THE IMPACT OF MONTESSORI TEACHING ON ACADEMIC ACHIEVEMENT OF ELEMENTARY SCHOOL STUDENTS IN A CENTRAL TEXAS SCHOOL DISTRICT: A CAUSAL-COMPARATIVE INQUIRY

A Dissertation

by

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This dissertation meets the standards for scope and quality of
Texas A & M University-Corpus Christi and is hereby approved.

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ABSTRACT

Providing a meaningful and experiential learning environment for all students has long created a concern for alternate ways to teach students who are reportedly demonstrating non-mastery on state standardized assessments. As the benchmark for showing successful academic achievement increases, so does the need for discovering effective ways for students to learn. The Montessori teaching method has been in existence since the early 1900s when Dr. Montessori made her discovery of the student learning process. Dr. Montessori connected to the laws of nature and the environment for creating students who are problem-solvers with critical-thinking skills. The Montessori Method is designed to promote independent learning and support normal development in children. A Montessori lesson is defined as any interaction between an adult and a child; it incorporates techniques that are defined to serve as guidance for the adult personality in working with the child.

The study investigated the impact of Montessori Method on the academic achievement of 3rd, 4th, and 5th grade students. The State of Texas Assessments of Academic Readiness (STAAR) was used to measure academic achievement in reading and mathematics. An ex post facto, causal-comparative design was employed. The characteristic-present samples consisted of 47 3rd, 40 4th, and 44 5th graders. There were 71 3rd, 60 4th, and 49 5th graders in the comparison samples. Due to non-probability nature of the sampling technique, external validity was limited to study participants. Due to non-experimental nature of the study, no causal inferences were drawn.

A series of Multivariate Analysis of Variance (MANOVA) showed that there were no statistically significant differences between the students who received the Montessori Method of instruction and those who did not on the basis of the outcome measures of academic achievement

in reading and mathematics. The mean difference effect sizes, which were used to examine the practical significance of the findings, ranged from negligible to small.

Although the results of the study did not support the hypothesis, it must be pointed out that the Montessori Method of teaching facilitates self-paced learning that promotes a child's independence and encourages decision-making which are instrumental in becoming successful learners. Additionally, Montessori advocates experiences that are "real-world" and allow children to build intrinsic motivational opportunities; therefore, creating independent thinkers that will be competitive problem-solvers in the global economy of the 21st century. The limited studies on the Montessori Method of teaching offer opportunities for further investigation at all grade levels. For example, it is recommended to conduct a study to compare students who receive Montessori education during the early years of their academic life with those who receive Montessori education from pre-k to high school graduation. Because the Montessori name does not have a trademark, there are opportunities for investigating Montessori teacher preparation and comparing the preparation of the teachers to the standardized assessment results. There are also opportunities for investigating the method and curriculum used at schools that carry the name Montessori for comparison purposes amongst Montessori schools as well as in comparison to the results of the standardized assessments at these schools.

DEDICATION

I dedicate my dissertation to my husband, Juan Salazar, my three sons, Juan, Aaron, Mike, and my two grandsons, Juanito (J.D.) and Mikey. It is for you that I accepted the challenge to take this journey. Being a first generation graduate made it important for me to raise the benchmark of what is possible in our family. To my sons and grandsons, I encourage each of you to learn how to realize your dreams and not be afraid to take that path. It is easier to follow the path of least resistance and to settle for what is; I encourage you to step outside your comfort zone and chase your dreams no matter how challenging they may seem. IT IS ALL POSSIBLE!

To my husband, thank you for your endless support, encouragement and love. You have been by my side for 31 years; I love you for everything you are and for who I am with you.

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Philippians 4:13 I can do all things through God who gives me strength.

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Chapter I

Introduction

Background and Setting

Providing a meaningful and experiential learning environment for all students has been a global goal of all concerned individuals. In the 1800s, Dr. Édouard Seguin, a French physician used the scientific approach of self-directed materials to help mentally challenged children learn. Dr. Seguin declared that the mentally challenged children were successful in using materials that enabled them to be self-directed. The success of Dr. Seguin intrigued Dr. Maria Montessori and using his materials, she conducted her own experiments with the children while still living in Rome, Italy. Her observations and experiments with the children ultimately led her to design the Montessori Method, but she did not always have a passion for teaching and ironically was initially against teaching as a career.

The history of Dr. Montessori starts with knowing that even though Italy became a single unified nation in 1870, the political format changed. There was still much division which was especially clear in the social fabric (Kramer, 1988). The lack of social reform, along with political bureaucracy, made it difficult for Italy to make progress. Among the lack of civil liberties was a "school system a hundred years behind the times and attended by only a small fraction of the population" (Kramer, 1988, p. 19). In the mid-1870s, a group of liberals and conservatives came together and engaged in a transformismo, where government agreed to isolate the extremes of the left and the right in an effort to meet on middle grounds. Among the ideals that the transformismo addressed was "the development and support of public education" (Kramer, 1988, p. 20).

Maria Montessori, born in 1870, was five years old during the crucial time of the

transformismo. Her father was a government official and her mother had dedicated herself to seeing the unity of Italy. Maria Montessori's family made the decision to move to Rome in an effort for her to get a better education (Kramer, 1988). Montessori had developed a lifelong love for mathematics and because she had no interest in becoming a teacher, she chose to attend a boys' school of engineering. It was at the engineering school that she also found her interest in biology. Montessori discovered that what she wanted to do was to study medicine and against societal acceptance, she enrolled in the College of Medicine at the University of Rome. By 1896, in spite of the great resistance in a male-dominated society, she became the first female to qualify as an Italian physician (Kramer, 1988). Dr. Montessori devoted much of her time as a physician in studying Dr. Édouard Seguin's research and developed the conviction that medicine was not the answer to helping children with retardation, but that education was the answer.

By 1907, Montessori had established her first educational program, Children's House, in a poor district of Rome, where she first observed children, using Dr. Édouard Seguin's materials. After observing the children working with Seguin's materials, Montessori concluded that the children's behavior to be in a focused state of concentration that aligned with a peaceful and harmonious environment. Montessori termed the behavior change *normalization*, and concluded that it was at this state of being that children had reached a normal state (Havis, 2006a).

Although the Montessori principles and method of learning were first introduced to the United States in 1913, it was not until the 1960s that the name Montessori became well known when it was reintroduced to the United States in 1962 (Kramer, 1988). It was at this time that schools and organizations began to use the Montessori approach, using various interpretations, versions, and ideas of the approach. In 1979, Lee Havis, who revised the book *Maria Montessori: Her Life and Work,* founded the International Montessori Society (IMS). The

purpose of the organization was to study and support the principles of Montessori and the belief that peace and harmony are keys to learning and that a commitment to the laws of nature is required.

The Montessori self-directed and independent way of learning through peace with the environment contradicts the traditional method of instruction in public schools, which is teacher directed and leaves little for a child to learn naturally. Montessori acknowledges a child's natural eagerness to learn and supports that desire with a carefully prepared environment which results in students who are grounded in self-discovery and trusting of their own abilities (Black, 2011). Montessori, known for her many thoughts and quotes in regards to educating children in an environment prepared for self-learning, did not approve or promote helping children with tasks they were able to accomplish on their own. Montessori cautioned that completing tasks for children took away from them the ability to teach themselves. In the book, *In Montessori: The Science Behind the Genius*, Lillard (2008) reported "The very structure of schools, from physical arrangements to schedules to the ubiquitous use of textbooks and tests, supports behaviorist techniques and thereby leads teachers to take a fundamentally behaviorist approach. If the teacher has a desk in front of a blackboard at the front of the classroom and students are seated in rows facing the teacher, small group or individual work is unnatural" (Lillard, 2005, p. 13). According to Angeline Stoll Lillard, when students are seated in rows and listen to lectures, they are deprived of the opportunity to discover learning on their own. In addition to lecture style seating arrangements, "Learning in traditional schools comes largely from books, even during years when children in traditional schools are not yet particularly good readers" (Lillard, 2005, p. 13).

It has been over 100 years since Dr. Montessori first introduced the Montessori Method

of teaching. It was reported that over 5,000 schools in the United States use the Montessori Program which included nearly 300 public schools (Lillard & Else-Quest, 2006). The Michael Olaf Montessori Company estimated over 7,000 Montessori schools worldwide (Olaf, 2012).

Statement of the Problem

There is a school district in central Texas, which served approximately 15,000 students at the time of conducting the study. There was one Montessori elementary school, hereafter referred to as The School, in the district. The School, founded in 1998 as a Montessori public school, served 450 students. The effectiveness of the Montessori Method of instruction had not been systematically investigated in The School.

Conceptual Framework

Montessori teaching provided the conceptual framework for the study. The Montessori Method promotes independent learning and self-discovery. The teaching method strives to control the environment and not the child. The environment is committed to the laws of nature and a child is encouraged and allowed to roam about his/her environment as a natural normal being. In a Montessori setting, there are three basic elements: 1) physical objects, 2) other children, and 3) an adult personality (Havis, 2006a). The International Montessori Society (IMS) illustrated 20 protocols that "provide a contextual control of error for conducting experimental interactions with children" (Havis, 2006a, p. 15). The Montessori protocols are: 1) well-being of total environment; 2) least amount of adult involvement; 3) present moment; 4) no negative attention to misbehavior; 5) don't correct child; 6) basis of interest (ask; touch/look); 7) model good behavior; 8) eye contact before talking; 9) don't interrupt concentration; 10) be friendly – get acquainted; 11) enhance independence; 12) no rules for children; 13) emphasize main points – isolate variable; 14) child watching; 15) same routines all the time; 16) take out everything; 17)

from the shelf; 18) lay out randomly; 19) simplify complexity – hint; 20) confirm accuracy – clarify/expand (Havis, 2006a, p. 28-30).

It is the Montessori belief that a prepared environment for learning allows children to learn when they want to learn; therefore, enabling a trained teacher to match the curriculum to the child instead of the child to the curriculum, as done in traditional schools (Miller, 2009). Further, students in a Montessori program are placed in a multi-aged grouping environment prepared in three-year increments. For example, a 6 to 9-year-old child placed in a classroom, allows the teacher to spend three years with the student. The teacher makes records of what s/he observes in the child, and what and how the child chooses to learn. When the child leaves the 6-9 year-old environment and proceeds to the 9-12 year-old environment, the number of new students entering the program are equivalent to the number of students leaving the community. The advantage to this practice is the minimal disruption to the already established learning environment (Miller, 2009). In addition, the Montessori teacher spends less time getting to know his/her students each school year as s/he already knows two-thirds of the class. In a Montessori environment, students engage in practical life exercises intended to foster their independence. There are four categories of these exercises: 1) preliminary applications, 2) applied applications, 3) grace and courtesy, and 4) control of movement. Standardized testing is considered a practical life exercise and a major emphasis is not placed on testing. Dr. Jean Miller earned her doctorate in Montessori studies and writes *e*-articles for Montessori Australia. In Issue 4 of 2009, she summarized the Montessori viewpoint on standardized testing with the following quote by Carrie Driver Johnson, a Montessorian that lives in Milwaukee, Wisconsin "If we must use standardized tests, then they can be approached in a Montessori setting as a Practical Life exercise. We must remember these tests do not measure intelligence but only how well a child

can take a particular test at a particular time and place" (Miller, 2009, p. 3). The Montessori quote about standardized testing is contradictory to the drills of traditional schools in which teachers focus on student performance on standardized tests to produce desirable results.

Purpose of the Study

The purpose of the study was to examine the impact of Montessori teaching on academic achievement of elementary school students in an urban school district in Central Texas. The 3rd, 4th, and 5th grades were selected because they are the first three years in which standardized testing is conducted in Texas. The study was guided by the following research questions:

1. Do third, fourth, and fifth grade students who attend a Montessori public school program perform better than do third, fourth, and fifth grade students who attend a non-Montessori public school program on the basis of achievement in mathematics?
2. Do third, fourth, and fifth grade students who attend a Montessori public school program perform better than do third, fourth, and fifth grade students who attend a non-Montessori public school program on the basis of achievement in reading?

Operational Definitions

In the school year 2011-2012, the State of Texas Assessments of Academic Readiness (STAAR) was introduced as the new standardized state assessment for students in elementary and secondary schools. The STAAR is based on the Texas Essential Knowledge and Skills (TEKS) and measures readiness standards in mathematics and reading. For the purpose of the study, achievement in mathematics and reading were measured by the proportion of correct answers to questions in each of the State of Texas Assessments of Academic Readiness (STAAR) categories. Mathematics categories were 1) numbers, operations and quantitative reasoning; 2) patterns, relationships, and algebraic reasoning; 3) geometry and spatial reasoning;

4) measurement; and 5) probability and statistics. Reading categories were 1) understanding across genres; 2) understanding and analysis of literary texts; and 3) understanding and analysis of informational texts analysis.

Delimitations, Limitations, Assumptions

The study was delimited to two elementary schools in an urban school district in Central Texas, and the outcome measures of academic achievement in mathematics and reading. The study employed non-random sampling; thus, external validity was limited to study participants. It was assumed that the data provided to the researcher were accurate and that the teachers had followed the curricula accordingly in teaching various classes.

Significance of the Study

In preparation for life, students need education that supports their natural environment to ascertain their curiosity and to promote intrinsic learning. Schools need to be able to develop and foster independence in students in an effort to provide citizens who can compete in the world. In a competitive job market, employers seek to hire problem-solvers who can facilitate teamwork and accomplish more with less. Students who are able to prepare their own plan for accomplishment are engaged in the training of becoming self-reliant human beings.

In 2004, American broadcast journalist hosted the ABC-TV special "The 10 Most Fascinating People of 2004." Among the 10 most fascinating people were Larry Page and Sergey Brin, founders of the enormous internet search engine, Google.com, who credited their success to having been Montessori students (Olaf, 2012). Both Larry Page and Sergey Brin attributed their independence and ability to being self-directed and self-starters as something they learned as Montessori students. William Wright, a computer game designer best known for his design of *The Sims* game series which has been the best-selling PC game in history attributes his

success to having been educated in a Montessori environment at an early age. He has attributed his self-motivation, creativity, and problem-solving skills to having learned the joy of discovery at an early age through Montessori schooling, as did Amazon founder, Jeff Bezos, along with other famous Montessorians.

The Montessori Method facilitates self-paced learning that promotes a child's independence and encourages decision-making which are instrumental in becoming successful. Additionally, Montessori advocates experiences that are "real-world" and allow children to build intrinsic motivational opportunities; therefore, creating independent thinkers that will be competitive problem-solvers.

In addition to the interest in facilitating a child's independence with critical thinking skills and problem solving abilities, the schools are forced to look for effective teaching methods that will enable students to score well on state assessments. Educational leaders are also familiar with the requirements of No Child Left Behind that requires 100% of the students able to show mastery on the state assessment by 2014. The standardized assessment currently given to students in Texas is the State of Texas Assessments of Academic Readiness (STAAR) (Texas Education Agency, 2012a).

Chapter II

Review of the Literature

Introduction

The goal of providing a meaningful and experiential learning environment for all students has long created a concern for alternate ways to teach students who are reportedly demonstrating non-mastery on state standardized assessments. Chapter 2 provided a systematic review of the research and literature related to student academic achievement and Montessori teaching in comparison to non-Montessori teaching. In an effort to better understand the Montessori Method and be able to compare the effectiveness to a non-Montessori traditional method, the traditional method is equally defined and explored. The chapter is presented in seven sections: 1) Montessori Method, 2) Multi-age Classrooms, 3) Non-Montessori Traditional Teaching, 4) Conceptual Framework, 5) Academic Achievement, 6) Teacher Preparation, and 7) summary.

