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The effects of single-gender math classroom activities on the achievement and behavior outcomes of fifth-grade girls and boys at a public elementary school

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THE EFFECTS OF SINGLE-GENDER MATH CLASSROOM ACTIVITIES ON THE ACHIEVEMENT AND BEHAVIOR OUTCOMES OF FIFTH-GRADE GIRLS AND BOYS AT A PUBLIC ELEMENTARY SCHOOL

By

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Abstract

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Erik P. Chaussee, Ed.D.

University of Nebraska, 2012

Advisor: Dr. Peter J. Smith

The purpose of this study was to examine single-gender schools and/or classes as a method of improving student achievement and gaining greater satisfaction in school. The paper also examined the effects of single-gender classes on student achievement, the academic gender gap, and the attitudes of students and teachers. It also looked at the legal implications of such a practice. In addition, it examined a variety of school district's past methods and structures in order to implement a single-gender school or single-gender classes within a coed school including other programs within schools

Acknowledgements

I want to express my sincere appreciation to my advisor and chairperson of my committee, Dr. Peter Smith. He spent many hours guiding me and offering good advice and suggestions. I also want to thank my committee: Dr. Kay Keiser, Dr. Neal Grandgenett, and Dr. John Hill. I am in deep appreciation to the administrators of the Millard Public Schools and the teachers at Grace Abbott. While on this journey I asked many questions of those that had blazed this trail before and they provided me with good answers and great advice. I appreciate the teachers at Grace Abbott who were willing to undertake single-gender classes despite being something rarely attempted. We ended with good results.

I want to give a big thanks to my family. It has been said many times that our parents are our first teachers. In my case, it is very true of my mother, Ellen Chaussee. She instilled in me a love of reading and her appreciation of education drove me to be a life-long learner and to seek success in all that I do. My father, Curtis Chaussee, taught me the value of having a strong work ethic. Lastly, my children, Ben and Brooke Chaussee were patient and sometimes I had to skip dinners so I could work on my final degree, my doctorate.

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CHAPTER ONE

INTRODUCTION

When a woman announces to the world that she is pregnant, one of the most, if not the most frequently asked questions is, "Is it a boy or girl?" Of all the characteristics that make up who we are, our gender is one of the most significant. At baby showers, it is blue for boys and pink for girls. At birthday parties we buy trucks for boys and dolls for girls (the author doesn't consider action figures to be dolls). Being a male or a female is what defines us, guides us, and to an extent, determines who we are in a family and may impact our career choices. Yet, the place where children spend a vast amount of their first eighteen years, schools, for the most part, teach and treat the students as if these basic gender differences do not exist. Research in this dissertation will show that boys outperform girls in math and science and girls outperform boys in language arts. Research also shows that the majority of students in special education are boys and that boys get into trouble far more often and more seriously than girls, including suspension from school. More boys than girls are diagnosed with Attention Deficit Hyperactivity Disorder. While for the majority of the nation's history, girls were considered second class citizens both in education and in the work force; recent findings show that boys are the minority in honor societies in high school and students in college (Sommers, 2000). The literature review in chapter two will give examples of instructional strategies that allow each boy and girl to learn at their maximum taking gender differences into account.

Schools have long considered differentiation as a necessary and important part of education. Differentiation is the process of meeting the needs of all students-usually the needs are defined as academic or cultural. A student who excels at math should have

different work than the student who struggles with basic mathematical concepts. Schools have different expectations for a student who arrives from a foreign country knowing little English than a student who lives in a wealthy suburban neighborhood and therefore, their needs are met differently. This differentiation can be in the form of different teaching style and a different educational placement. Yet, schools rarely take into account gender differences when looking at how students learn and how they react to the school setting. The closest a school may get to recognizing those differences is a girls' line and boys' line or a boys against the girls in a spelling contest.

However, throughout our history there have always been single-gender schools, albeit mainly private ones, usually Catholic schools, and there are public single-gender schools in other countries. Conversely, because of No Child Left Behind, there are more and more schools and school districts experimenting with single-gender classes and schools as the federal government have loosened the reigns of Title IX.

Purpose of the Study

The purpose of this study is to find the ways that boys and girls learn and act differently in school and find the structure, support, and instructional strategies that optimize learning for all students enabling them to reach their greatest potential, academically and socially. Learning about how boys and girls learn differently does not mean that students need to be segregated into single-gender classes and schools. That may be ideal, but educators can optimize learning by becoming more aware of these differences and use this knowledge when planning and teaching whether boys are girls are together in a coeducational setting or separated into single-gender classes.

The study analyzed the math and science grades and life skills marks for a group of students at the end of fourth grade and at the end of fifth grade in one school setting. The school is a highly successful school in a suburban neighborhood with a low minority population, a low percentage of students on free and reduced lunch, and with district and state assessment scores that range from the high 80's to mid 90's as far as percent mastery. The school enjoys scores on norm-referenced standardized test, the Terra Nova, in the 80th to 90th national percentile over the last several years. The school has a great deal of parent participation and enjoys high marks in parent surveys. At the time of the study, the enrollment was 410 students in kindergarten through fifth grade with a certified staff of 31 including three fifth grade teachers. The district's enrollment at that time was just under 22,000 with 24 elementary schools, none of which have had single-gender classes. Although enjoying high academic success, nevertheless, not all students do well academically. Although, there are differences between how girls and boys at the studied school perform, there is not what could be considered a large gender gap. There are many interventions that can and are used to optimize learning; teaching with gender in mind is just one of them. Teaching with gender in mind is not putting all girls in one class and all boys in another class. Although, that is a strategy, placement in single-gender classes without knowledge of instructional strategies about the ways boys and girls learn differently, is not an effective approach.

Literature Related to the Topic

There are a large number of articles and books that discuss gender differences; there are not many studies that show academic differences with large groups of students. One reason for this is the low number of public schools and school districts that have

single-gender classes or schools and/or look at gender differences as an intervention and as a way to increase student achievement, improve the social setting, and decrease behavior problems. There are many both in education and outside education that disagree with the idea that there are gender differences and to segregate boys and girls in different settings is wrong, but numerous studies show that African-American male is the most at-risk student in American schools (Noguera, 2002). Many cultural and economic reasons do exist for the cause of this fact; school districts are looking for interventions to help stem the tide of the decline of this demographic group. The literature offers several examples of using single-gender schools and classes as one relatively inexpensive intervention. However, the purpose of this research is not to single out one demographic group for improvement, but to use the review of current literature and the findings from this dissertation's study to show that there are differences and are unique methods to help boys and girls learn at their maximum potential through instructional strategies geared toward those unique differences.

Importance of the Study

The educational landscape in the United States began to change considerably in 2001 with the passage of The No Child Left Behind Act. States and school districts were being held accountable for the academic achievement of their students like never before. To fail to meet the requirement of NCLB could cost states millions of dollars, teachers' and principals' jobs, and the reputation of the schools involved. Since enactment, Congress increased federal funding of education, from $42.2 billion in 2001 to $54.4 billion in 2007. Funding tied to NCLB received a 40.4% increase from $17.4 billion in 2001 to $24.4 billion. The funding for reading quadrupled from $286 million in 2001 to

$1.2 billion (Aspey, Colby, & Smith, 2006). There is debate as to whether all the increased funding is making a difference in overall academic achievement, closing the achievement between whites and minorities, and reducing the drop-out rate, especially in urban areas. The federal government has been accused of not fully funding the act and enacting it at a time when states were in a financial crisis. In 2008 the United States and world has found itself in the worst financial crisis since the Great Depression. States have been forced to comply with the act while their tax revenues have been dramatically reduced.

To meet the requirements of the act will require a certain percentage of students to be at grade level in reading and math each year before 2014 and 100% of students to be on grade level by 2014. Schools will need potent interventions in order to meet the federal government's compliance of 100%. Interventions are expensive and usually require additional personnel, material, and time. However, single-gender classes within a coeducational school may be one relatively inexpensive and uncomplicated intervention. It requires training and staffing changes as well as a strong commitment from parents, educators, and the community. But, the costs are low compared to other interventions brought about due to NCLB and the fear of noncompliance. The parents, educators at all levels, and the community have a stake in the findings of this study. Even without the threat of schools being placed on the NCLB "watch list", this study will show that knowledge of how boys and girls learn differently can lead to more effective instruction, how single-gender classes *and schools* can be attained, and that this knowledge and structure can lead to increased academic achievement and an increased positive attitude

about school. This study contributes to the body of scholarly knowledge and gives educators practical methods to help children.

Research Questions

The following research questions will be used to analyze student achievement and student behavior in two single-gender math classes, one consisting of boys and one consisting of girls:

Overarching Pretest-Posttest Achievement Research Question #1. Do girls who participated in single-gender math program classroom activities lose, maintain, or improve their end of fourth-grade pretest Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving compared to their end of fifth-grade posttest Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving?

Overarching Pretest-Posttest Achievement Research Question #2. Do boys who participated in single-gender math program classroom activities lose, maintain, or improve their end of fourth-grade pretest Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving compared to end of fifth-grade posttest Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving?

Overarching Posttest-Posttest Achievement Research Question #3. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving?

Overarching Pretest-Posttest Achievement Research Question #4. Do girls who participated in single-gender math program classroom activities lose, maintain, or improve their end of first quarter mathematics classroom grades compared to their end of fourth quarter mathematics classroom grades?

Overarching Pretest-Posttest Achievement Research Question #5. Do boys who participated in single-gender math program classroom activities lose, maintain, or improve their end of first quarter mathematics classroom grades compared to their end of fourth quarter mathematics classroom grades?

Overarching Posttest-Posttest Achievement Research Question #6. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fourth quarter posttest mathematics classroom grades?

Overarching Pretest-Posttest Achievement Research Question #7. Do girls who participated in single-gender math program classroom activities lose, maintain, or improve their end of first quarter science grades compared to their end of fourth quarter science grades?

Overarching Pretest-Posttest Achievement Research Question #8. Do boys who participated in single-gender math program classroom activities lose, maintain, or improve their end of first quarter science grades compared to their end of fourth quarter science grades?

Overarching Posttest-Posttest Achievement Research Question #9. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fourth quarter posttest science classroom grades?

