessary to determine if these findings can be replicated or expanded by changing one or more of the variables or procedures used in this study. School systems in urban areas are actively seeking ways to improve literacy rates, which are still very uneven, especially for children living in poverty (Hernandez, 2011). Future research on the questions raised in this study may lead to findings that will confirm or deny the conclusions drawn from this endeavor. Although this study did not indicate that the Montessori-based literacy methods would result in improved outcomes, it did provide insights worthy of future investigations.

1. Conduct a study examining Montessori-based literacy curriculum at a Montessori public charter school in which the children have been instructed in the Montessori methods starting at the age of three to determine if having the full benefit of Montessori-based instruction would result in different reading achievement outcomes.

2. Conduct a matched-pairs study which examines Montessori-based literacy curriculum methods at one or several of the other Montessori public charter schools in the State of Maryland to assess if the results are similar to those that emerged in this study.
3. Measure the same children in Grades 3 through 7 at this same Montessori school and compare them to students in a different public charter school, who are being instructed with a literacy method other than *Houghton-Mifflin*, to determine if the results differ when the Montessori students are compared to a different group of students.

4. Conduct a pretest/posttest study of these same groups of students, using a different reading measure (other than the *Maryland School Assessment*) which incorporates other areas of reading like phonological awareness, decoding of single words, and/or reading fluency, to determine if there are any significant differences in performance between the students in Grades 3 through 7 who were instructed in Montessori literacy methods versus those who were instructed in the *Houghton-Mifflin* approach.

5. Do a study of these same students, five years from now, to see if there continue to be no significant differences at the high school level by comparing student reading achievement on the Critical Reading section of the *Scholastic Achievement Test* (SAT).

6. Do a large, multi-state, matched-pairs study of children in public Montessori schools across the nation to assess if there are differences in reading achievement when the Montessori students are compared to students being instructed in basal reading approaches similar to the *Houghton-Mifflin* approach used in this study.

7. Do a study using the same students, the same variables, and the same evaluation instrument over a longer period of time to determine if the cumulative achievement results are different than those measured at only one point in time.

8. Do a study examining the average amount of time students in a Montessori classroom spend on literacy instruction so that future comparisons can take into account the fact that the child (rather than the
teacher) chooses how much time is spent on literacy instruction.

Understanding how many minutes on average the children in a Montessori-based classroom spend on literacy activities makes it easier to compare the efficacy of instruction in a Montessori classroom to other literacy methods used in classrooms with teacher-directed instruction.

9. Do a case study in a particular Montessori school or a group of Montessori schools investigating the fidelity of the actual literacy methods being used in the classroom to the classic Montessori literacy-based methods and materials developed by Dr. Maria Montessori which are approved by the American Montessori Society (AMS) and/or the Association Montessori Internationale (AMI).

**Closing Remarks**

The “double jeopardy” children mentioned at the beginning of this dissertation, who live in poverty and do not reach Proficient literacy levels by the end of Grade 3, are four times more likely to not graduate from high school (Hernandez, 2011). Their futures will be determined, to a large extent, by the successfulness of their reading achievement in their elementary and middle school experiences; their circumstances implore educational researchers to continue to investigate and refine our knowledge base of evidence-based literacy strategies.
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Appendix A

REQUEST FOR APPROVAL OF RESEARCH, DEMONSTRATION OR RELATED ACTIVITIES INVOLVING HUMAN SUBJECTS

All material must be typed.

PROJECT TITLE: THE EFFECT OF MONTESSORI-BASED LITERACY INSTRUCTION AND METHODS ON READING ACHIEVEMENT OF STUDENTS IN GRADES 4, 5, 6, AND 7

CERTIFICATION STATEMENT:

In making this application, I (we) certify that I (we) have read and understand the University’s policies and procedures governing research, development, and related activities involving human subjects. I (we) shall comply with the letter and spirit of those policies. I (we) further acknowledge my(our) obligation to (1) obtain written approval of significant deviations from the originally-approved protocol BEFORE making those deviations, and (2) report immediately all adverse effects of the study on the subjects to the Director of the Institutional Review Board, Seton Hall University, South Orange, NJ 07079.