Montessori Method

Dr. Maria Montessori graduated from medical school in 1896 at the University of Rome and was the first female doctor in Italy. One month after graduation, Montessori became a staff member at the Psychiatric Clinic at the University of Rome and began working at the children's hospital. One of Montessori's duties included visiting the children that were committed to the asylums in Rome. After observing the children in the asylums, Montessori became convinced that the children could benefit from a type of special education.

While working at the children's hospital in 1897, Montessori had what she considered a revelation. During this period of revelation, she reported her observation that children with a mental deficiency presented a pedagogical need rather than mainly a medical problem (Montessori, 1966). Montessori concluded that the children she was working with at the hospital

could not be treated in hospitals but rather needed to be trained in schools (Montessori, 1912). The manifestation of her reflection was reported in *Montessori, a Modern Approach* as follows: "I succeeded in teaching a number of the idiots from the asylum both, to read and write so well that I was able to present them at a public school for examination with normal children. When they passed the examination successfully . . . while everyone was admiring the progress of my idiots, I was searching for the reason which could keep the happy healthy children of the common schools on so low a plane that they could be equaled in tests of intelligence by my unfortunate pupils. I became convinced that similar methods applied to normal children would develop or set free their personality in a marvelous and surprising way" (Lillard, 1972, pp. 2).

Montessori travelled to London and Paris to observe and study the works of Jean Itard and Dr. Édouard Seguin, who had been pioneers of self-directed materials and education. When Montessori returned, the Italian Minister of Education asked her to teach the teachers of Rome. Her teaching became a course of lectures that developed into the State Orthophrenic School and in 1898, Montessori was named the director. It was during this time that Montessori first introduced her pedagogical theory, aligned with her philosophy, that a child carries within him/herself, though unaware, the person s/he will become. Her educational theory was a combination of ideas taken from anthropology, education, and medicine, as she echoed her belief that a child should be taught before making him/her execute a task (Montessori, 1912). Her teaching originated and immersed in Rome in 1907, when she observed that children would always conform and return to their state of complete self-discipline within their own surroundings. Montessori observed young children repeatedly and found her results to be consistent in an exact scientific manner and consistently resulting in children being at peace and harmony with their natural environment (Lillard, 2005).

Constructivist Theorist, John Dewey (1859-1952), also emulated the importance of the environment in the learning process in his famous *My Pedagogic Creed*, stating that education does not prepare a student for life, but rather life itself is the education (Dewey, 1897). Montessori promoted independent learning and supported learning development in children, promoting the theory that education is life itself. One of the most significant attributes of Montessori teaching is the validation that students learn in a different way, at their own pace, and following their inner guidance of nature (Havis, 2006a). In Montessori Method, peace and harmony are keys to learning and therefore a commitment to the laws of nature is required. In practice, the Montessori Method requires the control and preparation of the learning environment and never the control of the child. The child is a natural spiritual being that will react and respond accordingly to the environment that has been prepared for learning. A Montessori Method prepared environment consists of physical objects, other children, and the adult personality. The adult personality is the teacher in the classroom who is present to observe and guide as necessary. In Montessori, the basic experiment is that every child has a capable and willing inner guidance, which enables self-direction and causes responses according to the prepared environment. A child using his/her own self-direction in a prepared environment will respond using inner guidance for true self-directed normal development (Havis, 2009).

In Montessori Method**,** 10 basic techniques incorporate physical action with the child to enable control of the environment. The physical interaction techniques from light to heavy are as follows: 1) eye contact "…teacher and child looking in each other's eyes. Implies no negative judgmental expression" (Havis, 2006b, p. 33); 2) proximity "…teacher moving physically closer to or further away from a misbehavior scenario…" (Havis, 2006b, p. 34); 3) distraction "If there is some child who persistently annoys the others, the most practical thing to do is to interrupt

him…"(Montessori & Claremont, 1969, p. 254); 4) clear direction "…teacher telling child to do something…" (Havis, 2006b, p.32); 5) repetition is the act of doing again and a natural way for children to learn (Hardinge, 1994); 6) patient waiting "The teacher must be quiet and passive, waiting patiently and almost withdrawing herself from the scene…" (Montessori & Claremont, 1969, p. 240); 7) reflective language "…the teacher repeating back the same language given initially by the child…" (Havis, 2006b, p. 34); 8) questioning "…teacher asking the child something …often used to resolve fantasy behavior" (Havis, 2006b, p. 34); 9) cooperative touching "… teacher doing something with child that requires some element of physical contact with child…" (Havis, 2006b, p. 32); and 10) imagination – pre-visioning ".... an intending Montessori teacher…must keep her imagination alive…she sees that single normalized type" (Montessori & Claremont, 1969, p. 252).

The techniques work when applied in conjunction with the 20 applicable protocols, which define how to prepare the environment. The protocols of the Montessori Method that direct the use of the various techniques are: 1) well-being of total environment; 2) least amount of adult involvement; 3) present moment; 4) no negative attention to misbehavior; 5) do not correct child; 6) basis of interest (ask; touch/look); 7) model good behavior; 8) eye contact before talking; 9) do not interrupt concentration; 10) be friendly – get acquainted; 11) enhance independence; 12) no rules for children; 13) emphasize main points – isolate variable; 14) child watching; 15) same routines all the time; 16) take out everything; 17) from the shelf; 18) lay out randomly; 19) simplify complexity – hint; 20) confirm accuracy – clarify/expand**.** In using the techniques and protocols, it is equally important to use "safe words" as part of the Montessori environment, especially in a difficult misbehavior situation. Safe words are often difficult for adults who have developed negative language like "no" and "don't" when dealing with

children's misbehavior (Havis, 2006a). The following statements are examples that incorporate useful safe words: "Come over here. Let me show you something." "What do you think?" "Where does this go?" "Who else can help you with that?" (Havis, 2006a, p.7). Montessori consists of practical life materials that include taking care of oneself, the environment, and social graces. Major attributes taught to children of a Montessori environment are respect, body movement, and using polite language. One of the most significant attributes of Montessori teaching is the validation that students at all levels learn in different ways and each at their own pace following their inner guidance of nature (Havis, 2006a).

The Montessori Method promotes the learning of children by encouraging and promoting the utilization of physical objects as well as promoting their nurturing ability of care and respect for each other and their natural environment. A child in a Montessori environment learns to exercise self-control, be self-organized, and use self-correction. Montessori beliefs require a response to children's misbehavior by modifying the environment. An example of this modification would be to remove the detrimental influences surrounding the child, therefore, resulting in modifying the environment in question. The Montessori Method does not support enforcing control of the child, as is a more practical approach in a non-Montessori environment. Academic development is extremely important in children and the results are measured, using standardized assessments in school, but Montessori upholds that true measurement is the success of a child transposed into an adult (Lillard, 1996). The academic development in a Montessori environment provides an orderly arrangement of self-teaching materials that children use to learn freely and independently. In a non-Montessori setting, the environment is more of a robotic environment where everyone is doing the same thing at the same time and children practice learning the same material with the same approach in unison.

On February 11, 2009, The Montessori Foundation published the following definition of traditional American school: traditional American school for centuries was the one-room schoolhouse with multi-age groups and teachers who remained with the same groups of children for several years (Seldin 2009). In Montessori Method, children of mixed ages with mixed abilities are in multi-age classrooms that stay together for a minimum of three years. The multi-age setting promotes what traditional school set out to be but later deviated from it in a traditional public school classroom. During this multi-age period, there is consistency with interaction, socialization, problem solving, and child-to-child teaching and learning. Children self-challenge themselves according to their ability and work self-paced in an environment that has been prepared to promote learning from their peers as well as offer opportunities to participate in peer teaching.

Multi-age Classrooms

One important component of a Montessori classroom is the construction of a classroom that includes multi-age grouping. Multi-age classrooms consist of a mixture of children that have an age span that is greater than one year and typically incorporates a three-year age span. The three-year age span provides continuous stability in the classroom from the beginning of the year to the end of the school year and for subsequent years. The students in the multi-age classroom typically already know at least one-third of the classroom and the majority know two-thirds of the classroom. One-third of the classroom exits to a higher level each year and one-third is new to the classroom each school year. Minimizing the number of new students into the teacher's classroom allows the teacher to get to know students and their development well. This procedure also minimizes the anxiety a student commonly feels when dealing with a new school year and the experiences that come with the arrival of the new school year. Such experiences

generally include a new teacher, new peers, new expectations and new programs.

In a multi-age classroom, the teacher serves as a facilitator and encourages children to help each other, promoting peer-to-peer learning and discovery. These classrooms are beneficial in providing opportunities for children to develop skills intellectually, socially, and emotionally. Students in the multi-age classrooms experience opportunities to develop leadership skills regardless of age, and the class develops a strong alliance. The bond created gives students a sense of community much like an extended family. In this environment, students learn to care for each other and this process ultimately results in learning to care for others as a way of being.

The older students who help the younger students experience leadership opportunities in the multi-age classroom. "Slightly older children might serve as the best kinds of models for learning to re-enact structured sequences of action, from which much Montessori learning stems" (Lillard, 2005, p. 201). As the class stays together, the younger students become the older children and practice their observations, experiences, and modeling. Some of the children who get to experience this leadership opportunity would not have this experience in a single age classroom (Grant, Johnson & Forsten, 1996). Montessori students learn through peer tutoring and by example based on the modeling of their older peers. Gaustad (1997), Katz (1995), and Veenman (1995) found that students in multi-age classrooms demonstrated increased self-esteem, more cooperative behavior, better attitudes toward school in general, increased pro-social behavior consisting of caring, tolerance, patience, and supportive behaviors with enriched personal responsibility, and a decline in discipline problems than did the comparison groups. Grouping in multi-age classrooms allows students to come in and out of groups based on their individual self-paced learning and take on the role of the teacher or the learner based on their being. In addition, students form and join groups based on their interests, social needs, and other

criteria, which provides experiences toward diversity. The diversity experienced in multi-age classrooms encourages students to find commonalities almost without realization of the process (Powell, 2009).

The literature in support of multi-age classrooms includes the study by Barbara Pavan, Professor of Educational Administration at Temple University. Dr. Pavan did a study of 64 subjects attending a multi-age classroom. She found that 58.00% of the students in multi-age classrooms performed better on academic achievement than their peers who attended single-age classrooms. Additionally, she found that 33.00% of the multi-age students performed as well as their peers in a single-age classroom and only 9.00% did worse than students in a single-age classroom (Pavan, 1992).

Another study on multi-age conducted by Kadivar, Nejad, and Emamzade (2005) used 261 subjects who were randomly selected and placed in two groups: 1) single-age classes (n = 130, female = 49, male = 81) and 2) multi-age classes (n = 131, female = 56, male = 75). Findings revealed statistically significant difference in academic achievement between the single-age classes and the multi-age classes with the multi-age classes outperforming their single-age peers. The study supported the multi-age concept used by Montessori, as part of the classroom setting that is supportive of the student-learning environment.

Non-Montessori Traditional Teaching

"Mistaken practices" is how Michael Rosanova (2003, p.8) described traditional American schools. Rosanova conducted a comparison of the Montessori Method and the traditional approach and wrote the following: "In a traditional classroom, the Three R's are the focus. The teacher stands before the group, disburses information, and then leads a few group drills. One size fits all. Children who do not catch on are relegated to lower "ability groupings"

and the same mistaken teaching practices are repeated" (Rosanova, 2003, p. 8).

The environment of a traditional classroom setting typically consists of five or six rows with five to seven chairs lined up straight (McCorskey & McVetta, 1978). This setting, which was described and referred to as "something like tombstones in a military cemetery" was not conducive to student learning (Rosenfeld & Civikly, 1976, p. 161). The operational description by Hurt, Scott, and McCroskey (1978) was that traditional seating focused on students giving the teacher all their attention while minimizing student-to-student interaction and accepting teacher-directed study as the only means of learning. In this type of structured environment, there can only be one leader and that is the role of the teacher. However, over the years, education theorists such as Dewey, Piaget, Bruner, and Montessori have provided an alternative way of thinking in regards to teaching but because traditional education offers the benefit of familiarity to adults who were educated in the same method, they resorted to continue the use of the well-known traditional method (Zilversmit, 1993). Education students struggle to understand constructivism and therefore fail to implement the method well. The students that become the teachers can only relate to what they experienced in traditional methods provided to them by their elementary and high school teachers (Renninger, 1998).

The classroom setting in a traditional classroom encompasses the same setting and the same practice of placing the teacher as the focus and discouraging student-to-student interaction. This type of setting encourages the belief that all children will learn in the same way, at the same time, and with the same structured approach. This type of uniform setting promotes teacher-led instruction as the only method of learning, which is not applicable to learning for all students and promotes dependency and acceptance for teacher-directed study as the only means of learning (Hurt, Scott & McCroskey, 1978). In the early 1900s, John Dewey criticized the seating

arrangement that came with traditional teaching because it fostered teacher directed instruction and prohibited student interaction. The traditional setting discouraged student-to-student learning and student self-discovery. The fall 2008 issue of *Tomorrow's Child* reported that traditional teaching leads to people who become dependent and who learn to work only within the traditional system, therefore, not allowing self-reliance and independent thinking. The issue further elaborated that traditional schools produce people who could follow systematic orders in responding to their supervisors in lieu of being independent thinkers who were problem-solvers (Seldin, 2008).

The alleged ineffectiveness of a traditional school education is questioned when great people like Abraham Lincoln grew up to be President of the United States of America with only 50 weeks of traditional education (Gatto, 2000). President Lincoln did not have any other kind of education other than the one he acquired through self-discovery. Innovative thinker Charles Leadbeater along with researcher Annika Wong (2010) joined Maria Montessori and John Dewey in the belief that learning comes from the change made by action that allows students to reflect and determine the symbiotic relationship. Leadbeater's book, *Innovative in Education: Lessons from Pioneers around the World* (2012) reaffirmed the position that traditional educations systems are failing. Leadbeater spoke at the World Innovative Summit for Education (2011) and reinforced that delivering more of what is already dysfunctional is not a solution. He emphasized that simply providing more of what is already not working in public schools would not provide a solution to our existing educational challenges. Charles Leadbeater insisted that our educational system needed different educational approaches in order to have satisfactory results. Bransford, Brown, and Cocking (1999) and Donovan and Bransford (2013) stated that traditional academic approaches emphasized on memorization and would not develop students

who are critical thinkers or students who can speak, and write effectively. We require a different framework (Tinney, 2012). Early pioneer theorist and current philosophers concluded that traditional methods and their current effect in public schools are not enough to meet the need for learning. Subsequently, governments would have to turn to more innovative strategies that must come from outside the traditional school system (Leadbeater & Wong, 2010).

Conceptual Framework

The Montessori Method of teaching provided the conceptual framework for the study. Dr. Montessori believed the child's mind operates much differently than an adult. Modern scientists have continued to confirm and discover scientific data that reinforces Montessori's discoveries. The Montessori Method, in practice, promotes independent learning and self-discovery and defines the laws of nature as being intricate in the ability for a child to learn at capacity. The teaching method strives to control the environment and not the child. The environment is committed to the laws of nature and the child is encouraged and allowed to roam about his/her environment as a natural normal being. Dr. Montessori based her educational methods on scientific observations of children learning and the processes used by the child's mind and their contentment with the laws of nature and their environment.