Overarching Pretest-Posttest Achievement Research Question #10. Do girls who participated in single-gender math program classroom activities lose, maintain, or improve their Life Skills as measured by ending of first quarter fifth-grade teacher administered rubric scores compared to their end of fourth quarter Life Skills markings for exceeds expectations (score = 1), satisfactory/meets expectations (score = 2), and needs improvement (score = 3) for (a) completes tasks in a timely manner, (b) responds appropriately to oral/written directions, (c) identifies a problem and seeks better solutions, (d) cooperates with others to complete a task or goals, (e) uses good work skills, (f) demonstrates responsibility, (g) sets and pursues goals, (h) finds answers to questions and concerns, (i) is trustworthy and honest (j) has a positive attitude, (k) demonstrates self-control over emotions and body, (l) keeps trying, (m) takes pride in classroom and school, (n) respects individual differences, (o) respects the rights of others, and (p) uses kind words and actions?

Overarching Pretest-Posttest Achievement Research Question #11. Do boys who participated in single-gender math program classroom activities lose, maintain, or

improve their end of first quarter Life Skills markings (teacher administered rubric scores) compared to their end of fourth quarter Life Skills markings for (a) completes tasks in a timely manner, (b) responds appropriately to oral/written directions, (c) identifies a problem and seeks better solutions, (d) cooperates with others to complete a task or goals, (e) uses good work skills, (f) demonstrates responsibility, (g) sets and pursues goals, (h) finds answers to questions and concerns, (i) is trustworthy and honest (j) has a positive attitude, (k) demonstrates self-control over emotions and body, (l) keeps trying, (m) takes pride in classroom and school, (n) respects individual differences, (o) respects the rights of others, and (p) uses kind words and actions?

Overarching Posttest-Posttest Achievement Research Question #12. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fourth quarter Life Skills rubric scores for (a) completes tasks in a timely manner, (b) responds appropriately to oral/written directions, (c) identifies a problem and seeks better solutions, (d) cooperates with others to complete a task or goals, (e) uses good work skills, (f) demonstrates responsibility, (g) sets and pursues goals, (h) finds answers to questions and concerns, (i) is trustworthy and honest (j) has a positive attitude, (k) demonstrates self-control over emotions and body, (l) keeps trying, (m) takes pride in classroom and school, (n) respects individual differences, (o) respects the rights of others, and (p) uses kind words and actions?

Assumptions

The study has several strong features. One of the most important features is the quality of the staff at the researched school. The teachers involved in the study were

eager to participate in a new program. Classes at the school in fifth grade had been departmentalized for many years. Equally important is the math curriculum of the studied school's district. It is both rigorous and extensive, which helps to prepare students for middle school. All data is available through the school district's database and all data are uniformly required and uniformly collected.

Limitations of the study

Prior to the 2008/09 school year there are had not been any single-gender classes in any elementary school in the research school's district in recent years, if ever. During the 2008/09 school year the single-gender math classes (N =42) at the research school were the only single-gender classes in the district. There was one fifth grade math class made up entirely of boys (n =19) and one fifth grade math class made up entirely of girls (n =23). These classes were in existence during the entire school year, but came to an end after that school year. One-third of the fifth grade students were in a traditional co-educational class due to the odd number of classes. The students in the coed class were in the top third of the fifth grade based on math abilities. There were no other classes in other schools in the school district that could be used as a comparison. Students were only compared to themselves through a pre-test and a post-test. Therefore, the application of findings was somewhat limited, but they could potentially be transferable to other schools and school districts.

The study took place during only one academic school year. Students who did not take both the pre-test at the end of fourth grade and the post-test at the end of fifth grade were not included in this study. This was the school's and the students' first experience with single-gender classes, there was a possibility of competition and rivalry

between the genders potentially causing students to perform beyond their usual level because they perceive they are in competition (Gall, Borg, & Gall, 1996).

Delimitations of the Study

In this study, it has been stated that single-gender teaching can be an inexpensive example of an instructional intervention. It is the only intervention this study will examine. Additionally, the reason for this study is not solely to look at single-gender teaching as an intervention. The study will show, through the literature review, that there are benefits to gender-unique instruction and placement of students based on gender besides academic achievement.

The study was delimited to two classes at one grade level of fifth grade students in one elementary school in a suburban school district during one school year. The students selected were from the fifth grade class, but only two-thirds of the students were selected. Due to the fact that single-gender classes need to be structured in pairs and there were three fifth grade classes, there was one coeducational math class. The fifth grade boys were taught by a male teacher and the fifth grade girls were taught by a female teacher for the single-gender math classes.

As required by district policy, the studied school had reteaching and remediation policies and procedures in place for all students who failed to score at the barely proficient level. All students who scored below proficient received reteaching materials and assistance during class or outside class time. Students were allowed to retake the math ELO test approximately three weeks later. However, in this study, only the first ELO's scores were used.

All teachers in the research school's district are required, by policy, to take the District Instructional Model (DIM) training. A large piece of DIM was differentiation of instruction. Teachers utilized DIM in their classrooms in order to meet the individual academic needs of all students.

Definition of Terms

Single-gender teaching/instruction. Single-gender teaching or instruction is instructing students in a way with gender differences taken into account. This may include the knowledge that generally, boys have better spatial skills than girls and when the curriculum involves this skill, consideration is given that some girls may have more difficulty mastering this particular skill. This also may include the knowledge that boys can be more assertive in a classroom than girls so the girls may have to be drawn out more. Single-gender teaching may or may not be in a room or school with only one gender.

Single-gender placement. This is a class, a homeroom, or a school with all of one gender. This may be one all-boys class in one grade with one subject in a typical co-educational school setting.

Coeducation. This is a class, a homeroom, or a school which includes both genders, boys and girls. The term *coed* will be used synonymously with *coeducation.*

Essential Learner Outcome (ELO) examinations. ELO examinations are district developed criterion-referenced tests. Results of the ELOs are used in state reporting for student achievement. Although students who do not meet the specified cut score retake ELOs, the data used in this study was from initial testing only and did not include any retaken ELO's.

Life skills. Life skills are the 16 skills that are considered essential for helping students to be ready for work, for life-long learning, and for citizenship. These skills are managing time, following directions, solving problems, working with others, good working habits, responsibility, setting goals, organizing and evaluating information, integrity, self-discipline, a positive attitude, perseverance, participating in community, respecting diversity in others, respecting rights of others, and treating others in a respectful manner. Students are given instruction in these life skills in grades kindergarten through fifth in elementary school.

District Instructional Model (DIM). The District Instructional Model is defined as the five domains: planning, instruction, assessment, learning environment, and professional responsibilities that teachers are to incorporate in order to promote successful student learning. The first four domains within the model are based on the following: students succeed because teachers plan with individual learning results in mind, students achieve desired learning results from effective participation in well-designed and executed units and lessons, students are given many opportunities to learn the prescribed curriculum of the district education program, student develop the capacity to understand and apply knowledge in meaningful ways, student progress is continually monitored and teaching is adjusted to optimize individual learning. Students who are not meeting individual learning goals are supported by proactive intervention, student grades reflect evidence of learning, students are engaged in a positive, productive environment established by the teacher, student behavior expectations that comply with studied school's district policy are clearly taught and effectively implemented, and students are expected to meet challenging and differentiated learning goals.

Cut score. Cut score is defined as the proficiency level that insures that students scoring at or above this level clearly demonstrate they have met the prescribed standards measured by the assessments. The cut score varies from test to test and is not based on a certain percent for mastery.

Proficiency Levels. Proficiency levels are defined as the four levels designated as the quality of work a student must produce to demonstrate the quality of work at each level. Proficiency levels were determined by school district personnel. The four levels from low to high in the studied school's district are below proficient (below the cut score), barely proficient, proficient, and beyond proficient.

Title IX. Title IX of the Education Amendments of 1972 is U.S. law enacted on June 23, 1972. It was renamed in 2002 as the Patsy T. Mink Equal Opportunity in Education Act, but is most commonly known simply as Title IX. The law states that "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance" (United States Department of Labor, 2010).

No Child Left Behind Act. This is a bill passed in 2001 by the U.S. Congress concerning the education of children in the U.S. It is commonly referred to as NCLB or "nicklebee." NCLB supports standards-based education reform, which is based on the belief that setting high standards and establishing measurable goals can improve individual outcomes in education. The Act requires states to develop assessments in basic skills to be given to all students in certain grades, if those states are to receive federal

funding for schools. The Act does not assert a national achievement standard; standards are set by each individual state.

Gender. Gender is a set of characteristics that make up the sex of a person. In this study, gender will refer to whether a person is a boy/male or girl/female. It will not be used synonymously with sex except in referring the National Association for Single Sex Public Education (NASSPE).

Criticallogical. Criticallogical is critical thinking using logic and reasoning.

Instructional strategies. Instructional strategies are those methods of instruction that a teacher uses to instruct students to meet learning objectives.

Professional development. Professional development refers to skills and knowledge attained for both personal development and career advancement. It ranges from books to journal articles to workshops to conferences.

Organization of the Study

The remainder of this study is organized into five chapters in the following manner. Chapter Two presents a review of the relevant literature dealing with both the history and evolving trends in single-gender teaching and structure. Chapter Three delineates the research design and methodology of the study. The instruments used to gather and record the data, the procedure followed, and determination of the sample selected for the study is described. An analysis of the data and a discussion of the findings are presented in Chapter Four. In Chapter Five are the summary, conclusions, and recommendations of the study. The study concludes with a reference section and appendices.

CHAPTER TWO

REVIEW OF THE LITERATURE

This literature review analyzed the current research on single-gender teaching and knowing. The main areas/questions of literature reviewed are (1) a brief history of single-sex schools, (2) a case for single-sex classes and schools (3) are girls more successful academically when taught in single-gender classes; (4) are boys more successful academically when taught in single-gender classes; (5) are certain subjects more conducive to single-gender teaching than others; (6) do single-gender classes have an effect on student behavior; (7) are there instructional strategies that are more effective with girls; (8) are there instructional strategies that are more effective with boys.

This study was concerned with a year-long program of single-gender teaching and its impact on student achievement in math and science and social skills. Single-gender classes and schools are rare in the United States thus there is not a great deal of research on this topic. This study not only reviewed the literature and examined the data, but looked at activities that teachers can use to assist their students which are gender-related.