FRAN LEVIN-BOWMAN, M.Ed.

**Please print or type out names of all researchers below signature. Use separate sheet of paper, if necessary.**

My signature indicates that I have reviewed the attached materials and consider them to meet IRB standards.

Christopher [Signature]

RESEARCHER’S ADVISOR OR DEPARTMENTAL SUPERVISOR

6-1-13

**Please print or type out name below signature**

The request for approval submitted by the above researcher(s) was considered by the IRB for Research Involving Human Subjects Research at the June 2013 meeting.

The application was approved [ ] not approved [ ] by the Committee. Special conditions were [ ]___ were not [ ] set by the IRB. (Any special conditions are described on the reverse side.)

Mary J. [Signature], Ph.D.

DIRECTOR,

SETON HALL UNIVERSITY INSTITUTIONAL REVIEW BOARD

3/2005
Appendix B

Baltimore City Public Schools

Stephanie Rawlings-Blake
Mayor, City of Baltimore

Chair, Baltimore City Board of School Commissioners

Andrés A. Alonso, Ed.D.
Chief Executive Officer

0000012

OAA IRB Exempt Letter

August 6, 2012

Fran Bowman
Baltimore Montessori Public Charter School
1600 Guilford Avenue
Baltimore, Maryland 21202-2838

Dear Ms. Bowman:

IRB# 0000012

TITLE OF PROPOSAL: Reading Achievement in Montessori Charter Schools

The Office of Achievement and Accountability (OAA) Institutional Review Board (IRB00008794) for the Protection of Human Subjects has reviewed your protocol and approved it for certification as it met the criteria under category (46.101(b)(4)) for exemption from further IRB review.

Date of Review: 08/02/12

Annual review is not required for this protocol, since it was determined to be exempt. However, any changes to the research design or procedures that could introduce new or increased risks to human subjects must be submitted in writing to OAA IRB for review, before the changes are incorporated to ensure they do not change the exempt status of the protocol. All correspondence and materials used in this protocol must reference the above IRB number. Approval is valid for one year and would expire on August 5, 2013.

Please note that external data requests are reviewed separately and require a separate submission using OAA External Data Request Form.

If you have any questions, please contact the IRB Chair at (443) 642-4032.

Respectfully,

<signature>

Dr. Dibon, Ph.D.
IRB Chair

C: Jennifer K. Bell-Ellwanger, Achievement and Accountability Officer

Dr. Kimberly Howard, Director, Research, Office of Achievement and Accountability

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Appendix C

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE BALTIMORE CITY BOARD OF SCHOOL COMMISSIONERS
AND
Fran Bowman

THIS MEMORANDUM OF UNDERSTANDING ("MOU") is made this 31st day of December 2012, by and between the Baltimore City Board of School Commissioners ("Board") for the Baltimore City Public Schools ("City Schools") Fran Bowman ("Vendor").

WHEREAS, the Vendor and the Board wish to enter into a memorandum of understanding to support the OAA IRB approved research study titled, "Reading Achievement in Montessori Charter Schools," which is being conducted by Fran Bowman.

NOW THEREFORE, THIS MOU WITNESSETH THAT, in consideration of the mutual promises and covenants herein contained and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

A. TERM
The term of this MOU shall begin on December 31, 2012 and end on December 30, 2013, unless sooner terminated in accordance with this MOU.

The parties may renew this agreement for an additional term upon the written agreement of the parties within 60 days prior to the expiration of this MOU.

B. OBLIGATIONS OF THE PARTIES
During the term of this Agreement the Vendor and the Board shall perform such obligations which are set forth in the attached Vendor proposal, and is made a part of this Agreement (Attachment I to this Agreement). Performance of this Agreement is contingent upon appropriate consents as required by the Office of Achievement and Accountability with City Schools.

C. COMPENSATION
No compensation shall be provided to either party. If there are any costs associated with the obligations of this MOU, each party shall bear their own costs and/or expenses.