It is a Montessori belief that a prepared environment for learning allows children to learn when they want to learn therefore enabling a trained teacher to match the curriculum to the child instead of vice versa as done in traditional schools (Miller, 2009). There are eight principles of Montessori Education that help to frame the conceptual framework of this study and though they are deeply engrained in the Montessori Method, they are capable of co-existing in a traditional classroom if a traditional teacher were to accept and implement the principles. These principles are supported today by research studies in psychology and education (Lillard, 2005). According

to Lillard (2005), the eight principles of Montessori education are as follows and are further defined in the next paragraph: 1) that movement and cognition are closely entwined, and movement can enhance thinking and learning; 2) that learning and well-being are improved when people have a sense of control over their lives; 3) that people learn better when they are interested in what they are learning; 4) that tying extrinsic rewards to an activity, like money for reading or high grades for tests, negatively impacts motivation to engage in that activity when the reward is withdrawn; 5) that collaborative arrangements can be very conducive to learning; 6) that learning situated in meaningful contexts is often deeper and richer than learning in abstract contexts; 7) that particular forms of adult interaction are associated with more optimal child outcomes; 8) that order in the environment is beneficial to children.

1. Movement and cognition: Montessori described the first principle as noting that thinking seems to be expressed by the hands before it can be put into words and an idea in which Piaget evidentially concurred.

2. Choice: free choice is the ability for the child to have choice and control in their environment therefore promoting the independence in a child. Montessori children are free to make many more choices than students in traditional classrooms are. Research in psychology suggests that more freedom and choice within a structure with order are linked to better psychological and learning outcomes.

3. Interest: best learning practices occur when a student has a deep-rooted interest in what they are doing to learn. Montessori education capitalizes on interests that appear regularly at particular times in development such as the pique interest children have for learning language in the pre-school years.

4. Extrinsic rewards are avoided: extrinsic rewards are disruptive to a student's

concentration. Learning works best when extrinsic rewards are not part of the framework.

5. Learning with and from peers: In Montessori primary classrooms children often choose to work alone by choice. As children get older, they practice and learn to work together rather than competing against each other as in often the practiced at a traditional school.

6. Learning in context: Instead of learning largely by what the teacher is saying, a Montessori student learns primarily by doing.

7. Teacher ways and child ways: Montessori teachers set limits and then set children free within those boundaries.

8. Order in environment and mind: Montessori classrooms are organized and orderly, physically in terms of layout and conceptually in terms of how the material progresses.

Standardized testing is not a priority or an absolute focus for Montessori schools. Standardized testing in accordance with the following philosophy is handled accordingly: "If we must use standardized tests, then they can be approached in a Montessori setting as a Practical Life exercise. We must remember these tests do not measure intelligence but only how well a child can take a particular test at a particular time and place" (Miller, 2009, p. 3). The Montessori's quote about standardized tests is contradictory to the drills of traditional schools to promote student performance on standardized tests.

The review of the literature revealed a number of studies based on the Montessori Method and results varied. Lillard and Else-Quest (2006) examined the academic achievement and social scores of kindergarten through sixth grade students enrolled in a public Montessori school in the Milwaukee Independent School District in comparison to students not enrolled in a Montessori program. The study titled, *Evaluating Montessori Education,* revealed there were statistically significant differences between the Montessori students and the non-Montessori

students on the basis of academic achievement and social scores. The Montessori students outperformed their peers in all but the sixth grade.

McDurham (2011) examined the academic achievement of seventh and eighth grade students from a Montessori program in comparison to seventh and eighth grade students from a non-Montessori program. Academic achievement was defined as the TAKS results in mathematics and reading for seventh grade Montessori students and the TAKS results in reading, science, math and social studies for eighth grade students. The study titled, *A Comparison of Academic Achievement for Seventh and Eighth Grade Students from Montessori and Non-Montessori School Programs,* revealed there were statistically significant differences between the Montessori students and the non-Montessori students on the basis of academic achievement and the Montessori students outperformed their matched counterparts on all TAKS tests.

Dohrmann, Nishida, Gartner, Lipsky, and Grim (2007) performed a quantitative study in which they compared the academic achievement of two groups of Milwaukee high school students on the basis of math and science performance. One group attended a Montessori school from pre-kindergarten through fifth grade and a matched peer group that attended non-Montessori schools. The study titled, *High School Outcomes for Students in a Public Montessori Program,* revealed there were statistically significant differences between the two groups and the Montessori students outperformed the non-Montessori group.

Lopata, Wallace, Finn, and Kristin (2005) examined the academic achievement of fourth and eighth grade students from a Montessori program in comparison to fourth and eighth grade students from a non-Montessori program. Academic achievement was defined as standardized measures in math and language arts for both groups. The study titled, *Comparison of Academic Achievement between Montessori and Traditional Education Programs,* failed to support the

hypothesis that enrollment in a Montessori program was associated with higher academic achievement.

Mallett (2013) examined the academic achievement of first, second, third, fourth and fifth grade students from a Montessori program in comparison to first, second, third, fourth and fifth grade students from a non-Montessori program. Academic achievement was defined as results on the Iowa Tests of Basic Skills (ITBS) Total Reading and Total Math scores for first and second grade. Academic achievement was defined as results on the Texas Assessment of Knowledge and Skills (TAKS) for third, fourth, and fifth grade. The study titled, *Academic Achievement Outcomes: Montessori and Non-Montessori Public Elementary Students,* revealed there were no differences between the Montessori students and the non-Montessori students on the basis of academic achievement in first, second, and third grade. The study revealed there were statistically significant differences and the Montessori students outperformed their matched counterparts in fourth and fifth grades.

Academic Achievement

*"*Two fundamental cornerstones of American schooling today were placed at the turn of the 20th century: the school as a factory and the child as a blank slate" (Lillard, 2005, p. 3). Angeline Lillard used her quote to illustrate that America's traditional schools continue to educate students with a factory *one-size fits all* concept, and students continue to appear with a blank slate; therefore academic achievement is still in the same state of urgency of 1983 when *A Nation at Risk* made its debut to the American public. Regardless of the concept, philosophy, pedagogy, or design, the measurement for academic achievement has been determined the same for all schools. The pendulum has swung from conservative and traditional test-oriented

programs to progressive and permissive programs and back again to test-oriented programs, where we stand today (Lillard, 2005).

The 66th Legislature in 1979, acknowledged the criticism of America's high school students graduating without a proper education that would equip them to perform successfully in the workforce. This movement further concluded that accountability was necessary in the form of a standardized test that would provide measurement of the academic education of students (Cruse & Twing, 2000). In 1980, the first standardized test known as the Texas Assessment of Basic Skills (TABS) was developed to measure academic achievement in public schools. By 1983, TEA started publishing test scores in an effort to show the public how students were mastering the curriculum in Texas public schools. In 1983, the public also faced the 18-month study, *A Nation at Risk: the Imperative for Educational Reform* (Ravitch, 2010), by the National Commission on Excellence Education (NCEE), which was created to evaluate America's educational program and make recommendations for improving education. The report indicated that American schools were failing and American pupils were unable to compete in a highly skilled work force. Among other alarming concerns that were stated in the report by the NCEE was the concern that each generation of Americans has outstripped its parents in education, literacy, and economic attainment; and that for the first time in the history of our country, the educational skills of one generation would not surpass, equal, or even approach those of the parents" (United States. National Commission on Excellence in Education, 1983). A Nation at Risk has been credited with placing education on the top of the nation's agenda and starting the elementary and secondary education reform that was reauthorized in 2001 as NCLB. Over a quarter of a century later it continues to mandate better results on standardized testing. Stedman (2009) has made reference in his study of educational trends that the Nation at Risk report caused

one of the greatest debates in the country on education. In 1983, no debate had taken greater precedence since Sputnik. Accountability continues to be a top agenda item and the minimum is no longer acceptable as the United States of America struggles to take and maintain a lead role. After the TABS, the Texas Educational Assessment of Minimum Skills (TEAMS) became the standardized test followed by the Texas Assessment of Academic Skills (TAAS) and it remained in use for over ten years. In the spring 2004, the new instrument to measure academic achievement was the Texas Assessment of Knowledge and Skills (TAKS), which was in use through 2011. Since spring 2012, academic achievement has been measured by the State of Texas Assessments of Academic Readiness (STAAR) (TEA, 2012a).

The creation of the STAAR was a collaborated effort between the TEA, the Texas Higher Education Coordinating Board (THECB), and Texas educators in response to the requirements set forth by Senate Bill 1031 of the 80th Texas Legislature, 2007 (Texas Legislature Online, 2012c) and House Bill 3 of the 81st Texas Legislature, 2009 (Texas Legislature Online, 2012d). The instrument is different in that it has a time limit for students, has more test questions than previous tests, and is more rigorous with a requirement of utilizing higher-order thinking skills (TEA, 2010). The STAAR is intended to measure readiness strands in reading and mathematics as well as reflecting how well the Texas Essential Knowledge and Skills (TEKS) are mastered. The concentration of the STAAR is to ensure academic achievement will reflect postsecondary readiness of high school graduates who can be competitive nationally and internationally (TEA, 2012a). In December 2010, House Bill 3 Transition Plan Report summarized the changes in the STAAR as follows: 1) increasing rigor and relevance of both standards and assessments; 2) creating and assessing postsecondary readiness standards; 3) establishing campus and district accountability based on higher college and career-readiness performance standards on STAAR

and on distinctions earned by campuses demonstrating achievement in areas not measured by the STAAR program as well as on academic performance; and 4) establishing new timelines for interventions and sanctions while also expanding school closure and alternative management options (TEA, 2012a). The STAAR is an instrument designed to not only measure academic achievement for a student's current school year but designed to dictate the growth necessary for the following year in order to succeed in subsequent years (TEA, 2012a).

The United States struggles to maintain the leadership role that it once held in the global economy. On July 23, 2010, the New York Times reported that the United States once having been the leaders of 25-to 34-year-olds with college degrees, now ranked number 12 among 36 industrialized nations (Lewin, 2010). Furthermore, the 2012 Texas Education Agency Final Adequate Yearly Progress (AYP) State Summary Table showed that only 44.50% of all campuses met AYP (TEA, 2012b).

Teacher Preparation

Teachers of a Montessori school must undergo extensive training in child development. They are not specific specialists of any area but rather the focus is on child development. A Montessori teacher is a generalist who works on using life experiences to help students learn the subjects generally taught in a traditional school setting and is considerably different from being a typical traditional school teacher. The teacher is a voluminous generalist who inspires the student to utilize meaningful learning experiences and apply them to his/her life and world. The subjects learned are applicable to everyday life. Two major organizations offer the training in the United States of America: the Association Montessori Internationale (AMI) and the American Montessori Society (AMS). Training for Montessori certification requires 200 to 600 pre-service contact hours based on the desired level of training and certification. Training for a Montessori

teacher includes understanding Montessori theory and philosophy as well as practicing how to prepare the learning environment for all students as well as learning the role of being the adult personality that provides guidance for the learner. In addition, the teacher learns about classroom management and practices the use of safe words as well as practicing how to control the environment but never the child. Teacher preparation also includes learning and practicing how to use the Montessori materials in order for teachers to develop their skills in demonstrating the materials.

The Montessori campus of this study required the teachers to train and receive certification through the Houston Montessori Center (HMC) located in Houston, Texas. The HMC was an AMS-affiliated training center and offered the following credentialed courses: 1) Infant and Toddler (ages birth through 3 years), 2) Early Childhood (ages 2.5 through 6 years), 3) Elementary I/II (ages 6 through 12 years), 4) Secondary I/II (ages 12 through 18 years), and 5) Administrators Course for Leading Schools.

The above credentialed courses consisted of several phases and requirements as part of the training. The HMC described one phase as the academic phase and requirements included lectures, demonstrations, materials, practice, small group projects, personal research, presentations, seminars, and curriculum development. This phase took place on-site and teachers were required to make housing arrangements because the academic phase required two summers along with other mid-year seminars (Houston Montessori Center, 2013).

Teachers who taught the third, fourth and fifth grade students that were the subject of the study also received specialized training in the Montessori philosophy along with child development. The teachers received specialized training on how to use the Montessori Method to teach language, mathematics, geometry, sciences, history, geography, practical life, fine arts,

and physical education. Training also included Montessori training in classroom learning as well as an overview of the developmental period of 2.5 through 6 years for the child. In addition to the required training, the teachers were required to do an internship for nine months and complete 60.00% of the academic phase during the internship. Each teacher worked with a Montessori certified mentor that was already Montessori-trained at the school or an AMS certified campus and completed a long-term project under this supervision.

The HMC required a bachelor's degree to provide training and used a team teaching approach in training the teachers. The following components were required for AMS certification: attendance and participation in classes, practicum in a classroom from an AMS certified school, written assignments, performance assessment, portfolio, and research project. The pre-service contact hours provided intense training in principles of child development and Montessori philosophy and teachers learned and practiced how to use Montessori classroom materials. Teachers who obtained their Montessori certification through HMC had been immensely immersed in the Montessori philosophy, Montessori method of teaching, as well as the protocols, planes of development, safe language and the importance of serving as a guide for students to develop their independence, critical-thinking skills and problem-solving skills.

The Montessori planes of development are stages that were broken down and defined by Montessori. Her theory was "that human development does not occur in steady, linear ascent but in a series of formative planes" (Lillard, 1996, p.4). Montessori referenced the formative planes as planes of development or planes of education (Montessori, 2004). These planes define the age span in which the development of a child is appropriate for the education the child explores in that developmental period. Montessori defined the planes as: 1) early childhood – birth to 6 years, 2) childhood – 6 to 12 years, 3) adolescence – 12 to 18 years, and 4) young adulthood – 18

to 24 years. The focal point of this study encompassed the childhood plane of development – 6 to 12 years of age. This plane includes students of third, fourth, and fifth grade which range from eight to eleven years of age. In this stage of childhood, children transform from being dependent on their sensory exploration and become social explorers (Lillard & Jessen, 2003). The planes of development are paramount to teacher preparation and require that teachers understand the developmental period the student is experiencing in order to solidify the experiences provided for the student. During preparation, a teacher trains to understand that in a Montessori classroom, s/he is not the focal point of a classroom environment and often referred to as *the guide* instead of teacher. The Montessori classroom does not have a teacher desk and often is on the floor presenting a lesson. The purpose for referring to the teacher as *the guide* and not having a desk, which may indicate that s/he is in charge, is to give ownership to the student and encourage the child to be responsible for their own learning (Chattin-McNichols, 1998).

Summary

As the Texas Education Agency continues to raise the benchmark for showing successful academic achievement through state assessments, so will the need continue to grow for discovering effective ways for students to learn. Montessori has been in existence since the early 1900s when Dr. Montessori made her discovery of student learning and the connection to the laws of nature and the environment. Traditional instruction has varied in its definition but not in the approach. The review of the literature was useful in identifying, examining, and synthesizing various topics related to the focus of the study, which were used to better understand the results of the investigation and informative in discussing the findings and drawing theoretical and practical implications. The findings in previous studies related to the Montessori Method will symmetrically contribute to the understanding of the comparison between the Montessori group

and the comparison group. Though the results of the studies vary, each contributes the information discovered by the researcher and the findings of both groups for comparison and further investigation.

Chapter III

Method

Introduction

The primary purpose of the study was to investigate the impact of the Montessori program on third, fourth and fifth grade students' academic achievement in mathematics and reading. The study was guided by the following research questions:

1. Do third, fourth, and fifth grade students who attend a Montessori public school program perform better than do third, fourth, and fifth grade students who attend a non-Montessori public school program on the basis of achievement in mathematics?
2. Do third, fourth, and fifth grade students who attend a Montessori public school program perform better than do third, fourth, and fifth grade students who attend a non-Montessori public school program on the basis of achievement in reading?