The History of Single-Gender Classes

To the casual observer, it would seem that most people attend or have attended coeducational schools given the vast majority of public and private schools in the U.S. are coed. However, that has not always been the case nor is it the case in every country in the world. Coeducational schools became the embedded practice in the first half of the nineteenth century (Tyack & Hanson, 1992). There were some challenges to the practice, but none threatened its common practice. The practice began not because of a certain philosophy of coeducation embraced by the people at that time, but because of financial

constraints (Riordan, 1990). Coeducational schools were economically more efficient. In our country's early years, only boys attended schools (Datnow & Hubbard, 2002). But after the Revolutionary War, there was fresh sense of the possibility of educating women (Tyack & Hanson, 1992). By the end of the nineteenth century, boys and girls were attending the same schools throughout the United States with few exceptions (Datnow & Hubbard, 2002). Education for girls and women was limited to basic skills courses and did not include academic subjects that would lead to higher education (Speilhagen, 2008). Single-gender schools have been common in Europe, especially the United Kingdom, and Australia for centuries. In the United States single-gender schools have been much more prevalent among Catholic schools due to the fact that they do not have to follow the practices of Title IX.

Early feminists urged access to all students for the entire academic curriculum, especially precollege classes such as math and science (Speilhagen, 2008). This practice of coeducation in the United States continued for decades. Coeducational classes opened the doors to precollegiate study by girls and caused a substantial increase in enrollment in colleges across the nation (Speilhagen, 2008). However, beginning in the 1980's, well-publicized reports that women and girls were being shortchanged in schools and that coeducation was giving men and boys the upper hand (Sadker & Sadker, 1994) began to refuel an interest in what are the best gender policies in education and how to reduce the impact of gender bias and stereotyping in education and improving the education of boys and girls (Datnow & Hubbard, 2002). It became apparent that some schools had single-gender physical education classes that routinely lacked resources for classes and teams for girls. This mirrored what was happening at the college level as well (Speilhagen,

2008). Ultimately, the federal government attempted to stem this criticism with the passage of the Title IX of the Education Amendment of 1972. Sax (2003) wrote that Title IX, the sex-discrimination statute prohibited public schools from separating boys and girls for all or part of the school day with few exceptions.

The Case for Single-Gender Classes

It would probably be safe to say that every school in the United States and throughout the world has its own unique culture. There are unique programs that exist in some schools such as International Baccalaureate, Montessori, etc. that create a difference in cultures. Rural, urban, and suburban schools certainly vary in their culture. But, regardless of location, ethnicity, socioeconomics, and other cultural differences, perhaps more aggressively than ever before, public schools are under attack for presumably failing to deliver academic rigor and for contributing to the decline of society's moral values (Datnow, Hubbard, & Conchas, 2001, p. 184). Schools have a common structure or culture that is almost impossible to change (Tyack & Cuban, 1995). There have been many attempts at school reform over the last fifty years going back to 1957 with the Soviet's launching of Sputnik. At the heart of school reform is a change in the culture of schools. Students learn more in schools where the culture is such that their peers and teachers make academics the number one priority and hold high expectations for all students, and when the climate supports the adults also (Heck & Marcoulides, 1996 as cited in Firestone, W. & Louis, K. 1999).

One cultural icon in the United States is that, with few exceptions, boys and girls learn side by side in public schools. But do they receive the same quality of education?

In the previous decade, Myra and David Sadker (1994) stated that although girls are in the majority in our nation's schools but are second class educational citizens:

Sitting in the same classroom, reading the same textbook, listening to the same teacher, boys and girls receive very different educations. From grade school to graduate school female students are more likely to be invisible members of the classrooms (p. 1).

The No Child Left Behind Act of 2001 (NCLB) has encouraged school districts to try same gender classes (U.S.D.E., 2004, P 5), and the practice is increasing. However, it is a major cultural shift that not everyone agrees with. Title IX, the 1972 sex-discrimination statute prohibited public schools from separating boys and girls for all or part of the school day with few exceptions (Sax, 2003). Provisions of Title IX state that no school receiving federal funds shall "provide any course or otherwise carry out any of its education activity separately on the basis of sex" (as cited in Herr, K. & Arms, E, 2003, p. 529). The Office of Civil Rights in the Department of Education adhered to this policy (Salomone, 2006, p. 778). However, recently some school districts have begun to interpret federal policies in order to address the needs of at-risk students. Between 2000 and 2003, fifteen single-sex public schools opened, mainly in urban areas. Some educate boys and girls in separate classrooms and others are totally single-sex (Salomone, R., 2006, p. 778). An increase in schools may stem from the No Child Left Behind act which has been interpreted as allowing, in fact, possibly encouraging single-sex classes as an intervention to close the achievement gap (www.ed.gov. 2008). The first official sign of change came in 2001 when as part of No Child Left Behind, Congress approved federal funding for innovative educational programs, including "same-gender schools and classrooms, consistent with applicable law (Salomone, R., 2006, p. 784)."

Adding to the debate were statements made by two prominent government officials found in Guirian, Stevens, & Daniels (2009). U.S. Secretary of Education, Margaret Spellings stated, "Research shows that some students may learn better in single-sex environments…Every child should receive a high quality education in American and every school and district deserves the tools to provide it" (p. 1). Then U.S. Senator Hillary Clinton in an article in Newsday on same sex schools said:

> The idea behind providing choices in public schools is, for me, one of the best ways that we can ensure choices of learning environments that will maximize the achievements of every student. I think we need to be creative and think outside the box (p. 1).

It has become apparent is that there is not enough research on single-sex programs. One reason is that, although increasing, there are still not large numbers of schools and school districts attempting this. Some may fear cries of discrimination and/or lawsuits as single-sex classrooms could be perceived as unfair to girls (Campbell & Sanders, 2002). Another reason for the lack of research is the sustainability of such programs. Changes in administration, funding, and public perception are factors that may end a school's or district's efforts at promoting and instituting single-gender classes. If No Child Left Behind is going to allow this practice, schools must be prepared with research to back up their innovation.

Since A Nation at Risk and more recently No Child Left Behind public schools have faced increasing pressure for students to perform well academically (Datnow, Hubbard, & Conchas, 2001, p. 184). To prove or disprove academic success and the increased availability and use of technology, a sharp increase in the use of data has taken

place in the last few years. One result of all of this data is the research that shows that there is a gender gap in the United States (Dee, T. 2006). However, most research and data show an achievement gap between ethnic groups and economic groups. Little attention is given to the gender gap.

According to the Department of Education's Early Childhood Longitudinal Study, when children enter kindergarten, boys and girls perform similarly on tests of both reading and mathematics. But a few years later, by the spring of the 3rd grade, boys, on average, outperform girls in math and science, while the girls outperform the boys in reading. Disconcertingly, NAEP (National Assessment for Educational Progress), commonly known as the Nation's Report Card, results show that for children between the ages of nine and 13, the gender gaps in science and reading roughly double and the math gap increases by two-thirds. For children between the ages of 13 and 17, there is modest growth in the math and reading gender gaps but a substantial expansion of the gap in science (Dee, T. 2006). Costello (2008) found in the 2004 NAEP report that males who have made it through 12 years of school have significantly poorer reading scores than females. White males of college-educated parents, 23% scored "below basic" in reading compared to 7% of their female peers. Among Hispanics, males of college-educated parents, 34 % were "below basic" in reading compared to 19% of the same category of females. Among black males of college-educated parents, 44% were "below basic" in reading compared to 33% of their female peers. Education Next reinforces, yet somewhat contradicts the Department of Education's Early Childhood Longitudinal Study mentioned above by stating that girls arrive in kindergarten far more ready than boys to engage in the verbal-rich curriculum that awaits them. By the end of elementary

school, the gap grows and widens in middle school (2010). Although each study shows boys entering school to be at a different starting point than the other, both studies agree that the gender gap in reading grows the longer boys are in school.

Due to a greater focus over the last two decades on girls' success in school, today boys are less likely than girls to be in an academic rigorous curriculum (Riordan, C. 1999). Public debate has centered on a "crisis" for boys, focusing on their lower reading and language test scores and higher rates for special education referrals compared to girls (Kleinfeld, 1999) and their greater likelihood to be involved in violent crime (Gilbert and Gilbert, 1998). Almost 60% of college students are girls, 58% of those earning a bachelor's degree were female and 62% of those earning a master's degree were female in 2007 (Bailey & Whitmore, 2010). Bailey and Whitmore (2010) also found that for the most part this is happening because K-12 schools are shortchanging boys. Far too many boys drop out before earning a high school diploma. Worse, too many boys who do make it through high school are either unprepared for or unmotivated to do college-level work (pp. 53).

For decades, girls have outperformed boys in reading and writing as shown by standardized tests. This may be due to developmental, learning style, or brain differences and/or an anti-school culture felt by boys (NCES 2003; Pollack, 1998). Boys often regard reading and writing as feminine that threaten their masculinity (Dutro 2001/2002).

This phenomenon of boys falling behind girls isn't just in the United States. In the book,

Boys' Underachievement in Education, (2006) the authors found this to be taking place around the world:

> A number of countries, many of them in the Commonwealth, have also made tremendous progress in girls' education in the last one two decades. As a result, gender disparities are narrowing in many parts of the globe. At the same time, a new phenomenon has emerged in certain countries where gender disparities in education are turning in favour of the girls, therefore, against the boys (p. 3).

This academic gender gap appears to be more pronounced in urban areas. In July, 2009, the Center for Labor Market Studies at Northeastern University tracked the graduated students from Boston Public Schools in 2007. The study concluded that for 167 women in four-year colleges there were only 100 men (Digest of Education Statistics, 2007). Dropout rates are much higher for minorities than whites with Hispanic boys having the highest dropout rate. African-American boys have a higher dropout rate than white boys (Digest of Education Statistics, 2007).

Boys are falling behind girls in other areas. Boys account for 70% of students identified with a learning disability. They account for 90% of the discipline referrals including suspensions and expulsions. They receive 70% of the D's and F's given in schools. They are more likely to engage in high-risk behavior and are far more likely to attempt suicide (Gurian, Stevens, and Daniels, 2009). Boys are more likely to express a strong dislike for school. More than one-third of high school boys say they seldom (or never) find their work to be meaningful or important and about the same number say that what they are learning has little relevance to what they need to know later in life (Tyre, 2009).

One such school district that implemented this practice of single gender classrooms a decade ago is the Long Beach (California) Unified School District. Middle

school Jefferson Leadership Academies became the first public middle school in the U.S. to offer separate classes for boys and girls. The district reported findings comparing the Grade Point Averages (GPA) for all students who attended Jefferson in 1998/99 and who attended in 1999/00 and found these results:

> Students' GPA for students who had previously attended Jefferson in either grade six or seven increased for all students, male and female, in both grades seven and eight under the single-gender academy configuration. The increase was statistically significant for both genders at grade seven and for boys at grade eight (Sharpe, W., p. 1).