D. DOCUMENTATION AND RECORD KEEPING
The Vendor shall maintain documentation as necessary to prove that it is meeting its obligations under this MOU and such other standards as apply. The Vendor shall maintain such documentation for a period of three (3) years after the termination of this MOU, or in the alternative, shall submit such documentation to the Board within 30 days of the expiration date of this MOU. At any time during normal business hours, and as deemed necessary by the Board, the Vendor shall make available to the Board any such documentation for inspection. Copies of any School Records are the property of the Board.

OAA MOU
September, 2012
E. CRIMINAL BACKGROUND CHECK.

It is the responsibility of the Vendor to make certain that its employees, agents, volunteers, and contractors and any instructors who have contact with students be fingerprinted and have a background check in compliance with Title 5, Subtitle 5, Part VI, of the Family Law Article of the Maryland Code.

1. Employees Having Direct Contact with Students:
   Any and all current and future employees of the Vendor who have direct contact with students must have a criminal background check and fingerprinting conducted by the Human Resources Department of the City Schools before beginning work in a City School. Previous background checks will not be accepted. The fee for the background check shall be paid by check or money order at the time the fingerprinting is performed. No employee can begin work in a City School until results have been received. Violation of this provision may result in Termination for Cause.

2. Employment of Sex Offenders:
The Vendor shall at all times be compliant with the Criminal Procedure Article of Annotated Code of Maryland Section 11-722 that states that a person who enters a contract with a County Board of Education or a nonpublic school may not knowingly employ an individual to work at a school if the individual is a registered sex offender. If a registered sex offender is employed by the Vendor, they are prohibited from assigning that employee to perform management, delivery, installation, repair, construction or any other type of services on any City Schools property. Violation of this provision may result in Termination for Cause.

F. STUDENT'S EDUCATION/MEDICAL/PSYCHOLOGICAL RECORDS/CONSENTS

Prior to dissemination or review of records, Vendor and its employees, agents, volunteers and contractors shall maintain the confidentiality of all medical, psychological, and student records in compliance with federal and state laws.

G. CONFIDENTIALITY

The Vendor acknowledges its responsibility to ensure compliance with the confidentiality provisions of the Family Educational Records Privacy Act (34 CFR §99) and Code of Maryland Regulations §13A.08, with respect to school records provided by the Board, if applicable. Any confidential information provided by City Schools to Vendor, including all copies thereof must be used by Vendor only as permitted by this Agreement and only for the purposes herein described. Such information shall not be disseminated or disclosed to any third party, not a party to this Agreement, without the express written consent of City Schools, and can only be done so in
ac accordance with applicable privacy laws. Vendor agrees to return to City Schools all such information within 15 days of the expiration of termination of this Agreement; or with the express consent of City Schools, Vendor may destroy such information within 15 days of termination or expiration of this Agreement, certifying to City Schools in writing that the information has been destroyed.

H. DATA DISSEMINATION

For purposes of publicity, advertising, or news release in any form of medium, the parties shall confer with one another regarding the time, manner and content of appropriate data dissemination, results of studies or reports, or other materials, and consent to such dissemination, provided that such consent shall not be unreasonably withheld by either party.

I. MUTUAL INDEMNIFICATION

Neither party shall assume any obligation to indemnify, hold harmless, pay attorneys’ fees or damages that may arise from or in any way be associated with the performance or operation of this agreement. Furthermore, the liability of the parties shall be governed by the terms and provisions of the applicable Tort Claims Act. This provision shall not be construed as a waiver of either party’s rights under the doctrine of sovereign immunity, if applicable.

J. APPLICABLE LAW

This MOU shall be construed according to Maryland law and subject to the jurisdiction of its courts. Furthermore, the parties agree that any suits or actions brought by either party against the other shall be filed in a court of competent jurisdiction in Baltimore City.