Research Design

The study employed an ex-post facto, causal-comparative design. Comparisons are made between the characteristic-present and the comparison groups and the researcher attempts to identify relationships that may occur between the dependent and independent variable while speculating about possible causes or effects for any observed variations in the collected data for both groups (Gall, Gall, & Borg, 2007).

The Montessori Method is designed to promote independent learning and support normal development in children. A Montessori lesson is defined as any interaction between an adult and a child. Montessori incorporates techniques that are defined to serve as guidance for the adult personality in working with the child. There are 10 basic techniques illustrated in chapter two that elaborate on the practicing method of Montessori teaching.

In the study, there was one independent variable, the Montessori program, with two levels: 1) Montessori program (characteristic-present group) and 2) non-Montessori program (comparison group). The outcome measures were the students' academic achievement scores on mathematics and reading STAAR state assessment. The researcher did not manipulate the independent variable; thus, no causal inferences were drawn.

Subject Selection

The study took place in an urban school district in central Texas. The study was delimited to third, fourth, and fifth grade students, because at the elementary level in Texas, such students are required to take the STAAR test in mathematics and reading. At the time of the study, the district served approximately 15,000 students, of which, 88.00% was identified as economically disadvantaged. Economically disadvantaged students were those eligible for free or reduced-priced meals under the National School Lunch and Child Nutrition Program, or other public assistance (TEA, 2012b). The National School Lunch Program is a federally assisted program that assists over 100,000 public schools along with non-profit private schools and residential childcare institutes to provide nutritionally balanced free or low cost meals to children (United States Department of Agriculture, 2013). Even though any child may purchase a meal through the National School Lunch Program, free and reduced meals are provided for students who qualify. A student's eligibility for the National School Lunch and Child Nutrition Program is based on family income levels in accordance with state guidelines. Children from families that have incomes at or below the poverty level are eligible for free meals. For the period July 1, 2012, through June 30, 2013, an income for a family of four that was $29,965 or below was at the poverty level. Income between $29,966 and $42,643 for a family of four was slightly above the poverty level, but within range of qualification and the child was eligible for reduced-price

meals, and charged no more than 40 cents for their meal (United States Department of Agriculture, 2012). The student population of the district consisted of 56.00% Hispanic, 31.00% African-American, and 11.00% White. According to Fry & Gonzales (2008), the Pew Hispanic Center has reported more than half of all Hispanic students enrolled in school are predominately in public schools located in Texas and California. In addition, the Hispanic population of students in the nation's public schools is approximately 10 million and accounts for 60.00% of the growth in public schools. In the United States of America, the Hispanic population has more than doubled from 14.6 million in 1980, to 35.3 million in 2000 (Fry & Gonzales, 2008) . The *United States Census Bureau* (2011) reported 51.9 million Hispanics lived in the United States in 2011 and the Pew Hispanic Center projected that it would reach 60.4 million by 2020.

The study's two participating schools had comparable demographics in regards to ethnicity distribution of student population, campus attendance rate, economically disadvantaged population, student grades, and number of student population. The attendance rate for both campuses was 97.00% based on the Academic Excellence Indicator System (AEIS) report for 2011-2012 (TEA, 2012b) and the student/teacher ratio was 16 to 1 on average for the third, fourth, and fifth grades. Both schools used the State of Texas Assessments of Academic Readiness (STAAR) in the third, fourth, and fifth grades in the areas of reading and mathematics to measure academic progress. One elementary campus utilized the Montessori Method of learning since its establishment as a Montessori public school in 1998, and served approximately 450 students. The other elementary campus used a non-Montessori traditional method of instruction and served approximately 400 students. The Montessori campus had 131 third, fourth, and fifth grade students who tested STAAR in reading and mathematics. The non-Montessori campus had 180 third, fourth, and fifth grade students who tested STAAR in reading

and mathematics.

There were 131 and 180 students in the characteristic-present and comparison groups, respectively. Due to non-probability nature of sampling, external validity was limited to study participants. Permission to conduct the study was obtained from the Institutional Review Board at Texas A&M University-Corpus Christi and the school district in central Texas (Appendix A).

Instrumentation

The accountability for schools to show academic achievement in public schools started with the 66th Legislature in 1979 (Texas Legislature Online, 2012a). During the 66th Legislature session and in response to criticism about high school students graduating without skills for success in the workplace, it was determined that the schools would be measured with a standardized test to establish accountability for students learning the curriculum (Cruse & Twing, 2000). The first test, the Texas Assessment of Basic Skills (TABS), began with the school year1980 - 1981 to 1984 - 1985. In 1983, the TEA started publishing the standardized test scores in an effort to be transparent with the public and show how students were mastering the curriculum in Texas public schools. In school year 1985 - 1986, the TABS test was replaced by the second standardized assessment test, the Texas Educational Assessment of Minimum Skills (TEAMS), which was in place through the school year 1989 - 1990. In the school year 1990 - 1991, the TEAMS test was replaced by the third state assessment standardized test, the Texas Assessment of Academic Skills (TAAS). The TAAS was used to measure academic achievement for over a decade until the school year 2002 - 2003. In 2003 - 2004, the next standardized state assessment, the Texas Assessment of Knowledge and Skills (TAKS), replaced the TAAS and was in use through the school year 2010 - 2011. In the school year 2011 -2012, the State of Texas Assessments of Academic Readiness (STAAR) was introduced as the new

standardized state assessment (TEA 2012a).

The STAAR is based on the Texas Essential Knowledge and Skills (TEKS) and measures readiness standards in mathematics and reading. The TEA, in collaboration with the Texas Higher Education Coordinating Board (THECB) and Texas educators, developed the STAAR assessment to replace the TAKS assessment in response to the requirements set forth by Senate Bill 1031 of the 80th Texas Legislature, 2007 (Texas Legislature Online, 2012c) and House Bill 3 of the 81st Texas legislature, 2009 (Texas Legislature Online, 2012d). The new requirements concentrate on ensuring postsecondary readiness of graduating high school students who can be competitive nationally and internationally (TEA, 2012a).

House Bill 3 Transition Plan Report dated December 1, 2010 for delivery to the 82nd Texas Legislature (Texas Legislature Online, 2012e) from the Texas Education Agency indicated the most significant changes targeted in the development of the new STAAR assessment were 1) increasing rigor and relevance of both standards and assessments; 2) creating and assessing postsecondary readiness standards; 3) establishing campus and district accountability based on higher college and career-readiness performance standards on STAAR and on distinctions earned by campuses demonstrating achievement in areas not measured by the STAAR program as well as on academic performance; and 4) establishing new time lines for interventions and sanctions while also expanding school closure and alternative management options.

The third grade STAAR mathematics test included five mathematics categories with 46 test items. Reporting Category 1 contained 15 items and assessed numbers, operations and quantitative reasoning. Reporting Category 2 contained 8 items and assessed patterns, relationships, and algebraic reasoning. Reporting Category 3 contained 9 items and focused on geometry and spatial reasoning. Reporting Category 4 contained 8 items and assessed

measurement. Reporting Category 5 contained 6 items and assessed probability and statistics.

The third grade STAAR reading test included three reading categories with 40 test items. Reporting Category 1 contained 6 items and targeted the understanding across genre. Reporting Category 2 contained 18 items and focused on patterns, relationships, and algebraic reasoning. Reporting Category 3 contained 16 items and assessed the understanding and analysis of literary texts.

The fourth grade STAAR mathematics test included five mathematics categories with 48 test items. Reporting Category 1 contained 17 items and assessed numbers, operations and quantitative reasoning. Reporting Category 2 contained 6 items and assessed patterns, relationships, and algebraic reasoning. Reporting Category 3 contained 12 items and focused on geometry and spatial reasoning. Reporting Category 4 contained 8 items and assessed measurement. Reporting Category 5 contained 5 items and assessed probability and statistics.

The fourth grade STAAR reading test included three reading categories with 44 test items. Reporting Category 1 contained 10 items and targeted the understanding across genre. Reporting Category 2 contained 18 items and focused on patterns, relationships, and algebraic reasoning. Reporting Category 3 contained 16 items and assessed the understanding and analysis of literary texts.

The fifth grade STAAR mathematics test included five mathematics categories with 50 test items. Reporting Category 1 contained 18 items and assessed numbers, operations and quantitative reasoning. Reporting Category 2 contained 6 items and assessed patterns, relationships, and algebraic reasoning. Reporting Category 3 contained 7 items and focused on geometry and spatial reasoning. Reporting Category 4 contained 8 items and assessed measurement. Reporting Category 5 contained 11 items and assessed probability and statistics.

The fifth grade STAAR reading test included three reading categories with 46 test items. Reporting Category 1 contained 10 items and targeted the understanding across genre. Reporting Category 2 contained 19 items and focused on patterns, relationships, and algebraic reasoning. Reporting Category 3 contained 17 items and assessed the understanding and analysis of literary texts.

Data Collection

The data were obtained from the study's Central Texas school district, which included raw scores for each of the STAAR categories in mathematics and reading, as well as data on selected characteristics of the subjects to describe the samples (i.e., gender, socio-economic status, and ethnicity). Permission to use the data for the purpose of the study was obtained from the school district (Appendix A).

Data Analysis

The data were downloaded into the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used to summarize and organize the data. Specifically, frequency and percentage distribution tables and the most appropriate measures of central tendency and variability were reported.

A series of chi-square test of independence was performed to compare the characteristic-present and comparison groups on the basis of demographic characteristics of socio-economic status, ethnicity, and gender. The test involves inferences about the independence of the modes of classification in a contingency table, which is a two-way table showing the two variables that are classified into mutually exclusive categories and the cell entries are frequencies. The null hypothesis is that the two modes of classification are independent of each other (Field, 2013).

The proportion of the total number of test questions answered correctly to the total

number of questions in each of the STAAR categories was used to measure academic achievement in mathematics and reading. Pearson product-moment correlation coefficient (Field, 2013) was used to show that the mathematics and reading category scores were correlated with each other.

There is a mathematical expression called vector, which represents each subject's score on more than one outcome measure. The mean of the vectors for each group is called centroid. A series of multivariate analysis of variance, MANOVA, (Stevens, 2009) was performed to test whether there were statistically significant differences between the Montessori and the comparison groups on the basis of the centroids for each set of STAAR categories. The equality of covariance matrices assumption was tested, using the Box's M test. To examine the practical significance of the findings, the mean difference effect size, Cohen's d, was computed and described as .2 = small effect, .5 = medium effect, and .8 = large effect (Cohen, 1988).

Chapter IV

Results

The purpose of the ex post facto causal-comparative study was to compare academic achievement in mathematics and reading objective test scores of 3rd, 4th and 5th grade students in a Montessori Program to the academic achievement in mathematics and reading objective test scores of 3rd, 4th and 5th grade students in a non-Montessori Program. It was hypothesized that the students in the Montessori program would outperform the students in the non-Montessori program on the basis of the above-stated outcome measures. The study was guided by the following research questions:

1. Do third, fourth and fifth grade students who attend a Montessori public school program perform better than do third, fourth, and fifth grade students who attend a non-Montessori public school program on the basis of achievement in mathematics?
2. Do third, fourth and fifth grade students who attend a Montessori public school program perform better than do third, fourth, and fifth grade students who attend a non-Montessori public school program on the basis of achievement in reading?

The data were obtained from the school district and coded, entered into a computer, and analyzed by using the Statistical Package for the Social Sciences (SPSS). Achievement in mathematics and reading was measured by the State of Texas Assessments of Academic Readiness (STAAR) test. The level of significance was set, a priori, at .01 to reduce the probability of type I errors due to performing multiple univariate and multivariate tests.

3rd Grade Results

A Profile of Subjects

The characteristic-present group (n = 47) included 3rd grade students who had participated in the Montessori program and the comparison group (n = 71) consisted of 3rd grade students who had not participated in the Montessori program. The two groups were compared on the basis of the demographic variables which were made available to the researcher by the school district. The majority of the students in both the Montessori program (89.40%, n = 42) and the comparison group (94.40%, n = 67) were economically disadvantaged, as determined by their eligibility for free or reduced lunch in the National School Lunch and Child Nutrition Program; group differences were not statistically significant, X^2 (1, N = 118) = .42, p = .52. Ethnicity for the Montessori program and the comparison program were initially coded as African American, Hispanic, or White. Due to cells having expected counts of less than 5, the data were recoded into Hispanic or non-Hispanic. The majority of the Montessori group (63.80%, n = 30) and the comparison group (70.40%, n = 50) were Hispanic; group differences were not statistically significant, X^2 (1, N = 118) = .30, p = .58. The majority of the Montessori group (61.70%, n = 29) and the comparison group (52.10%, n = 37) were male; group differences were not statistically significant, X^2 (1, N = 118) = .70, p = .40. Results are summarized in Table 1.

Table 1

A profile of Subjects, 3rd Grade

	Montessori Group (n = 47)		Comparison Group (n = 71)	
Demographic Characteristic	*N*	%	*N*	%
Socio-economic Status[a]				
Free/Reduced Lunch	42	89.40	67	94.40
Non-Free/Reduced Lunch	5	10.60	4	5.60
Ethnicity[b]				
Hispanic	30	63.80	50	70.40
Non-Hispanic	17	36.20	21	29.60
Gender[c]				
Male	29	61.70	37	52.10
Female	18	38.30	34	47.90

[a] X^2 (1, N = 118) = .42, p = .52
[b] X^2 (1, N = 118) = .30, p = .58
[c] X^2 (1, N = 118) = .70, p = .40

Outcome Measures

The outcome measures included State of Texas Assessment of Academic Readiness (STAAR) Reporting Categories for mathematics and reading. Mathematics included Category 1: Numbers, Operations and Quantitative Reasoning (15 test items), Category 2: Patterns, Relationships, and Algebraic Reasoning (8 test items), Category 3: Geometry and Spatial Reasoning (9 test items), Category 4: Measurement (8 test items), and Category 5: Probability and Statistics (6 test items). Reading included Category1: Understanding Across Genres (6 test items), Category 2: Understanding and Analysis of Literary Texts (18 test items), and Category 3: Understanding and Analysis of Informational Texts Analysis (16 test items).

Mathematics Achievement

Achievement in mathematics was measured by the proportion of correct answers to questions in each of the five reporting categories. The means and standard deviations are

summarized in Table 2.

Table 2

STAAR Mathematics Achievement Measures, 3rd Grade

	Montessori Group (n = 47)		Comparison Group (n = 71)	
Mathematics Reporting Category	M*	SD	M*	SD
Category 1	.61	.21	.53	.24
Category 2	.64	.27	.57	.28
Category 3	.73	.21	.67	.21
Category 4	.57	.25	.59	.26
Category 5	.55	.30	.52	.34

*Proportion of correct answers

Note: Category 1: Numbers, Operations and Quantitative Reasoning
Category 2: Patterns, Relationships, and Algebraic Reasoning
Category 3: Geometry and Spatial Reasoning
Category 4: Measurement
Category 5: Probability and Statistics

As can be seen in Table 3, mathematics Reporting Category test scores were correlated with each other and MANOVA was used to compare the Montessori and comparison groups on the basis of the group centroid.