In 1993, American University professors Myra and David Sadker published *Failing in Fairness: How America's Schools Cheat Girls*. During a three year study trained observers visited more than 100 classrooms in the eastern U.S. They noted these responses in the elementary classrooms they visited:

1. Boys called out eight times as often as girls. Teachers ignored the "raise your hand" rule. If boys called out the teacher usually praised their answers but if girls called out they were given reminders to raise their hands.
2. Boys were encouraged to solve problems on their own, but teachers helped girls who were stuck on problems.
3. Teachers gave more positive feedback to boys' answers than girls' answers.

In contrast, in 1998, the American Association of University Women published a report stating that single-gender education is not necessarily better than coeducation and found that boys and girls thrive on good education regardless of single gender or coed. Their findings:

1. There is no evidence that single-gender education is better for girls.

2. When elements of a good education are present, both boys and girls succeed. Those elements include small class sizes and a focused academic curriculum (AAUW, 1998, p. 7).

Researchers Nelson and Smith (2001) looked at external factors such as peers, family, and the school and their impact on gifted girls' academic and career achievements. This examination revealed that assertive boys continue to receive more teacher attention that gifted girls do in many classrooms. Additionally, male and female teachers still tend to view highly able boys as more competent in criticallogical thinking skills and in creative-problem solving skills than highly able girls (Nelson and Smith, 2001).

Siegle and Reis (1998) studied teacher perceptions of male and female students and reported that teachers continue to rate adolescent gifted females higher than gifted males in effort, but not ability.

Other research shows there is growing evidence that overall girls are outperforming boys academically as well as socially in schools. "There is a new gender gap with a predominant number of boys falling to the bottom of the heap" (Pollack, 1998, p. 234.) There is ample evidence that boys traditionally do better in math and science and girls do better in language arts (Dee, 2006). But, popular media and research show that girls are more successful overall in school. The Organization for Economic Cooperation and Development implemented a three year study of fifteen year old boys around the world called the Program for International Student Assessment measuring math, science,

and reading. In thirty-five developed countries, girls outperformed boys overall, especially in reading and math (Gurian, 2005, p 22-23).

As mentioned previously the irony here is that in the 1990's Sadker and Sadker were lamenting the plight of one gender, girls, in American public schools. A decade later, Gurian was doing the same, except for boys. Educators are concerned about this gender gap. Single-sex classrooms and/or schools may be an inexpensive intervention and an answer to this growing gender gap.

In the 2008-2009 school year, there were at least 442 public schools in the United States offering single-sex educational opportunities. Private and parochial secondary schools and colleges have had same-gender schools for years. Most of those 442 public schools are coed schools which offer single-sex classrooms, but which retain at least some coed activities according to the National Association for Single Sex Public Education (NASSPE) based in Montgomery County, Maryland (2008). That's a large increase in the last few years, but a tiny fraction of the public schools in this country. In June, 2010, the NASSPE listed on their web site 540 single gender schools, again, most of which have single-gender classrooms within a coeducational school (2010). Research on the subject presents some ambiguity and lack of agreement as to its benefits. There has been no national, comprehensive, controlled study of academic performance of U.S. students in public and private elementary and secondary single-sex schools. As stated previously, part of this is due to the small number of schools engaged in this (Campbell & Sanders, 2002).

Single-sex classrooms

Many conclusions can be drawn from the research in this chapter. Girls, once considered the weaker sex, have made academic gains over the last three decades and have outperformed boys in many academic areas. However, males still make more money than females, perhaps in part to the careers they select rather than from the inequities that exist (Sax, 2008). The evidence seems to strongly suggest that boys do better in math and science and girls do better in language arts. With training and preparation, the teacher of boys can instinctively and specifically culminate in creating boy-friendly classrooms. Teachers of girls can set up girl-friendly classrooms by incorporating all the research that shows how girls learn best (Gurian, Stevens, and Daniels, 2009). It is not the intention of this paper to understand why these conclusions appear to be true, nor to participate in the debate of society (i.e. Does society cause the gender gap?) vs. biology (i.e. Are boys' and girls' brains different?), but rather to acknowledge the realities and offer the best educational methods and strategies to allow each student to achieve his or her maximum potential.

The research also demonstrates that the brains of boys and men are very different from girls and women in terms of anatomy, function, and hormones. A Yale University study by Drs. Sally and Bennett Shaywitz (1995) showed that when males read, mainly the left inferior frontal gyrus lights up and when females read, the frontal lobe lights up on both sides of the brain. In 2001 neuroradiologist Dr. Joseph Lurito and others conducted brain research at Indiana University School of Medicine and found that a majority of males use their left side of their brain for listening and a majority of females use both sides for listening and processing what they hear. With medical advanced

technology, scientists can view brains response to stimuli thus showing key gender differences. It can be concluded that if males and females use different parts of their brains for similar functions (e.g. listening, processing, language development, spatial manipulation) there must be different ways they learn. If they learn differently, there are many benefits to teaching them differently with different instructional strategies and setting up a different learning environment with those gender differences in mind. Obviously, many students of both genders thrive in the typical coed classroom and that each child is an individual with a unique learning style. There are many similarities among boys and girls as well as differences between the genders and individuals.

These differences are not just in the structure of the brains, but in the ways they process information. This difference appears to help girls learn to read and write at a younger age and have a larger vocabulary throughout life. Boys do better with spatial manipulation and math calculations. Therefore, boys will do better when given more space while learning. They need movement. Boys also will tend to use fewer sensory words while writing and less tolerant than girls when asked to work at their seats and even harder for boys when asked to work quietly (Gurian, Stevens, and Daniels, 2009). Again, it must be remembered, these are generalizations with many exceptions for both genders.

Gurian, Stevens, and Daniels (2009) summarize various brain-based activities that can benefit both boys and girls when separated. This separation can take on a variety of forms from single-sex schools to merely separating boys and girls into single-sex groups during language arts. Girls are more likely to try new things when boys aren't around.

Boys at times can feel inadequate verbally to girls because of their stronger language skills and may flourish in an all-boys' group.

Given the research that boys outperform girls in math and science, specific instructional strategies can be implemented in both single-gender and coed classes. If the girls are without the boys, they are freer to experiment and discuss their findings. Sadker and Sadker (1993) found that boys talk out more and are called on more by teachers. Thus, without the boys, girls have a better opportunity to learn and enjoy math and science classes.

Given the stated benefits of single-gender teaching, whether in coed or separate classes, professional development is crucial to the success of any program. With any change in any organization, it is crucial that the leadership is supportive of the change. In education, that is the principal. The principal can then form a leadership team of faculty that is interested as potential participants. This could include parents and other members of the community. The leadership team should coordinate the professional development, which needs to take place prior to teaching single-gender classes and be on-going. Without it, some teachers may feel overwhelmed given the boys' "movement" in a classroom, as one example. Teacher training can take many forms from journal articles to books to workshops. Once started, teachers need to be given opportunities to share their reactions and instructional strategies that worked with one gender and those that either didn't work or needed refining when used with one gender. "The delight of watching single-gender classes is that observations about differences are almost immediate" (Spielhagen, 2008). In Spielhagen's research (2008) she reported that teachers consistently felt that it would take more than a year to see all the advantages and

disadvantages of single-gender classrooms. After one year, 19 of 21 teachers teaching single-gender classrooms in the studied school wanted to return to the single-gender rooms.

Behavior Issues Related to Gender

The research for this paper has shown that boys enjoy and need more movement, blurt out more, and are less ready for school compared to girls. Boys have more office referrals, more likely to be in special education, and more likely to drop out. Can single-gender classrooms decrease boys' discipline issues? Most articles and books on this subject discuss the issue of distraction. Are boys and girls more distracted in mixed-gender classes as hormones start entering the landscape in late elementary years and early middle school years? The research doesn't specifically answer the distraction question, but does offer an insight into differences of boys and girls behaviors in coed vs. single-gender classes.

Spielhagen (2008) reported on a school in New York that tracked discipline referrals for middle school students in both coed and single-gender classes. The students in grades sixth through eighth were tracked for three years. The data looked at a variety of infractions prior to the implementation of single-gender classes and after the implementation. The data is somewhat inconclusive due to a variety of factors (e.g. subjectivity of infraction reporting, different class sizes in mixed and single gender classes, a change in administration, etc.) but does offer a hint that students in a single-sex classroom may learn with fewer distractions and disciplinary issues compared to a traditional mixed-gender environment. The study found that males tend to initiate more disciplinary issues than females no matter which environment. However, could teacher

bias have an impact on the study and the prevalence of more boys in trouble than girls due to gender stereotyping? Teacher bias can be reduced by adequate preparation through professional development.

Instructional Strategies Unique for Boys

This section will examine instructional strategies that can boost academic achievement when teachers instruct with gender in mind. An old adage in education is that good teaching is good teaching. The strategies presented here will not disagree with that statement. A good teacher who knows nothing about the different ways that boys and girls learn will have more success than a poor teacher who teaches with gender in mind. The idea is that great teachers can become even better and can help students gain greater success when certain strategies are employed in the classroom. As stated earlier, the NAEP test shows that girls outperform boys in reading in all age groups for the last three decades. Costello (2008), writing in Principal, states that officially there are four student subgroups that must meet state proficiency goals in order to meet AYP for NCLB: race/ethnicity, English language learners, disability, and income. But, unofficially, these four groups are all made up of just two subgroups, boys and girls. He listed several strategies that close the reading achievement gender gap by creating a boy-friendly environment in a classroom. A summary of the strategies follow:

Use knowledge of brain research to learn the differences in the brain of boys and girls. Functional MRI's show that girls use both sides of their brain when reading and listening and boys use only one side of their brain. This may account as to why boys take longer to learn how to read, place less value on reading, and read less often.

Create a "boy-friendly" reading environment. It should come as no surprise that boys and girls have many different reading interests. Boys will rarely read a book with a female main character, although girls will read with little regard to the main character's gender. Boys like adventure stories and nonfiction more than girls do.

Create opportunities for oral reading. Boys benefit from read alouds because they can engage the disengaged boy, can introduce boys to a variety of stories, and can increase their vocabulary foundation.

Increase the use of male role models for reading. Females read more than males for pleasure, although newspapers are read by more men than women. Men can be invited into a school to read to students or to discuss their use of reading for pleasure and/or business, such as on a panel. Upper grade boys can read and listen to younger boys (Costello, 2008).