K. PROFESSIONALS

In the event the services to be provided by Vendor must by law be provided by individuals who are licensed and/or certified, Vendor shall only assign individuals to provide services under this Agreement who are licensed and/or certified in accordance with the law. Additionally, Vendor shall only assign individuals who have been credentialed by the Vendor to provide the specific professional services required by this Agreement. All such individuals assigned by Vendor to provide services shall maintain their license and/or certification in good standing (not under review or subject to suspension, credentials current) during the entire term of this Agreement. Vendor shall, prior to providing services, submit documentation that the individuals assigned to provide services are properly credentialed and are licensed and/or certified to the Director of Materials, 200 E. North Avenue, Baltimore, Maryland 21202.

L. TERMINATION FOR CONVENIENCE

Either party may terminate this MOU by giving to the other party written notification thereof at least ninety (90) days prior to termination.

M. ENTIRE AGREEMENT

OAA MOU
September, 2012
This MOU constitutes the entire and full understanding between the parties hereto and neither party shall be bound by any representations, statements, promises or agreements not expressly set forth herein.

N. INTERPRETATION
The Agreement shall not be construed or interpreted for or against any party hereto because the party drafted or caused that party’s legal representative to draft any of its provisions. Any heading of the paragraphs in this MOU is inserted for convenience and reference only and shall be disregarded in construing or interpreting this MOU.

O. SEVERABILITY
Each provision of this MOU shall be deemed a separate, severable, and independently enforceable provision. The invalidity or breach of any provision shall not cause the invalidity or breach of the remaining provisions or of the MOU, which shall remain in full force and effect.

P. MODIFICATIONS AND AMENDMENTS
Any and all modifications to the terms of this Agreement must be by a written Amendment, signed and approved by all parties.

Q. ASSIGNMENT
This Agreement shall be binding upon the parties hereto and their successors and assigns, except that neither shall assign their rights, duties or responsibilities set forth in this MOU without the express written consent of the other party.

R. CONTRACT MONITOR
Communications for the purposes of billing, payment and submission of documentation required by this Agreement shall be between the Board’s Contract Monitor who is as follows

For the Board:
Ike Diibor
Coordinator, Institutional Research
200 East North Avenue
Baltimore, MD 21202
(410) 396-8956
IDiibor@bcps.k12.md.us

For the Vendor:
Fran Bowman
Researcher
3648 Eltham Way
Owings Mills, MD 21117
(410) 868-4781
Franbowman918@gmail.com

With a copy to:
Director of Materials Management
200 E. North Avenue, 4th Floor, Baltimore, Maryland 21202

OAA MOU
September, 2012
THIS AREA INTENTIONALLY LEFT BLANK
IN WITNESS WHEREOF, the parties have signed and sealed this Agreement as of the day first written above.

BALTIMORE CITY BOARD OF SCHOOL COMMISSIONERS

BY: Andres A. Alonso, Ed.D.
Chief Executive Officer

PARTNER/VENDOR NAME

BY: Fran Bowman, M.Ed.
Please print name

APPROVED AS TO FORM AND LEGAL SUFFICIENCY THIS 8th DAY OF May, 2013.

OFFICE OF LEGAL COUNSEL
5/8/2013

OAA MOU
September, 2012
Appendix D

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that Fran Bowman successfully completed the NIH Web-based training course “Protecting Human Research Participants”.

Date of completion: 06/04/2013

Certification Number: 1190009
Appendix E

SETON HALL UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN SERVICES
OFFICE OF GRADUATE STUDIES

APPROVAL FOR SUCCESSFUL DEFENSE

Doctoral Candidate, Fran Rowan, has successfully defended and made the required modifications to the text of the doctoral dissertation for the Ed.D. during this Fall Semester 2013.

MENTOR:
Dr. Christopher Tienken

COMMITTEE MEMBER:
Dr. Barbara Steeble

COMMITTEE MEMBER:
Dr. Vincent Calotta

COMMITTEE MEMBER:
Dr. Maria Pisan

The mentor and any other committee members who wish to review revisions will sign and date this document only when revisions have been completed. Please return this form to the Office of Graduate Studies, where it will be placed in the candidate's file and submit a copy with your final dissertation to be bound as page number two.