Table 3

Correlation Matrix for STAAR Mathematics Category Scores, 3rd Grade

Factor	Math Score 1	Math Score 2	Math Score 3	Math Score 4	Math Score 5
Math Score 1	1.00	.73*	.66*	.63*	.70*
Math Score 2		1.00	.50*	.55*	.67*
Math Score 3			1.00	.57*	.61*
Math Score 4				1.00	.62*
Math Score 5					1.00

*$p < .01$

The MANOVA showed group differences on the basis of the centroids were not statistically significant, F (5, 112) = 1.65, p = .15. The equality of covariance matrices

assumption was met, *Box's M* = 14.09, *p* = .57.

Mean difference effect sizes were used to examine the practical significance of the findings as computed by Cohen's d. Results, ranging from .06 (negligible effect) to .30 (small effect) are summarized in Table 4.

Table 4

Mean Difference Effect Sizes, STAAR Mathematics Achievement Measures, 3rd Grade

STAAR Reporting Category	Mean Difference	Effect Size*
Category 1	.07	.30
Category 2	.07	.25
Category 3	.06	.30
Category 4	.02	.06
Category 5	.03	.10

* .2 = small effect, .5 = medium effect, .8 = large effect

Note: Category 1: Numbers, Operations and Quantitative Reasoning
Category 2: Patterns, Relationships, and Algebraic Reasoning
Category 3: Geometry and Spatial Reasoning
Category 4: Measurement
Category 5: Probability and Statistics

Reading Achievement

Achievement in reading was measured by the proportion of correct answers to questions in each of the three Reporting Categories. Table 5 summarizes the means and standard deviations.

Table 5

STAAR Reading Achievement Measures, 3rd Grade

Reading Reporting Category	Montessori Group (n = 47) M*	SD	Comparison Group (n = 71) M*	SD
Category 1	.69	.22	.61	.26
Category 2	.57	.22	.50	.20
Category 3	.64	.22	.55	.23

*Proportion of correct answers

Note: Category 1: Understanding Across Genres
Category 2: Understanding and Analysis of Literary Texts
Category 3: Understanding and Analysis of Informational Texts Analysis

The reading Reporting Category test scores were correlated with each other (Table 6) and MANOVA was used to compare the Montessori and comparison groups on the basis of the group centroid.

Table 6

Correlation Matrix for STAAR Reading Category Scores, 3rd Grade

Factor	Reading Score 1	Reading Score 2	Reading Score 3
Reading Score 1	1.00	.59*	.62*
Reading Score 2		1.00	.75*
Reading Score 3			1.00

*$p < .01$

The MANOVA showed that the group differences on the basis of the centroids were not statistically significant, F (3, 114) = 1.55, p = .21. The equality of covariance matrices assumption was met, *Box's M* = 4.36, p = .65.

Mean differences effect sizes, as computed by Cohen's d, were used to examine the practical significance of the findings. Results, which are summarized in Table 7, showed that effect sizes for all measures were between small and medium.

Table 7

Mean Difference Effect Sizes, STAAR Reading Achievement Measures, 3rd Grade

STAAR Reporting Category	Mean Difference	Effect Size*
Category 1	.08	.34
Category 2	.07	.34
Category 3	.09	.37

* .2 = small effect, .5 = medium effect, .8 = large effect

Note: Category 1: Understanding Across Genres
Category 2: Understanding and Analysis of Literary Texts
Category 3: Understanding and Analysis of Informational Texts Analysis

4th Grade Results

A Profile of Subjects

The characteristic-present group (*n = 40*) included 4th grade students who had participated in the Montessori program and the comparison group (*n* = 60) consisted of 4th grade students who had not participated in the Montessori program. The two groups were compared on the basis of the available demographic variables. The majority of the students in both the Montessori program (85.00%, *n* = 34) and the comparison group (93.30%, *n* = 56) were economically disadvantaged, as determined by their eligibility for free or reduced lunch in the National School Lunch and Child Nutrition Program; group differences were not statistically significant, X^2 (1, *N* = 100) = 1.04, *p* = .31. Ethnicity for the Montessori program and the comparison program were initially coded as African American, Hispanic, or White. Due to cells having expected counts of less than 5, the data were recoded into Hispanic or non-Hispanic. The majority of the Montessori group (80.00%, *n* = 32) and the comparison group (71.70%, *n* = 43) were Hispanic; group differences were not statistically significant, X^2 (1, *N* = 100) = .50, *p* = .48. The majority of the Montessori group (55.00%, *n* = 22) were female students though only by a count of four students. The comparison group had an even number of males and females

(50.00%, n = 30); group differences were not statistically significant, X^2 (1, N = 100) = .08, p = .78. Results are summarized in Table 8.

Table 8

A profile of Subjects, 4th Grade

	Montessori Group (n = 40)		Comparison Group (n = 60)	
Demographic Characteristic	*N*	%	*N*	%
Socio-economic Status[a]				
Free/Reduced Lunch	34	85.00	56	93.30
Non-Free/Reduced Lunch	6	15.00	4	6.70
Ethnicity[b]				
Hispanic	32	80.00	43	71.70
Non-Hispanic	8	20.00	17	28.30
Gender[c]				
Male	18	45.00	30	50.00
Female	22	55.00	30	50.00

[a] X^2 (1, N = 100) = 1.04, p = .31
[b] X^2 (1, N = 100) = .50, p = .48
[c] X^2 (1, N = 100) = .08, p = .78

Outcome Measures

The outcome measures included State of Texas Assessment of Academic Readiness (STAAR) Reporting Categories for mathematics and reading. Mathematics included Category 1: Numbers, Operations and Quantitative Reasoning (17 test items), Category 2: Patterns, Relationships, and Algebraic Reasoning (6 test items), Category 3: Geometry and Spatial Reasoning (12 test items), Category 4: Measurement (8 test items), and Category 5: Probability and Statistics (5 test items). Reading included Category1: Understanding Across Genres (10 test items), Category 2: Understanding and Analysis of Literary Texts (18 test items), and Category 3: Understanding and Analysis of Informational Texts Analysis (16 test items).

Mathematics Achievement

Achievement in mathematics was measured by the proportion of correct answers to questions in each of the five reporting categories. The means and standard deviations are summarized in Table 9.

Table 9

STAAR Mathematics Achievement Measures, 4th Grade

	Montessori Group (n = 40)		Comparison Group (n = 60)	
Mathematics Reporting Category	M*	SD	M*	SD
Category 1	.58	.23	.60	.18
Category 2	.50	.25	.53	.28
Category 3	.56	.17	.59	.20
Category 4	.47	.22	.43	.21
Category 5	.47	.30	.50	.28

*Proportion of correct answers

Note: Category 1: Numbers, Operations and Quantitative Reasoning
Category 2: Patterns, Relationships, and Algebraic Reasoning
Category 3: Geometry and Spatial Reasoning
Category 4: Measurement
Category 5: Probability and Statistics

As can be seen in Table 10, mathematics Reporting Category test scores were correlated with each other.

Table 10

Correlation Matrix for STAAR Mathematics Category Scores, 4th Grade

Factor	Math Score 1	Math Score 2	Math Score 3	Math Score 4	Math Score 5
Math Score 1	1.00	.58*	.62*	.54*	.58*
Math Score 2		1.00	.48*	.49*	.51*
Math Score 3			1.00	.49*	.56*
Math Score 4				1.00	.54*
Math Score 5					1.00

*$p < .01$

The MANOVA showed group differences on the basis of the centroids were not statistically significant, F (5, 94) = .62, p = .68. The equality of covariance matrices assumption was met, *Box's M* = 21.76, p = .15.

Mean difference effect sizes were used to examine the practical significance of the findings as computed by Cohen's d. Results showed negligible effect sizes, ranging from .09 to .11, as summarized in table 11.

Table 11

Mean Difference Effect Sizes, STAAR Mathematics Achievement Measures, 4th Grade

STAAR Reporting Category	Mean Difference	Effect Size*
Category 1	.02	.09
Category 2	.03	.11
Category 3	.03	.14
Category 4	.04	.17
Category 5	.03	.11

* .2 = small effect, .5 = medium effect, .8 = large effect

Note: Category 1: Numbers, Operations and Quantitative Reasoning
Category 2: Patterns, Relationships, and Algebraic Reasoning
Category 3: Geometry and Spatial Reasoning
Category 4: Measurement
Category 5: Probability and Statistics

Reading Achievement

Achievement in reading was measured by the proportion of correct answers to questions in each of the three Reporting Categories. Table 12 summarizes the means and standard deviations.

Table 12

STAAR Reading Achievement Measures, 4th Grade

Reading Reporting Category	Montessori Group (n = 40) M*	SD	Comparison Group (n = 60) M*	SD
Category 1	.62	.19	.51	.23
Category 2	.56	.20	.52	.24
Category 3	.55	.19	.52	.19

*Proportion of correct answers

Note: Category 1: Understanding Across Genres
Category 2: Understanding and Analysis of Literary Texts
Category 3: Understanding and Analysis of Informational Texts Analysis

The reading Reporting Category test scores were correlated with each other (Table 13) and MANOVA was used to compare the Montessori and comparison groups on the basis of the group centroid.

Table 13

Correlation Matrix for STAAR Reading Category Scores, 4th Grade

Factor	Reading Score 1	Reading Score 2	Reading Score 3
Reading Score 1	1.00	.68*	.59*
Reading Score 2		1.00	.61*
Reading Score 3			1.00

*$p < .01$

The MANOVA showed that the group differences on the basis of the centroids were not statistically significant, F (3, 96) = 2.82, p = .04.

Mean differences effect sizes, as computed by Cohen's d, were used to examine the practical significance of the findings. Results, ranging from .16 (small effect) to .52 (medium effect) are summarized in Table 14. The equality of covariance matrices assumption was met, *Box's M* = 7.21, p = .32.

Table 14

Mean Difference Effect Sizes, STAAR Reading Achievement Measures, 4th Grade

STAAR Reporting Category	Mean Difference	Effect Size*
Category 1	.11	.52
Category 2	.04	.16
Category 3	.03	.17

* .2 = small effect, .5 = medium effect, .8 = large effect

Note: Category 1: Understanding Across Genres
Category 2: Understanding and Analysis of Literary Texts
Category 3: Understanding and Analysis of Informational Text Analysis

5th Grade Results

A Profile of Subjects

The characteristic-present group (n = 44) included 5th grade students who had participated in the Montessori program and the comparison group (n = 49) consisted of 5th grade students who had not participated in the Montessori program. The two groups were compared on the basis of the available demographic variables. The majority of the students in both the Montessori program (88.60%, n = 39) and the comparison group (100.00%, n = 49) were economically disadvantaged, as determined by their eligibility for free or reduced lunch in the National School Lunch and Child Nutrition Program; group differences were not statistically significant, X^2 (1, N = 93) = 3.86, p = .05. Ethnicity for the Montessori program and the comparison program were initially coded as African American, Hispanic, or White. Due to cells having expected counts of less than 5, the data were recoded into Hispanic or non-Hispanic. The majority of the Montessori group (56.80%, n = 25) and the comparison group (73.50%, n = 36) were Hispanic; group differences were not statistically significant, X^2 (1, N = 93) = 2.16, p = .14. The majority of the Montessori group (63.60%, n = 28) were female while the majority of the comparison group (69.40%, n = 34) were male; group differences were statistically significant,

X^2 (1, N = 93) = 8.89, $p < .01$. The simple correlations between gender and the outcome measures ranged from .06 to .14 and none was statistically significant; thus, gender was not considered a confounding variable. Results are summarized in Table 15.

Table 15

A profile of Subjects, 5th Grade

	Montessori Group (n = 44)		Comparison Group (n = 49)	
Demographic Characteristic	*N*	%	*N*	%
Socio-economic Status[a]				
Free/Reduced Lunch	39	88.60	49	100.00
Non-Free/Reduced Lunch	5	11.40	0	.00
Ethnicity[b]				
Hispanic	25	56.80	36	73.50
Non-Hispanic	19	43.20	13	26.50
Gender[c]				
Male	16	36.40	34	69.40
Female	28	63.60	15	30.60

[a] X^2 (1, N = 93) = 3.86, p = .05
[b] X^2 (1, N = 93) = 2.16, p = .14
[c] X^2 (1, N = 93) = 8.89, $p < .01$

Outcome Measures

The outcome measures included State of Texas Assessment of Academic Readiness (STAAR) Reporting Categories for mathematics and reading. Mathematics included Category 1: Numbers, Operations and Quantitative Reasoning (18 test items), Category 2: Patterns, Relationships, and Algebraic Reasoning (6 test items), Category 3: Geometry and Spatial Reasoning (7 test items), Category 4: Measurement (8 test items), and Category 5: Probability and Statistics (11 test items). Reading included Category1: Understanding Across Genres (10 test items), Category 2: Understanding and Analysis of Literary Texts (19 test items), and Category 3: Understanding and Analysis of Informational Texts Analysis (17 test items).

Mathematics Achievement

Achievement in mathematics was measured by the proportion of correct answers to questions in each of the five reporting categories. The means and standard deviations are summarized in Table 16.

Table 16

STAAR Mathematics Achievement Measures, 5th Grade

Mathematics Reporting Category	Montessori Group (n = 44) M*	SD	Comparison Group (n = 49) M*	SD
Category 1	.66	.15	.60	.22
Category 2	.60	.25	.63	.27
Category 3	.66	.24	.61	.28
Category 4	.57	.28	.56	.28
Category 5	.69	.19	.59	.24

*Proportion of correct answers

Note: Category 1: Numbers, Operations and Quantitative Reasoning
Category 2: Patterns, Relationships, and Algebraic Reasoning
Category 3: Geometry and Spatial Reasoning
Category 4: Measurement
Category 5: Probability and Statistics

As can be seen in Table 17, mathematics Reporting Category test scores were correlated.

Table 17

Correlation Matrix for STAAR Mathematics Category Scores, 5th Grade

Factor	Math Score 1	Math Score 2	Math Score 3	Math Score 4	Math Score 5
Math Score 1	1.00	.53*	.66*	.67*	.57*
Math Score 2		1.00	.39*	.65*	.40*
Math Score 3			1.00	.55*	.43*
Math Score 4				1.00	.54*
Math Score 5					1.00

*$p < .01$

The MANOVA showed group differences on the basis of the centroids were not

statistically significant, F (5, 87) = 1.87, p = .11. The equality of covariance matrices assumption was met, *Box's M* = 12.14, p = .72.

Mean difference effect sizes were used to examine the practical significance of the findings as computed by Cohen's d. Results, ranging from .05 (negligible effect) to .45 (medium effect) are summarized in Table 18.

Table 18

Mean Difference Effect Sizes, STAAR Mathematics Achievement Measures, 5th Grade

STAAR Reporting Category	Mean Difference	Effect Size*
Category 1	.07	.35
Category 2	.03	.10
Category 3	.05	.20
Category 4	.01	.05
Category 5	.10	.45

* .2 = small effect, .5 = medium effect, .8 = large effect

Note: Category 1: Numbers, Operations and Quantitative Reasoning
Category 2: Patterns, Relationships, and Algebraic Reasoning
Category 3: Geometry and Spatial Reasoning
Category 4: Measurement
Category 5: Probability and Statistics

Reading Achievement

Achievement in reading was measured by the proportion of correct answers to questions in each of the three Reporting Categories. Table 19 summarizes the means and standard deviations.