Mulvey (2009) writes that she implemented single-gender classes at her school where she served as principal for 13 years to help the girls be free of the rambunctious boys. She said what began as a strategy to help girls, actually ended up helping the boys and the girls. One example she gives are the kindergarten classrooms that are filled with writing materials such as an easel, markers, pencils, clipboards to "read" the room, and lots of picture books. But the blocks and other fun building materials are gone or hidden. She cites this as one example of the feminization of our schools as the pressure to reach NCLB goals increases.

She offers strategies to help boys become successful students despite this feminization:

Delay reading instruction until children are ready for it.

This usually helps boys, but can help girls in some cases. When formal reading and writing instruction are introduced before a child is ready, this may lead to failure and feelings of insecurity.

Implement single-gender courses for students. Educate parents about the advantages and provide opportunities for choice.

Provide inservice to teacher to educate them on the best instructional strategies for the unique differences that exist for boys and girls.

Provide competitive learning as well as cooperative learning. Many boys (and girls) thrive under competition. Team work can offer both cooperative play within a competitive lesson.

King and Gurian (2006) wrote about a school in Colorado that had a significant gender gap on the Colorado state reading test. The boys' scores ranged from 6-21 points behind the girls and made up 75% of the special education enrollment at the school. The school introduced more "boy-friendly" strategies:

Increase movement and decrease worksheets-this keeps them energized and engaged. Boys like to move-most any parent of both genders knows that. Students can learn and move at the same time.

Use spatial visual representations. Boys and girls can create story boards, computer-generated writing or pod casts as an alternative to paper and pencil writing.

Allow students to choose their topics of writing and reading. Boys like to write about bombs, racing, sports, and war. Girls like to write about their best friends, mermaids, and unicorns. When one boy at the school was asked why boys like writing about super

heroes, he replied that "boys have R-rated minds." A nearby girl agreed silently by rolling her eyes.

Helping boys with homework. Boys get more D's and F's in schools than girls do. Boys may benefit from after-school study homework help and more accountability for getting their homework completed.

Make reading and writing purposeful. Help boys find the motivation to do well on both subjects. Boys may want to write letters to sports heroes and persuasive essays on making recess longer.

When looking at the research on how to help boys succeed in school, most, if not all, share one common element-movement. Boys have energy. Daniels (2009) recalls one Christmas morning when she and her husband had decided to allow the purchase of toy guns-a practice they had been avoiding for years:

> Santa was allowed to deliver two Nerf guns with rotating barrels that discharged five soft arrows in a row. They did not expect the boy energy they would witness as her sons enjoyed game after game of chasing each other upstairs and downstairs throughout the house, pounding each other with Nerf arrows. It was pure bedlam-a Christmas morning like no other (Gurian, Stevens, & Daniels, p. 87).

As was discussed with the kindergarten class that was allowing less time for free play, school districts are also examining the time and money needed for recess and physical education and question if it fits into the No Child Left Behind philosophy. One of the most important benefits of exercise is the way it affects our brains allowing us to be more alert, decrease stress, and improve our mood (Gurian, Stevens, & Daniels, 2009).

P.E. and recess are not the only places that movement can take place. Brain activities are a great way to keep kids moving in school. Brain Gym® activities are "designed to energize and motivate students, to help with balance and coordination, to change the mental state of students, and promote greater potential for learning" (Gurian, Stevens, & Daniels, 2009). Many of the activities involve connecting the two hemispheres of the brain. One easy example is for a teacher to ask students if they know the answer to a question to touch their left ear with their right hand. It allows movement across the hemispheres, is quick and easy to do, and can be done in the classroom. Like many of the strategies geared toward boys, brain activities can be helpful to girls as well.

Instructional Strategies Unique for Girls

Conversely, there are instructional strategies that can benefit girls. As has been pointed out, research has shown that boys outperform girls in math and science (with some exceptions in some research). Closely related to this is the field of technology. Burger reported (2002) that girls' interest in technology is on par with boys, but are underrepresented in the career choices that rely heavily on technology, such as engineering, computer science, and physics. She listed strategies for girls that help girls promote their success in the area of technology:

Create "girl-friendly" technology environments. That may include a technology after-school club for girls only or single-gender computer classes. Girls can be freer to express themselves in environments free from the boys' domineering attitudes and teachers' greater likelihood to call on boys.

Provide female role models in the area of technology. In 2008, 57% of college graduates were female, yet only 28% of college graduates in computer science were female. This

percentage has been declining over the past several years (National Center for Women & Information Technology, 2007). Women can be invited into a school to work with students or to discuss their use of technology for pleasure and/or in their jobs, such as on a panel. Upper grade girls can work with younger girls with technology. Women that use technology in their careers could be used as mentors for girls.

Create opportunities for cooperative learning. Girls tend to be more social and enjoy participating in group projects and learn well in group settings. Using technology can be isolating and can have a detrimental impact on girls.

Discuss the positive aspects of technology and how it has enhanced our lives and can be used to solve problems of society.

Integrate technology into courses that girls enjoy, such as art, history, and language. Girls can prepare presentations using technology or create blogs to discuss topics of interest (Burger, 2008).

As the research in this study has found, girls have underperformed boys in the area of math. There are math activities that help girls learn math concepts and lead to more success in math. Some teachers of girls-only classes have reported that a method to increase girls' math learning and math facts memorization along sensorial lines. The girls do well with sensory data such as noticing and remembering colors with great variety. Multiplication problems can be in red while division problems in green. Textures and shapes can be integrated into this type of learning. Classrooms can be set up like a giant grid to help students learn the four quadrants or placing their hands in certain directions to represent each of the four quadrants, for example, students raise both of their hands above their heads and to the right to represent quadrant I. Using more

movement, girls can play "single-hands" math. One partner is A and the other is B. Each holds up fingers from one hand. The teacher announces either addition or multiplication and the two arrive at an answer together.

As with math, research has found that girls are outperformed by boys in the area of science. Success in science, like math, requires the willingness to take risks. This presents a challenge to girls, at least initially (Gurian, Stevens, & Daniels, 2009). Boys desire movement and want to skip the directions and experiment-part of what makes a good student of science. Girls are more orderly-they want to follow all the steps, work cooperatively, and take less risks-also the traits of a good student of science, but perhaps not the traits of a future scientist. Gurian, Stevens, & Daniels continue to state that girls can benefit from a single-gender science class as the teachers can concentrate on keeping the girls interest high and improve their self-confidence. The teachers look for their interests and try to integrate that into science learning as well as lots of verbal talk as girls' verbal skills are better than their spatial skills (2009). Girls would also benefit from panel discussions and mentors of women who use science in their careers or older girls working with younger girls in science.

As with the boys, Brain Gym® activities can be very beneficial to girls. Sometimes it can come at a needed break when the students are confused or overwhelmed. Activities include lazy eights or neck rolls. The students benefit from a break as well as engaging their brain.

Single-Gender Math Classes at the Research School

Beginning in the 2008/09 school year the research school implemented a plan to place 5th grade students in single-gender math classes. This idea originated from the

principal and was discussed over the summer of 2008 with his supervisor. Next the School Improvement Team was informed of this and approval was sought and granted from them. Only one parent had a question and two parents commented that it appeared to be a good idea. Next, the 5th grade teachers were informed including one male 4th grade teacher who was asked to teach the 5th grade males as research shows that boys do better with a same gender teacher (Dee, 2006). One theory asserts that the teacher's gender shapes communications between teacher and pupil, while another says the teacher acts as a gender-specific role model, regardless of what he or she says or does. According to this second theory, students are more engaged, behave more appropriately, and perform at a higher level when taught by one who shares their gender (Dee, T. 2006).

A letter was mailed to each fifth grade parent during the summer of 2008 explaining the plan, the reasons for this plan based on research listing three Internet sources, and giving an opportunity to respond if any questions or concerns. Neither comments nor questions were received.

To make this successful and to "sell" it to stakeholders the next year, data needed to be shown. It was decided the best way to compare students was the district Essential Learner Outcome assessment. Math ELO's are given to all 2nd, 3rd, 4th, and 5th graders in elementary school in the studied school's district. Other data exists, such as Terra Nova (district standardized assessment) scores but they were ruled out because the Terra Nova is not given to 5th graders. Therefore, the 4th grade math ELO and the 5th grade math ELO will be used in addition to other measures. The 4th grade ELO was given in the spring of 2008 to the current (at that time) 5th graders. The 5th grade math ELO was given in the spring of 2009 to the same students, now 5th graders.

The students were divided into six groups: all girls, non High Ability Learners (HAL) girls, HAL girls, all boys, non HAL boys, and HAL boys. The HAL program is a challenge program in which students must qualify based on testing. Due to the fact that there are an odd number of 5th grade classes it proved to be a logistical challenge to have every 5th grader in a same-gender class. Therefore, the top third academic students have been in the same math class for years and would continue that year in a coed setting. This top 1/3 are HAL students. The remaining two-thirds were split into a boy's class (non HAL boys) and a girls' class (non HAL girls).

Additionally, research shows that students perform better with the same gender teacher (Dee, T. 2006). However, the studied school does not have a 5th grade male teacher, but does have a 4th grade male teacher. He was recruited to teach the 5th grade boys.

That was the first year of single-gender math classes at the studied school so there were no previous classes to compare. Additionally, there are no single-gender math classes elsewhere in the studied school's district. There is one coeducational math class at the studied school, but those are high ability math students, which makes comparison difficult. However, a neighboring elementary school in this school district with similar demographics may provide a comparison between single-gender classes and coeducational classes at fifth grade with similar academic abilities (bottom 2/3 of each fifth grade).

CHAPTER THREE

METHODOLOGY

The purpose of the study is to determine the effect of single gender 60-minute every school day math classroom program activities on fifth-grade girls' and boys' math test scores, math grade scores, science grade scores, and teacher reported life skills determinations over the course of one academic school year. This chapter describes the participants, procedures, independent variable descriptions, dependent measures and instrumentation, research questions, and data analysis procedures.

Participants

Number of participants. The maximum accrual for this study will be $N = 42$ fifth-grade students participated in this study. Of the students who participated in single-gender math classrooms, 25 were girls and 17 were boys. This study will include only those students who completed fourth-grade pretest Essential Learner Outcome math assessment activities, completed fifth-grade single-gender math classroom activities for their fifth-grade school year, and completed fifth-grade posttest Essential Learner Outcome math assessment activities.

Gender of participants. Of the total number of subjects ($N = 42$), 25 (60%) were girls and 17 (40%) were boys. This gender ratio was congruent with the enrollment pattern in the school district where 50% are girls and 50% are boys.