Table 19

STAAR Reading Achievement Measures, 5th Grade

Reading Reporting Category	Montessori Group (n = 44) M*	SD	Comparison Group (n = 49) M*	SD
Category 1	.64	.22	.62	.22
Category 2	.59	.17	.53	.18
Category 3	.69	.20	.61	.19

*Proportion of correct answers

Note: Category 1: Understanding Across Genres
Category 2: Understanding and Analysis of Literary Texts
Category 3: Understanding and Analysis of Informational Texts Analysis

The reading Reporting Category test scores were correlated with each other (Table 20) and MANOVA was used to compare the Montessori and comparison groups on the basis of the group centroid.

Table 20

Correlation Matrix for STAAR Reading Category Scores, 5th Grade

Factor	Reading Score 1	Reading Score 2	Reading Score 3
Reading Score 1	1.00	.65*	.60*
Reading Score 2		1.00	.72*
Reading Score 3			1.00

*$p < .01$

The MANOVA showed that the group differences on the basis of the centroids were not statistically significant, F (3, 89) = 1.78, p = .16. The equality of covariance matrices assumption was met, *Box's M* = 3.33, p = .78.

Mean differences effect sizes, as computed by Cohen's d, were used to examine the practical significance of the findings. Results, ranging from .05 (negligible effect) to .38 (small effect) are summarized in Table 21.

Table 21

Mean Difference Effect Sizes, STAAR Reading Achievement Measures, 5th Grade

STAAR Reporting Category	Mean Difference	Effect Size*
Category 1	.01	.05
Category 2	.06	.34
Category 3	.07	.38

* .2 = small effect, .5 = medium effect, .8 = large effect

Note: Category 1: Understanding Across Genres
Category 2: Understanding and Analysis of Literary Texts
Category 3: Understanding and Analysis of Informational Texts Analysis

Grades 3, 4, and 5 Results

To examine the interaction effect of the grade level and Montessori program on the outcome measures, the grade level was added to the linear model and factorial MANOVA was employed for the purpose of data analysis. The interaction effects on mathematics test scores, $F(10, 604) = .05$, $p = .12$, and reading test scores, $F(6, 608) = .02$, $p = .28$, were not statistically effect.

Summary of Results

It was hypothesized that the students in the Montessori program would outperform the students in the non-Montessori program on the basis of academic achievement in mathematics and reading. Achievement in mathematics and reading was measured by the State of Texas Assessments of Academic Readiness (STAAR) test. Multivariate analysis of the data did not support the hypothesis.

Chapter V

Summary, Conclusions, and Discussions

Introduction

Texas public schools have reached an era where accountability is measured by performance on standardized assessments and linked to educational funding. In 1965, the *Elementary and Secondary Education Act* (ESEA) that became known as the No Child Left Behind ESEA when it was reauthorized in 2001 strengthened the requirements of standardized assessments for public school students. The idea has been to provide equitable funding for equitable education to the underprivileged (Landsburg, 2006) and allocate the necessary federal funding to models that proved to be successful through the assessment of standardized tests (U.S. Department of Education, 2012). On June 15, 2008, President Barack Obama stated during a speech in Flint, Michigan, "We could have made a real commitment to a world-class education for our kids, but instead we passed "No Child Left Behind," a law that –however well-intended – left the money behind and alienated teachers and principals instead of inspiring them" (Obama, 2008, p. 233). To support President Obama's assessment of the repercussions of *No Child Left Behind* is the fact that approximately 4 billion dollars were reportedly cut from public school funding in Texas in 2011, which led to the loss of over 900 jobs in education (Weber, 2011). The standardized assessment measurement of accountability and funding issue makes it necessary for schools to investigate and find models of instruction that will prove to be effective and provide the required results. The goal of providing a meaningful and experiential learning environment for all students has created a concern for alternate ways to teach students who are reportedly demonstrating non-mastery on state standardized assessment and have an impact on educational funding.

Summary

The Montessori Method has been in existence since the 1900s when it was first introduced by Maria Montessori. However, it was not until the 1960s that the name Montessori became well known and was reintroduced to the United States in 1962 (Kramer, 1988). In the 1960s, Schools and organizations began to use the Montessori approach, using various techniques, tools, and interpretations of the approach. Constructivist Theorist, John Dewey (1859-1952), emphasized in his famous *My Pedagogic Creed* (1897), the concept that education does not prepare a student for life but rather life in itself is the education. The foundation for Montessori teaching is that education is life itself and learning happens when students are allowed to learn in their own way and at their own pace (Havis, 2009). Montessori promotes independent learning while supporting learning development in children in an effort to promote self-discovery learning which supports the theory that education is life itself.

As the Texas Education Agency continues to raise the benchmarks for showing successful academic achievement through standardized assessment, so will the need continue to grow for discovering ways for students to learn. As long as information about our nation continues to reflect alarming results, such as ranking 17th in reading scores and 31st in mathematics scores when compared among industrialized nations, so will the search for instructional methods that show academic achievement in public schools (Edelman , 2012).

The purpose of the study was to examine the impact of Montessori teaching on academic achievement of elementary school students in an urban school district in Central Texas. The 3rd, 4th, and 5th grades were selected because they are the first three years in which standardized testing is conducted in Texas. The study was guided by the following research questions:

1. Do third, fourth, and fifth grade students who attend a Montessori public school program

perform better than do third, fourth, and fifth grade students who attend a non-Montessori public school program on the basis of achievement in mathematics?

2. Do third, fourth, and fifth grade students who attend a Montessori public school program perform better than do third, fourth, and fifth grade students who attend a non-Montessori public school program on the basis of achievement in reading?

Summary of Results

The primary purpose of the study was to test the hypothesis that the students in the Montessori program would outperform the students in the non-Montessori program on the basis of academic achievement in mathematics and reading. Achievement in mathematics and reading was measured by the State of Texas Assessments of Academic Readiness (STAAR) test. The characteristic-present group was recruited from a Montessori public school which had been founded in 1998 and served approximately 450 students. The comparison group was recruited from a school which employed a non-Montessori traditional method of instruction and served approximately 400 students. The characteristic-present group had 131 third, fourth, and fifth grade students who tested STAAR in reading and mathematics. The comparison group had 180 third, fourth, and fifth grade students who tested STAAR in reading and mathematics.

In 3rd grade mathematics, the characteristic-present group (n = 47) and the comparison group (n = 71) were compared on the basis of the outcome measures of achievement in mathematics, which was measured by the proportion of correct answers to questions in each of the five STAAR reporting categories: 1) Numbers, Operations and Quantitative Reasoning (15 test items), 2) Patterns, Relationships, and Algebraic Reasoning (8 test items), 3) Geometry and Spatial Reasoning (9 test items), 4) Measurement (8 test items), and 5) Probability and Statistics

(6 test items). The MANOVA showed group differences on the basis of the centroids were not statistically significant, F (5, 112) = 1.65, p = .15.

In 3rd grade reading, the characteristic-present group (n = 47) and the comparison group (n = 71) were compared on the basis of the outcome measures of achievement in reading, which was measured by the proportion of correct answers to questions in each of the three STAAR reporting categories: 1) Understanding Across Genres (6 test items), 2) Understanding and Analysis of Literary Texts (18 test items), and 3) Understanding and Analysis of Informational Texts Analysis (16 test items). The MANOVA showed that the group differences on the basis of the centroids were not statistically significant, F (3, 114) = 1.55, p = .21.

In 4th grade mathematics, the characteristic-present group (n = 40) and the comparison group (n = 60) were compared on the basis of the outcome measures of achievement in mathematics, which was measured by the proportion of correct answers to questions in each of the five STAAR reporting categories: 1) Numbers, Operations and Quantitative Reasoning (17 test items), 2) Patterns, Relationships, and Algebraic Reasoning (6 test items), 3) Geometry and Spatial Reasoning (12 test items), 4) Measurement (8 test items), and 5) Probability and Statistics (5 test items). The MANOVA showed group differences on the basis of the centroids were not statistically significant, F (5, 94) = .62, p = .68.

In 4th grade reading, the characteristic-present group (n = 40) and the comparison group (n = 60) were compared on the basis of the outcome measures of achievement in reading, which was measured by the proportion of correct answers to questions in each of the three STAAR reporting categories: 1) Understanding Across Genres (10 test items), 2) Understanding and Analysis of Literary Texts (18 test items), and 3) Understanding and Analysis of Informational

Texts Analysis (16 test items). The MANOVA showed that the group differences on the basis of the centroids were not statistically significant, F (3, 96) = 2.82, p = .04.

In 5th grade mathematics, the characteristic-present group (n = 44) and the comparison group (n = 49) were compared on the basis of the outcome measures of achievement in mathematics, which was measured by the proportion of correct answers to questions in each of the five STAAR reporting categories: 1) Numbers, Operations and Quantitative Reasoning (18 test items), 2) Patterns, Relationships, and Algebraic Reasoning (6 test items), 3) Geometry and Spatial Reasoning (7 test items), 4) Measurement (8 test items), and 5) Probability and Statistics (11 test items). The MANOVA showed group differences on the basis of the centroids were not statistically significant, F (5, 87) = 1.87, p = .11.

In 5th grade reading, the characteristic-present group (n = 44) and the comparison group (n = 49) were compared on the basis of the outcome measures of achievement in reading, which was measured by the proportion of correct answers to questions in each of the three STAAR reporting categories: 1) Understanding Across Genres (19 test items), 2) Understanding and Analysis of Literary Texts (19 test items), 3) Understanding and Analysis of Informational Texts Analysis (17 test items). The MANOVA showed that the group differences on the basis of the centroids were not statistically significant, F (3, 89) = 1.78, p = .16.

Conclusions

The researcher had hypothesized that students in the 3rd, 4th, and 5th grade who received the Montessori Method of instruction would outperform the 3rd, 4th, and 5th grade students in the non-Montessori group on the basis of academic achievement in mathematics and reading as measured by the 2012 STAAR test results. Multivariate analysis of the data did not support the hypothesis.

Discussion

The school that was the subject of the study has been using the Montessori Method since 1998 when it began utilizing the intervention as the approach for student learning. Though the results did not support the hypotheses that the Montessori group would outperform the non-Montessori group, it is necessary to acknowledge that both groups did well on the STAAR test in mathematics and reading.

The AYP is the measure by which schools, districts, and states are held accountable for student performance under Title I of the No Child Left Behind Act (NCLB) of 2001 (Center on Education Policy, 2011). Under the NCLB, the AYP is used to determine whether schools are being successful in educating their students and benchmarks are set each year that indicate the growth required for measuring academic success. The goal is to have 100.00% of the students reach proficiency in reading and mathematics by spring 2014. The annual results are compared to the previous year's results and based on state-determined AYP standards, it is determined whether the school has met the AYP standards, that is, whether or not it made the adequate progress toward the 100.00% proficiency goal for 2014 (U.S. Department of Education, 2012). The AYP requires that not only the state must evaluate reading/language arts and mathematics of students on average, but also on all subgroups including economically disadvantaged students and students with disabilities as well as minority groups. To make the AYP, at a minimum, 95.00% of students in each subgroup as well as 95.00% of the school as a whole must take the state standardized test and meet or exceed the measurable objectives/categories set by the state for each year (U.S. Department of Education, 2012).

The researcher found that although there were no statistically significant differences between the Montessori group and the non-Montessori group on the basis of academic

achievement in mathematics and reading as measured by the STAAR, there were differences in the schools meeting the AYP standards. The Montessori school met AYP standards in 2012, while the non-Montessori school failed to meet the AYP standards in mathematics and reading (TEA, 2013). As described above, the AYP requires that 95.00% of the students meet or exceed the measurable categories. Both the Montessori and non-Montessori groups performed well on the STAAR but only the Montessori group performed well enough to meet the AYP standards. The researcher also gave careful attention to the fact that Montessori students do not have the same advantages that non-Montessori students have in regards to being prepared for taking standardized assessments. In the Montessori Method, which was described in detail in chapter 2, there is no basis for practicing test taking skills, which therefore puts a Montessori student at a disadvantage when taking the standardized assessment. Though it is consistent in belief that the Montessori Method will ultimately provide the necessary life skills for students to be successful problem solvers, it will also take time to inherit those skills as a young child and learn to apply them in the context of standardized assessments. Students at a lower grade level may not know how to apply the aforementioned skills in completing standardized assessments because they lack the practice and therefore may not be equipped to truthfully show the academic achievement they internalize. As Montessori students get older, they will have the opportunity to learn to apply the test taking skills because of being subjected to taking the standardized assessment annually which provides repeated practice and may enable them to demonstrate the academic achievement.

Studies in Montessori are limited, even though the method has been in existence since the early 1900s. McDurham (2011) noted in her doctoral dissertation that the search of the term *Montessori* in ProQuest on theses and dissertations resulted in 287 graduate works. In the same

search, when she added the term *academic achievement*, that number was considerably reduced to only 11 findings. The limited studies that exist are not all in favor of Montessori students outperforming the comparison groups, but there are variables to be considered in the outcome of these studies. "Good studies are scarce, and they are not terribly conclusive but they generally indicate that Montessori schools advance children's test scores about as well or better than other programs" (Crain, 1992, p. 72), which is supported by this study's findings.

The researcher took a global view of the limited findings in regards to the effectiveness of the Montessori Method and concluded that there is a potential for numerous errors in the application of the Montessori Method. Based on the fact that the name itself does not have a trademark provides for the lack of consistency in its approach and definition. It was in 1967, when a trademark dispute known as *American Montessori Society, Inc. v. Association Montessori Internationale*, 155 U.S.P.Q. 591, 592 (1967), was settled by the US Patent and Trademark Trial and Appeal Board, refusing to grant exclusive use of the term "Montessori" to any particular Montessori organization. As a result, the name Montessori became a free term to be used publicly and without limitations and/or requirements.

In 2011, McDurham examined the academic achievement of seventh and eighth grade students from a Montessori program in comparison to seventh and eighth grade students from a non-Montessori program. Academic achievement was defined as the TAKS results in mathematics and reading for Seventh grade Montessori students and the TAKS results in reading, science, mathematics, and social studies for eighth grade students. The study titled, *A Comparison of Academic Achievement for Seventh and Eighth Grade Students from Montessori and Non-Montessori School Programs*, revealed there were statistically significant differences between the Montessori students and the non-Montessori students on the basis of academic

achievement, favoring the Montessori students. Based on McDurham's study, it can be concluded that 7th and 8th grade students who have had several years of Montessori teachings, are able to demonstrate their problem-solving and critical-thinking skills, which combined with having been subjected to practicing the standardized assessment by taking the test annually, are likely to do well on the standardized assessment. Additionally, it is expected that by the time students reach 7th and 8th grades, they have had the opportunity to experience test-taking, which is not available to students at lower grades, such as those who were investigated in the study.

Dohrmann, Nishida, Gartner, Lipsky, and Grim (2007) performed a quantitative study in which they compared the academic achievement of two groups of Milwaukee high school students on the basis of mathematics and science performance. One group attended a Montessori school from pre-kindergarten through fifth grade and a matched peer group that attended non-Montessori schools. The study titled, *High School Outcomes for Students in a Public Montessori Program,* revealed there were statistically significant differences between the two groups and that the Montessori students outperformed the non-Montessori group. The results of the investigation may suggest that problem-solving and critical thinking skills that the Montessori students had acquired during the early years of their formal education could have had long-term effects that influenced their academic achievement at the high school level.

Lopata, Wallace, Finn, and Kristin (2005) examined the academic achievement of fourth and eighth grade students from a Montessori program in comparison to fourth and eighth grade students from a non-Montessori program. Academic achievement was defined as standardized measures in mathematics and language arts for both groups. The study titled, *Comparison of Academic Achievement between Montessori and Traditional Education Programs,* failed to support the hypothesis that enrollment in a Montessori program was associated with higher

academic achievement, which is consistent with the current study's findings.

Mallett (2013) examined the academic achievement of first, second, third, fourth, and fifth grade students from a Montessori program in comparison to first, second, third, fourth, and fifth grade students from a non-Montessori program. Academic achievement was measured by the Iowa Tests of Basic Skills (ITBS) reading and mathematics scores for first and second grade, and by the TAKS for third, fourth, and fifth grade. The study titled, *Academic Achievement Outcomes: Montessori and Non-Montessori Public Elementary Students,* revealed that there were no differences between the Montessori students and the non-Montessori students on the basis of academic achievement in first, second, and third grade, which is consistent with the current study's findings. The study revealed there were statistically significant differences and that the Montessori students outperformed their matched counterparts in fourth and fifth grades, which, as noted earlier, could have been related to familiarity with test-taking skills.

Global learners with team building abilities who can problem-solve, think critically, and promote collaboration as a means for being successful are necessary virtues to compete in the workforce today. Based on these expectations and requirements, educators are constantly looking for ways to promote student learning and provide the guidance for students to become the 21st century graduates that will get out in the world and help America regain its position in the world.

The study provided the opportunity to systematically investigate the Montessori Method and its impact on academic achievement being that the method had not been previously investigated. Though the studies in Montessori are limited and further complicated by the fact that the name Montessori does not have a trademark, the method shows great potential for developing students who are problem-solvers, critical thinkers, and able to compete in the global

economy. Even though the study did not reveal statistically significant differences between the Montessori group and the non-Montessori group in academic achievement based on the STAAR results, there are other studies which show the statistically significant effectiveness of the intervention. The existing research also suggests that students of Montessori do better at an older age and credit the Montessori Method in their young age as the reason for their independence and success. One example is Larry Page and Sergey Brin, founders of the enormous internet search engine, Google.com, who credited their success to having been Montessori students (Olaf, 2012). Both Page and Brin attributed their independence and ability to being self-directed and self-starters as something they learned as Montessori students. Other prominent Montessori alumni are Jeff Bezos, founder of Amazon.com, who attended Montessori in pre-school; Julia Child, famous chef, who attended Montessori in pre-school; Jimbo Wales, founder of Wikipedia, who attended grade school in a Montessori-inspired environment; Alexis Lontos Leonidou, the composer who attended Montessori in grade school; Gabriel Garcia Marquez, Nobel Prize Winner for Literature, who attended Montessori in pre-school and 1st grade (Sims, 2011).

The limited studies on the Montessori Method offer opportunities for further investigation at all grade levels. For example, it is recommended to conduct a study to compare students who receive Montessori education during the early years of their academic life with those who attend Montessori education from pre-k to high school graduation.

Because the Montessori name does not have a trademark, there are opportunities for investigating Montessori teacher preparation and comparing the preparation of the teachers to the standardized assessment results. There are also opportunities for investigating the method and curriculum used at schools that carry the name Montessori for comparison purposes amongst

Montessori schools as well as in comparison to the results of standardized assessments at these schools.

Due to the non-probability nature of sampling, external validity was limited to study participants and the study was delimited to one school district in Central Texas. The study was also delimited to the outcome measures of academic achievement in mathematics and reading based on the STAAR for the 3rd, 4th, and 5th grade students of the schools that are the subject of this study. The researcher encourages the replication of the study at other districts in an effort to further investigate the Montessori Method and its impact on academic achievement. Additionally, inclusion of a qualitative component to better understand the quantitative component (i.e., conducting mixed methods studies) is recommended.

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Appendix A

TAMUCC IRB Application

TAMUCC IRB Approval

School District Approval

FOR COMPLIANCE OFFICE USE ONLY:
IRB#
Date Received:
☐ Revision

Application for Review of Research Involving Human Subjects
Institutional Review Board (IRB)

Texas A&M University-Corpus Christi

TEXAS A&M UNIVERSITY CORPUS CHRISTI
RESEARCH & GRADUATE STUDIES

INSTRUCTIONS

If you have any questions or need assistance completing this application, please contact Erin Sherman at (361)825-2497 or email erin.sherman@tamucc.edu

1. Complete CITI Training
CITI training is required for all researchers and faculty advisors listed on the protocol.
Note: The Certificate of Completion will be automatically emailed to the Research Compliance Officer upon completion.

2. Complete Form
All sections of the form are required. The protocol review will not begin if any section is incomplete. The form must be complete and free of typographical/grammatical errors.

3. Submit Application & Completed Supplemental Documents
Review of application will not begin until all required documentation is received.

IRB protocols will only be accepted in electronic format beginning January 1, 2012. Protocols should be emailed in this PDF format to the Research Compliance Officer, Erin Sherman, at erin.sherman@tamucc.edu. Initial protocol submissions may be emailed with digital signatures. Original signatures will be needed after any necessary revisions and before final approval is granted. The Research Compliance Officer will contact the principal investigator on the protocol for final signatures when needed. Signature pages may then be scanned and emailed to Erin Sherman at erin.sherman@tamucc.edu. Please contact Erin Sherman with any questions.

Check which of the following documents are submitted with the protocol application:

- ☐ Any other documents referenced in this application as applicable (survey instrument, interview questions, debriefing form, payment schedule, etc.)
- ☐ Grant/contract proposal as applicable
- ☒ Permission from site of study as applicable
- ☐ Recruitment Materials as applicable: Flyers, Letters, Phone Scripts, Email, Online Posting, etc.
- ☐ Consent Documentation as applicable: Informed Consent Form, Assent Form, *Translated Informed Consent Form, and *Translated Assent Form
  **See Translator/Interpreter Guidelines on the IRB forms page*
- ☐ Conflict of Interest Disclosure as applicable

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College:

○ Faculty ○ Staff Member ○ Undergraduate Student ○ Graduate Student ○ Faculty Advisor ○ Other

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○ Faculty ○ Staff Member ○ Undergraduate Student ○ Graduate Student ○ Faculty Advisor ○ Other

Specify Other:

CONFLICT OF INTEREST CERTIFICATION

All Principal Investigators and Co-Investigators must certify the Conflict of Interest Statement below and comply with the conditions or restrictions imposed by the University to manage, reduce, or eliminate actual or potential conflicts of interest or forfeit IRB approval and possible funding. This disclosure must also be updated annually (for expedited and full board reviews)when the protocol is renewed.

Carefully read the following conflict of interest statements and check the appropriate box after considering whether you or any member of your immediate family have any conflicts of interest.*

**Immediate family is considered to be a close relative by birth or marriage including spouse, siblings, parents, children, in-laws and any other financial dependents.*

Financial conflicts of interest include:

a) *A financial interest in the research with value that cannot be readily determined;*
b) *A financial interest in the research with value that exceeds $5,000.00;*
c) *Have received or will receive compensation with value that may be affected by the outcome of the study;*
d) *A proprietary interest in the research, such as a patent, trademark, copyright, or licensing agreement;*
e) *Have received or will receive payments from the sponsor that exceed $5,000.00 in a specific period of time;*
f) *Being an executive director of the agency or company sponsoring the research;*
g) *A financial interests that requires disclosure to the sponsor or funding source; or*
h) *Have any other financial interests that I believe may interfere with my ability to protect participants.*

ORIGINAL SIGNATURES REQUIRED

PLEASE NOTE: SIGNATURE PAGES MAY BE SUBMITTED EITHER (1) SCANNED ORIGINAL SIGNATURE(S) ON SIGNATURE PAGE EMAILED AS AN ATTACHMENT WITH FORM (2) SUBMITTED AS PRINTED HARD COPY

Principal Investigator *(Typed)*: Minerva M. Salazar

Principal Investigator *(Signature)*: Minerva M. Salazar

Date: 10.11.12

Conflict of Interest Certification: ◉ I have no conflict of interest related to this project. ○ I have a non-financial conflict of interest related to this project** ○ I have a financial conflict of interest related to this project**

B. Co-Principal Investigator or Faculty Advisor Certification:

Co-Principal Investigator/ Advisor *(Typed)*: Kamiar Kouzekanani

Co-Principal Investigator/ Advisor *(Signature)*: K. Kouzekanani

Date: 10.11.12 Check one: ○ Co-PI ◉ Faculty Advisor

Conflict of Interest Certification: ◉ I have no conflict of interest related to this project. ○ I have a non-financial conflict of interest related to this project** ○ I have a financial conflict of interest related to this project**

C. Co-Principal Investigator or Faculty Advisor Certification:

Co-Principal Investigator/ Advisor *(Typed)*:

Co-Principal Investigator/ Advisor *(Signature)*:

Date: Check one: ○ Co-PI ○ Faculty Advisor

Conflict of Interest Certification: ○ I have no conflict of interest related to this project. ○ I have a non-financial conflict of interest related to this project** ○ I have a financial conflict of interest related to this project**

D. Co-Principal Investigator or Faculty Advisor Certification:

Co-Principal Investigator/ Advisor *(Typed)*:

Co-Principal Investigator/ Advisor *(Signature)*:

Date: Check one: ○ Co-PI ○ Faculty Advisor

Conflict of Interest Certification: ○ I have no conflict of interest related to this project. ○ I have a non-financial conflict of interest related to this project** ○ I have a financial conflict of interest related to this project**

**PROVIDE DETAILS AS ATTACHMENT FOR ANY NON-FINANCIAL CONFLICT OR FINANCIAL CONFLICT OF INTEREST RELATED TO THIS PROJECT.

PROJECT CLASSIFICATION

○ Research Project ○ Masters Thesis ○ Class Project ◉ Doctoral Dissertation ○ Program Evaluation ○ Other

Specify Other:

REVIEW REQUESTED

Please thoroughly review the Human Subject Research Categories and Notes at the end of the protocol form before completing this section.

Exempt Review

*Are you requesting exempt status for the project?

◉ Yes ○ No

If yes, based on which category outlined at the end of the application?

Category 7.1.2(4)

Expedited Review

***(Expedited review does NOT mean rushed approval.** Please allow at least two weeks for the expedited review process.)*

**Are you requesting an expedited review of the project?*

○ Yes ◉ No

If yes, based on which category outlined at the end of the application?

Category

**** You may only select one of the above choices. A protocol cannot qualify for both exempt and expedited review.***

EXTERNAL FUNDING

Is the project externally funded? ○ Yes ◉ No *If yes, complete the remainder of the External Funding Section. If no, go to next section.*

External Funding Submission Deadline/Award Date:

Funding Agency:

PROJECT TITLE

Title of Project: The Impact of Montessori Teaching on Academic Achievement of Elementary School Students in a Central Texas School District

PROJECT DATES

Starting Date: Upon IRB Approval

The starting date CANNOT be a date before IRB approval is received. If you will start as soon as approval is received, enter "Upon IRB Approval" for the starting date.

Estimated Completion Date: One Year After IRB Approval

The above is an estimated date of completion. A Completion Report is due at the conclusion of the project noting the actual completion date.

PROJECT PURPOSE & OBJECTIVES

Describe Project Purpose:

Be specific and thorough.

The purpose of the study is to examine the impact of Montessori teaching on academic achievement of elementary school students in an urban school district in Central Texas on the basis of test scores in mathematics, reading, writing, and science on the State of Texas Assessments of Academic Readiness (STAAR) categories.

Describe Project Objectives and/or Research Questions:

Be specific and thorough.

The study is guided by the following research questions:

1. Do third, fourth and fifth grade students who attend a Montessori public school program perform better than do third, fourth and fifth grade students who attend a non-Montessori school program on the basis of achievement in reading?
2. Do third, fourth and fifth grade students who attend a Montessori public school program perform better than do third, fourth and fifth grade students who attend a non-Montessori school program on the basis of achievement in mathematics?
3. Do fourth grade students who attend a Montessori public school program perform better than do fourth grade students who attend a non-Montessori school program on the basis of achievement in writing?
4. Do fifth grade students who attend a Montessori public school program perform better than do fifth grade students who attend a non-Montessori school program on the basis of achievement in science?

RESEARCH SUBJECTS

Description and Source of Research Subjects:

MINIMUM information to include:
1. *Target number of participants*
2. *Location of participants (on campus or specifically provide names for other locations - permission needed from other locations)*
3. *Manner in which participants will be identified from a larger pool of individuals*
4. *Inclusion & Exclusion criteria for participants (ex. age, physical characteristics, learning characteristics, professional*

The study takes place in an urban school district in central Texas which serves approximately 15,000 students. The study is delimited to third, fourth, and fifth grade students because at the elementary level 1) third, fourth, and fifth grade students are required to take the STAAR test in mathematics and reading; 2) mandatory testing in writing is required for fourth grade students; 3) mandatory testing in science is required for fifth grade students. The characteristic-present group consists of a non-probability sample of approximately 350 third, fourth, and fifth grade students in a Montessori program. The comparison group consists of approximately 400 third, fourth, and fifth grade students in a non-Montessori program.

The students will not be contacted for any data collection. Their existing academic achievement data will be used for the purpose of the study.

criteria, etc.) ***5.*** *Minimum age for participants* ***6.*** *How participants will be contacted (ex. online, through a faculty member, through a social networking site, through a professional in a specific field, etc.)*	

RESEARCH DESIGN, METHODS, & DATA COLLECTION PROCEDURES

Describe Research Design, Methods and Data Collection Procedures for Human Subject Interactions: *Be specific and thorough.* *Be specific to your study.* *Describe the methods and procedures step-by-step in common terminology. Describe each procedure, including frequency duration and location of each procedure. Describe how data will be stored and protected, how long data will be kept following the study, etc.* *You do not need to describe the statistical methods for analyzing data once it is collected or other elements of the study not involving human subjects.*	The study employs an ex-post facto, causal-comparative design. The quantitative data will be obtained from the Waco Independent School District (WISD). The quantitative data will include raw scores for each of the STAAR categories. Permission to use the data for the purpose of the study has been obtained (see attached). At the 3rd grade, there are five mathematics categories: 1) Numbers, Operations and Quantitative Reasoning, 2) Patterns, Relationships, and Algebraic Reasoning, 3) Geometry and Spatial Reasoning, 4) Measurement, and 5) Probability and Statistics. There are three reading categories: 1) Understanding across Genres, 2) Understanding and Analysis of Literary Texts, and 3) Understanding and Analysis of Informational Texts Analysis. At the 4th grade, there are five mathematics categories: 1) Numbers, Operations and Quantitative Reasoning, 2) Patterns, Relationships, and Algebraic Reasoning, 3) Geometry and Spatial Reasoning, 4) Measurement, and 5) Probability and Statistics. There are three reading categories: 1) Understanding and Analysis across Genres, 2) Understanding and Analysis of Literary Texts, and 3) Understanding and Analysis of Informational Texts. There are three writing categories: 1) Composition, 2) Revision, and 3) Editing. At the 5th grade, there are five mathematics categories: 1) Numbers, Operations and Quantitative Reasoning, 2) Patterns, Relationships, and Algebraic Reasoning, 3) Geometry and Spatial Reasoning, 4) Measurement, and 5) Probability and Statistics. There are three reading categories: 1) Understanding and Analysis across Genres, 2) Understanding and Analysis of Literary Texts, and 3) Understanding and Analysis of Informational Texts. There are four science categories: 1) Matter and Energy, 2) Force, Motion, and Energy, 3) Earth and Space, and 4) Organisms and Environments.