Age range of participants. The age range of the study participants was nine years to 11 years of age. The age range of the study participants was congruent with the research school district's age range demographics for students from nine years to 11 years of age.

Racial and ethnic origin of participants. Of the total number of subjects (*N* = 42) for this study the racial and ethnic origin was White, not Hispanic *n* = 38 (91%), Black *n* = 1 (2%), Hispanic *n* = 1 (2%), and Asian/Pacific *n* = 2 (5%). The racial and ethnic origin of the study participants was congruent with the enrollment pattern of the school district.

Inclusion criteria of participants. Fifth-grade students who attended the research elementary school and completed fourth quarter fourth-grade pretest and completed fourth quarter fifth-grade posttest study dependent measures and were enrolled for the entire fifth-grade school year in the single-gender math classrooms were included as participants in the study.

Exclusion criteria of participants. Fifth-grade students in the research school who did not participate in single-gender math classroom activities were not included in the study.

Method of participant identification. Fifth-grade students in the research school who did participate in single-gender math classroom activities were included in the study. No individual identifiers were attached to the math achievement data of the 42 participating students in the two groups.

Description of Procedures

Purpose of the study. The purpose of the study is to determine the effect of single gender 60-minute every school day math classroom program activities on fifth-grade girls' and boys' math test scores, math grade scores, science grade scores, and teacher reported life skills determinations over the course of one academic school year.

Research design. The pretest-posttest comparative efficacy research design is displayed in the following notation.

Group 1 O_1 X_1 Y_1 O_2

Group 2 O_1 X_1 Y_2 O_2

Group 1 = Study subjects #1. Naturally formed group of fifth-grade girls (*n* = 25) who participated in a single gender math program classroom.

Group 2 = Study subjects #2. Naturally formed group of fifth-grade boys (*n* = 17) who participated in a single gender math program classroom.

X_1 = Study constant. All study subjects participated in and completed one school year of single gender math program activities. Single gender math program activities were developed and implemented by the school's elementary teachers and leadership personnel. The program was developed to support girls' and boys' ways of knowing and accelerate math achievement in both classrooms. The teacher for the girls' single gender math program classroom was female and the teacher for the boys' single gender math program classroom was male. Furthermore, all students participating in the single gender math program classrooms completed fourth-grade and fifth-grade in the research school. All girls' and boys' parents agreed to the placement of their child in the single gender math program classrooms.

Y_1 = Study independent variable, single gender math coursework, condition #1. Fifth-grade girls who participated in a single gender 60-minute every school day math program classroom developed to support girls' ways of knowing and accelerate math achievement.

Y_2 = Study independent variable, single gender math coursework, condition #2. Fifth-grade boys who participated in a single gender 60-minute every school day math program classroom developed to support boys' ways of knowing and accelerate math achievement.

O_1 = Study pretest dependent measures. (1) Achievement as measured by the studied school's district Essential Learner Outcome (ELO) ending of fourth-grade school year math test scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving. (2) Achievement as measured by ending of first quarter fifth-grade classroom grade for mathematics. (3) Achievement as measured by ending of first quarter fifth-grade classroom grade for science. (4) Life skills as measured by ending of first quarter fifth-grade teacher administered rubric scores for exceeds expectations (score = 1), satisfactory/meets expectations (score = 2), and needs improvement (score = 3) for (a) completes tasks in a timely manner, (b) responds appropriately to oral/written directions, (c) identifies a problem and seeks better solutions, (d) cooperates with others to complete a task or goals, (e) uses good work skills, (f) demonstrates responsibility, (g) sets and pursues goals, (h) finds answers to questions and concerns, (i) is trustworthy and honest (j) has a positive attitude, (k) demonstrates self-control over emotions and body, (l) keeps trying, (m) takes pride in classroom and school, (n) respects individual differences, (o) respects the rights of others, and (p) uses kind words and actions.

O_2 = Study posttest dependent measures. (1) Achievement as measured by the studied school's district Essential Learner Outcome (ELO) ending of fifth-grade school year math test scores converted to standard scores for (a) number representations, (b)

operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving. (2) Achievement as measured by ending of fourth quarter fifth-grade classroom grades for mathematics. (3) Achievement as measured by ending of fourth quarter fifth-grade classroom grades for science. (4) Life skills as measured by ending of fourth quarter fifth-grade teacher administered rubric scores for exceeds expectations (score = 1), satisfactory/meets expectations (score = 2), and needs improvement (score = 3) for (a) completes tasks in a timely manner, (b) responds appropriately to oral/written directions, (c) identifies a problem and seeks better solutions, (d) cooperates with others to complete a task or goals, (e) uses good work skills, (f) demonstrates responsibility, (g) sets and pursues goals, (h) finds answers to questions and concerns, (i) is trustworthy and honest (j) has a positive attitude, (k) demonstrates self-control over emotions and body, (l) keeps trying, (m) takes pride in classroom and school, (n) respects individual differences, (o) respects the rights of others, and (p) uses kind words and actions.

Research Questions and Data Analysis

The following student achievement Essential Learner Outcome fifth-grade math questions were addressed for girls and boys who participated in single-gender math program classroom activities.

Overarching Pretest-Posttest Achievement Research Question #1. Do girls who participated in single-gender math program classroom activities lose, maintain, or improve their end of fourth-grade pretest Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving compared to their end of fifth-grade posttest Essential Learner Outcome math achievement scores converted to

standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving?

Sub-Question 1a. Is there a significant difference between girls' end of fourth-grade pretest compared to girls' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (a) number representations after participating in single-gender math program classroom activities?

Sub-Question 1b. Is there a significant difference between girls' end of fourth-grade pretest compared to girls' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (b) operations after participating in single-gender math program classroom activities?

Sub-Question 1c. Is there a significant difference between girls' end of fourth-grade pretest compared to girls' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (c) geometry after participating in single-gender math program classroom activities?

Sub-Question 1d. Is there a significant difference between girls' end of fourth-grade pretest compared to girls' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (d) algebra after participating in single-gender math program classroom activities?

Sub-Question 1e. Is there a significant difference between girls' end of fourth-grade pretest compared to girls' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (e) data analysis after participating in single-gender math program classroom activities?

Sub-Question 1f. Is there a significant difference between girls' end of fourth-grade pretest compared to girls' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (f) problem solving after participating in single-gender math program classroom activities?

Analysis. Research Sub-Questions #1a, 1b, 1c, 1d, 1e, and 1f were analyzed using dependent *t* tests to examine significance of the difference between girls' end of fourth-grade pretest compared to girls' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving. Because multiple statistical tests were conducted, a one-tailed .05 alpha level was employed to help control for Type I errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #2. Do boys who participated in single-gender math program classroom activities lose, maintain, or improve their end of fourth-grade pretest Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving compared to end of fifth-grade posttest Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving?

Sub-Question 2a. Is there a significant difference between boys' end of fourth-grade pretest compared to boys' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (a) number representations after participating in single-gender math program classroom activities?

Sub-Question 2b. Is there a significant difference between boys' end of fourth-grade pretest compared to boys' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (b) operations after participating in single-gender math program classroom activities?

Sub-Question 2c. Is there a significant difference between boys' end of fourth-grade pretest compared to boys' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (c) geometry after participating in single-gender math program classroom activities?

Sub-Question 2d. Is there a significant difference between boys' end of fourth-grade pretest compared to boys' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (d) algebra after participating in single-gender math program classroom activities?

Sub-Question 2e. Is there a significant difference between boys' end of fourth-grade pretest compared to boys' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (e) data analysis after participating in single-gender math program classroom activities?

Sub-Question 2f. Is there a significant difference between boys' end of fourth-grade pretest compared to boys' end of fifth-grade posttest Essential Learner Outcome math scores converted to standard scores for (f) problem solving after participating in single-gender math program classroom activities?

Analysis. Research Sub-Questions #2a, 2b, 2c, 2d, 2e, and 2f were analyzed using dependent *t* tests to examine significance of the difference between boys'' end of fourth-grade pretest compared to boys' end of fifth-grade posttest Essential Learner

Outcome math scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving. Because multiple statistical tests were conducted, a one-tailed .05 alpha level was employed to help control for Type I errors. Means and standard deviations are displayed in tables.

Overarching Posttest-Posttest Achievement Research Question #3. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving?

Sub-Question 3a. Is there a significant difference between girls' end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations compared to boys' end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations after completing fifth-grade single-gender math program activities?

Sub-Question 3b. Is there a significant difference between girls' end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (b) operations compared to boys' end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (b) operations after completing fifth-grade single-gender math program activities?

Sub-Question 3c. Is there a significant difference between girls' end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (c) geometry compared to boys' end of fifth-grade Essential Learner Outcome

math achievement scores converted to standard scores for (c) geometry after completing fifth-grade single-gender math program activities?

Sub-Question 3d. Is there a significant difference between girls' end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (d) algebra compared to boys' end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (d) algebra after completing fifth-grade single-gender math program activities?

Sub-Question 3e. Is there a significant difference between girls' end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (e) data analysis compared to boys' end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (e) data analysis after completing fifth-grade single-gender math program activities?

Sub-Question 3f. Is there a significant difference between girls' end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (f) problem solving compared to boys' end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (a) problem solving after completing fifth-grade single-gender math program activities?

Analysis. Research Sub-Questions #3a, 3b, 3c, 3d, 3e, and 3f were analyzed using independent *t* tests to examine the significance of the difference between girls' end of fifth-grade Essential Learner Outcome math scores compared to boys' end of fifth-grade Essential Learner Outcome math scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving. Because

multiple statistical tests were conducted, a two-tailed .05 alpha level was employed to help control for Type I errors. Means and standard deviations are displayed in tables.

The following student achievement fifth-grade mathematics classroom grade score questions were addressed for girls and boys who participated in single-gender math program classroom activities.

Overarching Pretest-Posttest Achievement Research Question #4. Do girls who participated in single-gender math program classroom activities lose, maintain, or improve their end of first quarter mathematics classroom grades compared to their end of fourth quarter mathematics classroom grades?

Sub-question 4a. Is there a significant difference between girls' end of first quarter mathematics classroom grades compared to girls' end of fourth quarter mathematics classroom grades?

Analysis. Research Sub-Question #4a was analyzed using a dependent *t* test to examine significance of the difference between girls' end of first quarter pretest compared to girls' end of fourth quarter posttest mathematics classroom grades. Because multiple statistical tests were conducted, a one-tailed .05 alpha level was employed to help control for Type I errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #5. Do boys who participated in single-gender math program classroom activities lose, maintain, or improve their end of first quarter mathematics classroom grades compared to their end of fourth quarter mathematics classroom grades?