RISKS & PROTECTION MEANS

Describe the Specific Risks and Protection Means for Human Subject Participants: *Be specific and thorough. If no risk, state "No risk." If risks associated with the study are minimal and not greater than risks ordinarily encountered in daily life, state: Minimal Risk* ***and describe risks.*** *The risk levels provided in the protocol and the consent forms must be consistent.* *Describe each potential risk and the steps taken to protect human subject participants from the risk (ex. breach of confidentiality, data protection, possibly injury, psychological distress, pressure to conform, pressure to participate, etc.) Describe the protection means specifically and how participants will gain access to any necessary outside assistance (ex. medical care, counseling, etc.) if available.*	The study uses existing data in which all identifiers will be removed before the data are given electronically to the PI by WISD. All data will remain confidential. The researchers cannot think of any risks.

Consider whether there are physical, emotional, social, legal, etc. risks if participants' participation were to become public.	

BENEFITS VS. RISKS

Describe Benefits & Risks to Human Subject Participants: *Address benefits reasonably expected to the research participant and potential benefits to society. Any possible monetary compensation is not to be categorized as a benefit. Be specific and thorough.*	There are no direct benefits to the participant. Results of the study will be used to evaluate the Montessori educational program.

INFORMED CONSENT METHODS

Describe Methods for Obtaining Informed Consent from Human Subject Participants: *Be specific and thorough. Describe how researcher(s) will gain access to participants, how participants will be provided the consent documentation, in what format the consent will be provided, any discussion that will take place with participants, and methods of communication utilized to keep participants aware of their rights throughout the study, if applicable. Points to remember:* *(1) Participants must be given time to review the consent/ informational documents and ask questions* *(2) minors must have a separate assent for participation written at a level appropriate to the age group of participants, and parents must be given a separate parental consent form.* *(3) Information sheets should be utilized for exempt studies in which the only record of participants would be signed consent forms.* *(4) The online consent template should be utilized as a guide for online survey consent.*	Not applicable, as existing data will be used for which permission has been obtained (see attached).

☐ *Check if waiver of signed informed consent is requested. Justification must be provided for waiver. See waiver criteria at end of form.*

Justification:	

INVESTIGATOR(S) QUALIFICATIONS

Qualifications of the Investigator(s) to Conduct Research:	The PI is a doctoral student in Educational Leadership at Texas A & M University Corpus Christi and has completed the CITI online course on protection of human research participants. The faculty advisor, Dr. Kamiar Kouzekanani, is a professor of quantitative methodology in the College of Education.

Describe the qualifications of each investigator to conduct human subject research or attach CV/ biosketch.	

FACILITIES & EQUIPMENT

Facilities & Equipment to be Used in the Research: *Describe any equipment that will be used, including audio/video equipment.* ** Specifically list (by name) any off-campus locations that will be used.* *List any on-campus locations where the study will occur.*	The PI's personal computer is to be used as well as the PI's professional office and home office. The Statistical Package for the Social Sciences (SPSS) is to be used as well.

* Investigators must submit permission from all off-campus study locations and/or organizations providing data, specimens, access to participants, etc. Permission must be submitted with the IRB protocol application.

INVESTIGATOR(S) RESPONSIBILITIES & SIGNATURES

By complying with the policies established by the Institutional Review Board of Texas A & M University-Corpus Christi, the principal investigator(s) subscribe(s) to the principles stated in "The Belmont Report" and standards of professional ethics in all research, development, and related activities involving human subjects under the auspices of Texas A & M University-Corpus Christi. The principal investigator(s) further agree(s) that:

A. Approval will be obtained from the Institutional Review Board before making ANY change in this research project.
B. Development of any unexpected risks will be immediately reported to the Institutional Review Board.
C. An annual continuation application will be completed and submitted annually for expedited and full review studies. The study will CEASE once approval expires.
D. Signed informed consent documents will be kept for the duration of the project and for at least three years thereafter at a location approved by the Institutional Review Board and as described in the protocol.

ALL INVESTIGATOR(S) AND ADVISOR(S) MUST SIGN THE PROTOCOL. The Principal Investigator should save a copy of the IRB Protocol Form after emailing the form to the Research Compliance Officer for review. Type the name of each individual in the appropriate signature line. Add additional signature pages if needed for all Co-Principal Investigators, collaborating and student investigators, and faculty advisor(s).

ORIGINAL SIGNATURES REQUIRED

PLEASE NOTE: SIGNATURE PAGES MAY BE SUBMITTED EITHER (1) SCANNED ORIGINAL SIGNATURE(S) ON SIGNATURE PAGE EMAILED AS AN ATTACHMENT WITH FORM (2) SUBMITTED AS PRINTED HARD COPY

A. Principal Investigator Certification:

Principal Investigator *(Typed)*:	Minerva M. Salazar
Principal Investigator *(Signature)*:	Minerva M. Salazar
Date:	10.11.12

B. Co-Principal Investigator or Faculty Advisor Certification:

Co-Principal Investigator/ Advisor *(Typed)*:	Kamiar Kouzekanani

Co-Principal Investigator/ Advisor *(Signature)*: K. Kouzikanani

Date: 10.11.12 Check one: ○ Co-PI ◉ Faculty Advisor

C. Co-Principal Investigator or Faculty Advisor Certification

Co-Principal Investigator/ Advisor *(Typed)*:

Co-Principal Investigator/ Advisor *(Signature)*:

Date: Check one: ○ Co-PI ○ Faculty Advisor

D. Co-Principal Investigator or Faculty Advisor Certification

Co-Principal Investigator/ Advisor *(Typed)*:

Co-Principal Investigator/ Advisor *(Signature)*:

Date: Check one: ○ Co-PI ○ Faculty Advisor

Human Subject Research Categories

Please Note

Research involving special or protected populations, such as children, prisoners, pregnant women, mentally disabled persons, or economically or educationally disadvantaged persons, does not qualify for exempt review and is subject to full review.

The following types of studies do not qualify for exempt reviews and are subject to expedited or full reviews:

1) Studies involving a faculty member's current students
2) Studies supported by external funding
3) Studies involving the following and similar sensitive subject matters which can potentially cause discomfort and stress to the participant: Abortion, AIDS/HIV, Alcohol, Body Composition, Criminal Activity, Psychological Well-being, Financial Matters, Sexual Activity, Suicide, Learning Disability, Drugs, Depression

Studies involving audio taping and/or videotaping *DO NOT* qualify for exempt review.

7.1 Exempt Research Categories

7.1.1 Certain categories of research are exempt from the Protection of Human Subjects policy in the Code of Federal Regulations 45 CFR 46. The IRB Chair will determine, based on the federal guidelines, whether a research activity qualifies for exemption. Although exempt research is not regularly reviewed by the IRB, the exempt research form (and the informed consent form, if applicable) must be on file with the IRB, and the research may be reviewed at the committee's discretion. If the committee deems necessary, it may require a full review.

7.1.2 Unless otherwise required by federal departments or agencies, research activities in which the only involvement of human subjects will be in one or more of the following categories are generally exempt from full review by the IRB:

1) Research conducted in established or commonly accepted educational settings, involving normal education practices, such as
    i. research on regular and special education instructional strategies, or
    ii. research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
    i. information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
    ii. any disclosure of human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under the previous paragraph, if:
    i. the human subjects are elected or appointed public officials or candidates for public office; or
    ii. federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

5) Research and demonstration projects that are conducted by or subject to the approval of federal department or agency heads, and that are designed to study, evaluate, or otherwise examine:
    i. public benefit or service programs;
    ii. procedures for obtaining benefits or services under these programs;
    iii. possible changes in or alternatives to those programs or procedures; or
    iv. possible changes in methods or levels of payment for benefits or services under those programs

6) Taste and food quality evaluation and consumer acceptance studies:
    i. if wholesome foods without additives are consumed or
    ii. if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture

7.2 *Expedited Review Categories*

7.2.1 Expedited review procedures are available for certain kinds of research involving no more than minimal risk, and for minor changes in approved research. Specifically, research is eligible for expedited review if it involves no more than minimal risk (see 45 CFR as amended) to the subjects and the only involvement of human subjects will be in one or more of the categories listed below:

1) Collection of: hair and nail clippings, in a nondisfiguring manner; deciduous teeth; and permanent teeth if patient care indicates a need for extraction.

2) Collection of excreta and external excretion including sweat, uncannulated saliva, placenta removed at delivery, and amniotic fluid at the time of rupture of the membrane prior to or during labor.

3) Recording of data from subjects 18 years of age or older using noninvasive procedures routinely employed in clinical practice. This includes the use of physical sensors that are applied either to the surface of the body or at a distance and do not involve the input of matter or significant amounts of energy into the subject or an invasion of the subject's privacy. It also includes such procedures as weighing, testing sensory acuity, electrocardiography, electroencephalography, thermography, detection of naturally occurring radioactivity, diagnostic echography, and electroretinography. It does not include exposure to electromagnetic radiation outside the visible range (for example, X-rays, microwaves).

4) Collection of blood samples by venipuncture, in amounts not exceeding 450 milliliters in an eight-week period and no more often than two times per week, from subjects 18 years of age or older who are in good health and not pregnant.*

5) Collection of both supra- and subgingival dental plague and calculus, provided the procedure is not more invasive than routine prophylactic scaling of the teeth and the process is accomplished in accordance with accepted prophylactic techniques.

6) Voice recording made for research purposes such as investigation of speech defects.

7) Moderate exercise of healthy volunteers.**

8) The study of existing data, documents, records, pathological specimens, or diagnostic specimens.

9) Research on individual or group behavior or characteristics of individuals, such as studies of perception, cognition, game theory, or test development, where the research investigator does not manipulate subjects' behavior and the research will not involve stress to the subjects.

10) Research on drugs and devices for which an investigational new drug exemption or an investigational device exemption is not required.

11) Any other category specifically added to this list by HHS and published in the Federal Register.

* Subjects must be informed orally of the risk of bruising and infection.
** Moderate exercise does not include stress testing.

Criteria for Waiver of Consent

§46.116 General requirements for informed consent.

(c) An IRB may approve a consent procedure which does not include, or which alters, some or all of the elements of informed consent set forth above, or waive the requirement to obtain informed consent provided the IRB finds and documents that:

(1) The research or demonstration project is to be conducted by or subject to the approval of state or local government officials and is designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs; and
(2) The research could not practicably be carried out without the waiver or alteration.

(d) An IRB may approve a consent procedure which does not include, or which alters, some or all of the elements of informed consent set forth in this section, or waive the requirements to obtain informed consent provided the IRB finds and documents that:

(1) The research involves no more than minimal risk to the subjects;
(2) The waiver or alteration will not adversely affect the rights and welfare of the subjects;
(3) The research could not practicably be carried out without the waiver or alteration; and
(4) Whenever appropriate, the subjects will be provided with additional pertinent information after participation.

TEXAS A&M UNIVERSITY
CORPUS CHRISTI

ERIN L. SHERMAN, MAcc, CRA, CIP
Research Compliance Officer
Division of Research, Commercialization and Outreach

6300 Ocean Drive, Unit 5844
Corpus Christi, Texas 78412
O 361.825.2497 · F 361.825.2755

November 20, 2012

Ms. Minerva M. Salazar
4638 Willowick Drive
Corpus Christi, TX 78413

Dear Ms. Salazar,

The research project entitled "The Impact of Montessori Teaching on Academic Achievement of Elementary School Students in a Central Texas School District" (IRB# 128-12) has been granted approval through an exempt review under category 7.1.2(4). You are authorized to begin the project as outlined in the IRB protocol application.

Please submit an IRB Amendment Application for any modifications to the approved study protocol. Changes to the study may not be initiated before the amendment is approved. Please submit an IRB Completion Report to the Compliance Office upon the conclusion of the project. Both report formats can be downloaded from IRB website.

All study records must be maintained by the researcher for three years after the completion of the study. Please contact me if you will no longer be affiliated with Texas A&M University – Corpus Christi before the conclusion of the records retention timeframe to discuss retention requirements.

Please contact me if you have any questions.

Sincerely,

Erin L. Sherman

Erin L. Sherman

Institutional Research Pre-Approval Request

Please use this form for all institutional research requests. This form should be submitted to the Office of Curriculum, Instruction, Assessment, and Accountability no later than the 10th day of the month prior to projected submission to the IRB of the University. The District shall make every effort to provide feedback to the submitting party by the 25th of the month, approved, disapproved, or returned for further information. This pre-approval request must be accompanied by a project proposal or executive summary that details involvement by the campus or classroom in the project. Incomplete proposals will be returned.

Contact Person: Minerva M. Salazar Date: 09/06/2012

Educational Institution Represented: Texas A & M University - Corpus Christi

Research Project Title: The Impact of Montessori Teaching on Academic Achievement of Elementary School Students in a Central Texas School District

Proposed Location for the Research Project: Waco Independent School District

Participants Targeted for Study: Approximately 800 students in 3rd, 4th, and 5th grades at Provident Heights Elementary and Alta Vista Montessori
(Number and Description)

Proposed Beginning and Ending Dates for the Project: Study currently ongoing; expected completion August 2013.

Please answer the following questions in the space provided:

1. What is the potential direct or indirect impact for instructional improvement in Waco ISD?

   Study will reveal if there is an impact on student learning as measured by the STAAR test results when comparing students' results taught using the Montessori methods in comparison to the students' results that were taught using non-Montessori traditional methods.

   Study will also examine if teachers providing Montessori instruction were Montessori trained in order to compare between Montessori methods of instruction to non-Montessori instruction.

   The results of the study will be made available to Waco I.S.D. to be used as the district determines.

2. What is the expected time frame for completion of the portion of the research project that will be conducted in a Waco ISD facility?

   On-site visit will not be required for this study.

3. What loss of instructional time will be necessary for the gathering of data, if any? What data gathering activities will be conducted that will result in a loss of instructional time, i.e., administration of a reading inventory as a pre/post test?

   No loss of instructional time will be necessary as an on-site visit will not be required.

4. What is the expected impact on campus/department personnel other than yourself? How will you solicit volunteers?

   The approval for collecting the data has been awarded by Superintendent of schools, Bonny Cain, and the Assistant Superintendent, Jennifer Womack has kindly agreed to provide the necessary data.

   No impact on personnel is expected other than the time necessary to provide the data.

5. What information defined by FERPA as confidential student information will be necessary for the completion of this research project? How will you ensure that confidentiality is maintained throughout the project and in any written documents related to the project?

   Confidentiality is a requirement of the doctorate program. I have signed an Institutional Review Board application that ensures confidentiality will remain a priority for my study. The confidential reports requested that may have student information are STAAR reports that reveal information such as scores, gender, ethnicity, socio-economic status, etc.

6. How will the results of the research project be shared with Waco ISD? Is the intent for this research project to be published? If so, in what manner?

   The results of the study will be made available to Waco I.S.D. to be used as the district determines.

   There is a possibility the study will be published for educational purposes.

From:Waco ISD Asst Superintendent 254 755 9582 10/04/2012 14:37 #106 P.004/004

From:Waco ISD Asst Superintendent 254 755 9582 10/04/2012 11:12 #105 P.004/004

OCT-04-2012 10:32 From:
From:Waco ISD Asst Superintendent 254 755 9582 To:9755959582 Page:4/4
10/04/2012 09:41 #104 P.004/004

Campus Principal/Department Head

10-4-12
Date
10/4/12

Consensus of Review Committee:

__✓__Project Approved _____Project Approved pending IRB approval

_____Project Disapproved Reason:

_____Further information necessary prior to approval:

Committee approval:

9/10/12
Asst. Supt. Curriculum

Ex. Dir. of Education (Elem. Or Sec.)

Additional Committee Member

Title

Additional Committee Member

Title