Sub-question 5a. Is there a significant difference between boys' end of first quarter mathematics classroom grades compared to their end of fourth quarter mathematics classroom grades?

Analysis. Research Sub-Question #5a was analyzed using a dependent *t* test to examine significance of the difference between boys' end of first quarter pretest compared to boys' end of fourth quarter posttest mathematics classroom grades. Because multiple statistical tests were conducted, a one-tailed .05 alpha level was employed to help control for Type I errors. Means and standard deviations are displayed in tables.

Overarching Posttest-Posttest Achievement Research Question #6. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fourth quarter posttest mathematics classroom grades.

Sub-question 6a. Is there a significant difference between girls' end of fourth quarter mathematics classroom grades compared to boys' end of fourth quarter mathematics classroom grades?

Analysis. Research Sub-Question #6a was analyzed using an independent *t* test to examine significance of the difference between girls' end of fourth quarter mathematics classroom grades compared to boys' end of fourth quarter mathematics classroom grades. Because multiple statistical tests were conducted, a two-tailed .05 alpha level will be employed to help control for Type I errors. Means and standard deviations are displayed in tables.

The following student achievement fifth-grade science classroom grade score questions will be addressed for girls and boys who participated in single-gender math program classroom activities.

Overarching Pretest-Posttest Achievement Research Question #7. Do girls who participate in single-gender math program classroom activities lose, maintain, or improve their end of first quarter science grades compared to their end of fourth quarter science grades?

Sub-question 7a. Is there a significant difference between girls' end of first quarter science classroom grades compared to their end of fourth quarter science classroom grades?

Analysis. Research Sub-Question #7a was analyzed using a dependent *t* test to examine significance of the difference between girls' end of first quarter pretest science classroom grades compared to girls' end of fourth quarter posttest science classroom grades. Because multiple statistical tests were conducted, a one-tailed .05 alpha level was employed to help control for Type I errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #8. Do boys who participate in single-gender math program classroom activities lose, maintain, or improve their end of first quarter science grades compared to their end of fourth quarter science grades?

Sub-question 8a. Is there a significant difference between boys' end of first quarter science classroom grades compared to their end of fourth quarter science classroom grades?

Analysis. Research Sub-Question #8a was analyzed using a dependent *t* test to examine significance of the difference between boys' end of first quarter pretest science classroom grades compared to boys' end of fourth quarter posttest science classroom grades. Because multiple statistical tests were conducted, a one-tailed .05 alpha level was employed to help control for Type I errors. Means and standard deviations are displayed in tables.

Overarching Posttest-Posttest Achievement Research Question #9. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fourth quarter posttest science classroom grades.

Sub-question 9a. Is there a significant difference between girls' end of fourth quarter science classroom grades compared to boys' end of fourth quarter science classroom grades?

Analysis. Research Sub-Question #9a was analyzed using an independent *t* test to examine significance of the difference between girls' end of fourth quarter science classroom grades compared to boys' end of fourth quarter science classroom grades. Because multiple statistical tests were conducted, a two-tailed .05 alpha level was employed to help control for Type I errors. Means and standard deviations are displayed in tables.

The following student Life Skills fifth-grade classroom grade score questions were addressed for girls and boys who participated in single-gender math program classroom activities.

Overarching Pretest-Posttest Achievement Research Question #10. Do girls who participate in single-gender math program classroom activities lose, maintain, or improve their end of first quarter Life Skills administered rubric scores markings compared to their end of fourth quarter Life Skills administered rubric scores markings for exceeds expectations (score = 1), satisfactory/meets expectations (score = 2), and needs improvement (score = 3) for (a) completes tasks in a timely manner, (b) responds appropriately to oral/written directions, (c) identifies a problem and seeks better solutions, (d) cooperates with others to complete a task or goals, (e) uses good work skills, (f) demonstrates responsibility, (g) sets and pursues goals, (h) finds answers to questions and concerns, (i) is trustworthy and honest (j) has a positive attitude, (k) demonstrates self-control over emotions and body, (l) keeps trying, (m) takes pride in classroom and school, (n) respects individual differences, (o) respects the rights of others, and (p) uses kind words and actions?

Sub-question 10a. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (a) Completes tasks in a timely manner after participating in single-gender math program classroom activities?

Sub-question 10b. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (b) Responds appropriately to oral/written directions after participating in single-gender math program classroom activities?

Sub-question 10c. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered

Life Skills rubric scores for (c) Identifies a problem and seeks best solutions after participating in single-gender math program classroom activities?

Sub-question 10d. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (d) Cooperates with others to complete a task or goal after participating in single-gender math program classroom activities?

Sub-question 10e. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (e) Uses good work skills after participating in single-gender math program classroom activities?

Sub-question 10f. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (f) Demonstrates responsibility after participating in single-gender math program classroom activities?

Sub-question 10g. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (g) Sets and pursues goals after participating in single-gender math program classroom activities?

Sub-question 10h. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (h) Finds answers to questions and concerns after participating in single-gender math program classroom activities?

Sub-question 10i. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (i) Is trustworthy and honest after participating in single-gender math program classroom activities?

Sub-question 10j. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (j) Has a positive attitude after participating in single-gender math program classroom activities?

Sub-question 10k. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (k) Demonstrates control over emotions and body after participating in single-gender math program classroom activities?

Sub-question 10l. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (l) Keeps trying after participating in single-gender math program classroom activities?

Sub-question 10m. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (m) Takes pride in classroom and school after participating in single-gender math program classroom activities?

Sub-question 10n. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered

Life Skills rubric scores for (n) Respects individual differences after participating in single-gender math program classroom activities?

Sub-question 10o. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (o) Respects the rights of others after participating in single-gender math program classroom activities?

Sub-question 10p. Is there a significant difference between girls' end of first quarter pretest compared to their end of fourth quarter posttest teacher administered Life Skills rubric scores for (p) Uses kind words after participating in single-gender math program classroom activities?

Analysis. Research Sub-Question #10a, 10b, 10c, 10d, 10e, 10f, 10g, 10h, 10i, 10j, 10k, 10l, 10m, 10n, 10o & 10p were analyzed using a dependent *t* test to examine significance of the difference between girls' end of first quarter Life Skills determinants compared to girls' end of fourth quarter Life Skills determinants. Because multiple statistical tests were conducted, a one-tailed .05 alpha level was employed to help control for Type I errors. Means and standard deviations are displayed in tables.

Overarching Pretest-Posttest Achievement Research Question #11. Do boys who participated in single-gender math program classroom activities lose, maintain, or improve their end of first quarter Life Skills administered rubric scores markings compared to their end of fourth quarter Life Skills administered rubric scores markings for (a) completes tasks in a timely manner, (b) responds appropriately to oral/written directions, (c) identifies a problem and seeks better solutions, (d) cooperates with others to complete a task or goals, (e) uses good work skills, (f) demonstrates responsibility, (g)

sets and pursues goals, (h) finds answers to questions and concerns, (i) is trustworthy and honest (j) has a positive attitude, (k) demonstrates self-control over emotions and body, (l) keeps trying, (m) takes pride in classroom and school, (n) respects individual differences, (o) respects the rights of others, and (p) uses kind words and actions?

Sub-question 11a. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (a) Completes tasks in a timely manner after participating in single-gender math program classroom activities?

Sub-question 11b. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (b) Responds appropriately to oral/written directions after participating in single-gender math program classroom activities?

Sub-question 11c. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (c) Identifies a problem and seeks best solutions after participating in single-gender math program classroom activities?

Sub-question 11d. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (d) Cooperates with others to complete a task or goals after participating in single-gender math program classroom activities?

Sub-question 11e. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills

determinants for (e) Uses good work skills after participating in single-gender math program classroom activities?

Sub-question 11f. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (f) Demonstrates responsibility after participating in single-gender math program classroom activities?

Sub-question 11g. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (g) Sets and pursues goals after participating in single-gender math program classroom activities?

Sub-question 11h. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (h) Finds answers for questions and concerns after participating in single-gender math program classroom activities?

Sub-question 11i. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (i) Is trustworthy and honest after participating in single-gender math program classroom activities?

Sub-question 11j. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (j) Has a positive attitude after participating in single-gender math program classroom activities?

Sub-question 11k. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (k) Demonstrates self-control over emotions and body after participating in single-gender math program classroom activities?

Sub-question 11l. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (l) Keeps trying after participating in single-gender math program classroom activities?

Sub-question 11m. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (m) Takes pride in classroom and school after participating in single-gender math program classroom activities?

Sub-question 11n. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (n) Respects individual differences after participating in single-gender math program classroom activities?

Sub-question 11o. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills determinants for (o) Respects the rights of others after participating in single-gender math program classroom activities?

Sub-question 11p. Is there a significant difference between boys' end of first quarter Life Skills determinants compared to their end of fourth quarter Life Skills

determinants for (p) Uses kind words after participating in single-gender math program classroom activities?

Analysis. Research Sub-Question #11a, 11b, 11c, 11d, 11e, 11f, 11g, 11h, 11i, 11j, 11k, 11l, 11m, 11n, 11o & 11p were analyzed using a dependent *t* test to examine significance of the difference between boys' end of first quarter Life Skills determinants compared to boys' end of fourth quarter Life Skills determinants. Because multiple statistical tests were conducted, a one-tailed .05 alpha level was employed to help control for Type I errors. Means and standard deviations are displayed in tables.

Overarching Posttest-Posttest Achievement Research Question #12. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fourth quarter Life Skills administered rubric score markings for (a) completes tasks in a timely manner, (b) responds appropriately to oral/written directions, (c) identifies a problem and seeks better solutions, (d) cooperates with others to complete a task or goals, (e) uses good work skills, (f) demonstrates responsibility, (g) sets and pursues goals, (h) finds answers to questions and concerns, (i) is trustworthy and honest (j) has a positive attitude, (k) demonstrates self-control over emotions and body, (l) keeps trying, (m) takes pride in classroom and school, (n) respects individual differences, (o) respects the rights of others, and (p) uses kind words and actions?

Sub-question 12a. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (a) Completes tasks in a timely manner after participating in single-gender math program classroom activities?

Sub-question 12b. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (b) Responds appropriately to oral/written directions after participating in single-gender math program classroom activities?

Sub-question 12c. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (c) Identifies a problem and seeks best solutions after participating in single-gender math program classroom activities?

Sub-question 12d. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (d) Cooperates with others to complete a task or goals after participating in single-gender math program classroom activities?

Sub-question 12e. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (e) Uses good work skills of others after participating in single-gender math program classroom activities?

Sub-question 12f. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (f) Demonstrates responsibility after participating in single-gender math program classroom activities?

Sub-question 12g. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (g) Sets and pursues goals after participating in single-gender math program classroom activities?

Sub-question 12h. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (h) Finds answers for questions and concerns after participating in single-gender math program classroom activities?

Sub-question 12i. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (i) Respects the rights of others after participating in single-gender math program classroom activities?

Sub-question 12j. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (j) Is trustworthy and honest after participating in single-gender math program classroom activities?

Sub-question 12k. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (k) Respects Demonstrates self-control over emotions and body after participating in single-gender math program classroom activities?

Sub-question 12l. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (l) Keeps trying after participating in single-gender math program classroom activities?

Sub-question 12m. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (m) Takes pride in classroom and school after participating in single-gender math program classroom activities?

Sub-question 12n. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (n) Respects individual differences after participating in single-gender math program classroom activities?

Sub-question 12o. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (o) Respects the rights of others after participating in single-gender math program classroom activities?

Sub-question 12p. Is there a significant difference between fifth grade girls' and fifth grade boys' end of fourth quarter Life Skills determinants for (p) Uses kind words after participating in single-gender math program classroom activities?

Analysis. Research Sub-Question #12a, 12b, 12c, 12d, 12e, 12f, 12g, 12h, 12i, 12j, 12k, 12l, 12m, 12n, 12o & 12p were analyzed using an independent *t* test to examine significance of the difference between girls' end of fourth quarter Life Skills rubric scores compared to boys' end of fourth quarter Life Skills rubric scores. Because multiple statistical tests were conducted, a two-tailed .05 alpha level was employed to help control for Type I errors. Means and standard deviations are displayed in tables.

Data Collection Procedures

All study math achievement data were retrospective, archival, and routinely collected school information. Permission from the appropriate school research personnel was obtained. Math achievement data will be collected for 42 students who completed single-gender math classroom activities during their fifth-grade school year.

Performance site. The research was conducted in the public school setting through normal educational practices. The study procedures did not interfere with the normal educational practices of the public school and did not involve coercion or discomfort of any kind. Data will be stored on spreadsheets and computer flash drives for statistical analysis in the office of the primary researcher and the dissertation chair. Data and computer files will be kept in locked file cabinets. No individual identifiers will be attached to the data.

Institutional Review Board (IRB) for the protection of Human Subjects Approval Category. The exemption categories for this study will be provided under 45CFR.101(b) categories 1 and 4. The research will be conducted using routinely collected archival data. A letter of support from the district will be provided for IRB review.

CHAPTER FOUR

RESULTS

Purpose of the Study

The purpose of this study is to find the ways that boys and girls learn and act differently in school and find the structure, support, and instructional strategies that optimize learning for all students enabling them to reach their greatest potential, academically and socially. Learning about how boys and girls learn differently does not mean that students need to be segregated into single-gender classes and schools. That may be ideal, but educators can optimize learning by becoming more aware of these differences and use this knowledge when planning and teaching whether boys are girls are together in coeducational or separated into single-gender classes.

The study analyzed the math and science grades and life skills marks for a group of students at the end of fourth grade and at the end of fifth grade in one school setting. The school is a highly successful school in a suburban neighborhood with a low minority population, a low percentage of students on free and reduced lunch, and with district and state assessment scores that range from the high 80's to mid 90's as far as percent mastery. The school has a great deal of parent participation and enjoys high marks in parent surveys. At the time of the study, the enrollment was 410 students in kindergarten through fifth grade with a certified staff of 31 including three fifth grade teachers. The district's enrollment at that time was just under 22,000 with 24 elementary schools, none of which have had single-gender classes. Although enjoying high academic success, nevertheless, not all students do well academically. There are differences between how girls and boys at the studied school perform, there is not what could be considered a large

gender gap. There are many interventions that can and are used to optimize learning; teaching with gender in mind is just one of them. Teaching with gender in mind is not putting all girls in one class and all boys in another class. Although, that is a strategy, placement in single-gender classes without knowledge of instructional strategies about the ways boys and girls learn differently, is not an effective approach.

Overarching Pretest-Posttest Achievement Research Question #1. Do girls who participated in single-gender math program classroom activities lose, maintain, or improve their end of fourth-grade pretest Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving compared to their end of fifth-grade posttest Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving?

Sub-Question 1a. As seen in Table 1, the results of a repeated-measure t-test indicates there was not a significant difference between girls' end of fourth-grade pretest (M = 117.76, $S.D.$ = 8.61) compared to girls' end of fifth-grade posttest (M = 113.88, $S.D.$ = 12.75) Essential Learner Outcome math scores converted to standard scores for (a) number representations after participating in single-gender math program classroom activities $t(25) = 1.65$, $p = .06$, $r^2 = .10$.

Sub-Question 1b. As seen in Table 2, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of fourth-grade pretest (M = 122.16, $S.D.$ = 12.11) compared to girls' end of fifth-grade posttest (M = 126.44, $S.D.$ = 10.39) Essential Learner Outcome math scores converted to standard

scores for (b) operations after participating in single-gender math program classroom activities. Posttest scores were significantly higher $t(25) = 2.23$, $p = .02$, $r^2 = .17$.

Sub-Question 1c. As seen in Table 3, the results of a repeated-measure t-test indicates that there was not a significant difference between girls' end of fourth-grade pretest ($M = 121.12$, *S.D.* = 9.41) compared to girls' end of fifth-grade posttest ($M = 117.32$, *S.D.* = 10.82) Essential Learner Outcome math scores converted to standard scores for (c) geometry after participating in single-gender math program classroom activities $t(25) = 1.64$, $p = .06$, $r^2 = .10$.

Sub-Question 1d. As seen in Table 4, the results of a repeated-measure t-test indicates that there was not a significant difference between girls' end of fourth-grade pretest ($M = 118.64$, *S.D.* = 10.55) compared to girls' end of fifth-grade posttest ($M = 115.96$, *S.D.* = 8.55) Essential Learner Outcome math scores converted to standard scores for (d) algebra after participating in single-gender math program classroom activities $t(25) = 1.00$, $p = .17$, $r^2 = .04$.

Sub-Question 1e. As seen in Table 5, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of fourth-grade pretest (M = 119.92, *S.D.* = 12.22) compared to girls' end of fifth-grade posttest (M = 126.24, *S.D.* = 12.50) Essential Learner Outcome math scores converted to standard scores for (e) data analysis after participating in single-gender math program classroom activities. Posttest scores were significantly higher $t(25) = 2.41$, $p = .01$, $r^2 = .19$.

Sub-Question 1f. As seen in Table 6, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of fourth-grade pretest (*M = 118.56, S.D.* = 14.37) compared to girls' end of fifth-grade posttest (M =

112.80, *S.D.* = 7.15) Essential Learner Outcome math scores converted to standard scores for (f) problem solving after participating in single-gender math program classroom activities $t(25) = 2.36$, $p = .02$, $r^2 = .19$.

Overarching Pretest-Posttest Achievement Research Question #2. Do boys who participated in single-gender math program classroom activities lose, maintain, or improve their end of fourth-grade pretest Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving compared to end of fifth-grade posttest Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving?

Sub-Question 2a. As seen in Table 7, the results of a repeated-measure t-test indicates that there not was a significant difference between boys' end of fourth-grade pretest (*M* = 121.00, *S.D.* = 8.57) compared to boys' end of fifth-grade posttest (*M* = 121.06, *S.D.* = 12.05) Essential Learner Outcome math scores converted to standard scores for (a) number representations after participating in single-gender math program classroom activities $t(17) = 0.02$, $p = .49$, $r^2 = .00$.

Sub-Question 2b. As seen in Table 8, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of fourth-grade pretest (*M* = 120.00, *S.D.* = 11.91) compared to boys' end of fifth-grade posttest (M = 128.76, *S.D.* = 10.56) Essential Learner Outcome math scores converted to standard scores for (b) operations after participating in single-gender math program classroom activities. Pretest scores were significantly higher $t(17) = 3.27$, $p < .01$, $r^2 = .40$.

Sub-Question 2c. As seen in Table 9, the results of a repeated-measure t-test indicates that there was not a significant difference between boys' end of fourth-grade pretest (M = 115.82, $S.D.$ = 7.73) compared to boys' end of fifth-grade posttest (M = 114.35, $S.D.$ = 6.90) Essential Learner Outcome math scores converted to standard scores for (c) geometry after participating in single-gender math program classroom activities $t(17) = 0.69$, $p = .25$, $r^2 = .03$.

Sub-Question 2d. As seen in Table 10, the results of a repeated-measure t-test indicates that there was not a significant difference between boys' end of fourth-grade pretest (M = 119.88, $S.D.$ = 10.24) compared to boys' end of fifth-grade posttest (M = 121.76, $S.D.$ = 9.49) Essential Learner Outcome math scores converted to standard scores for (d) algebra after participating in single-gender math program classroom activities $t(17) = 0.52$, $p = .32$, $r^2 = .02$.

Sub-Question 2e. As seen in Table 11, the results of a repeated-measure t-test indicates that there was not a significant difference between boys' end of fourth-grade pretest (M = 116.41, $S.D.$ = 12.12) compared to boys' end of fifth-grade posttest (M = 121.06, $S.D.$ = 10.44) Essential Learner Outcome math scores converted to standard scores for (e) data analysis after participating in single-gender math program classroom activities t (17) = 1.59, $p = .07$, $r^2 = .14$.

Sub-Question 2f. As seen in Table 12, the results of a repeated-measure t-test indicates that there was not a significant difference between boys end of fourth-grade pretest (M = 115.06, $S.D.$ = 7.89) compared to boys' end of fifth-grade posttest (M = 113.88, $S.D.$ = 7.99) Essential Learner Outcome math scores converted to standard

scores for (f) problem solving after participating in single-gender math program classroom activities t (17) = 0.58, p = .29, r^2 = .02.

Overarching Posttest-Posttest Achievement Research Question #3. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fifth-grade Essential Learner Outcome math achievement scores converted to standard scores for (a) number representations, (b) operations, (c) geometry, (d) algebra, (e) data analysis, and (f) problem solving?

Sub-Question 3a. As seen in Table 13, the results of an independent-measure t-test indicates that there was not a significant difference between girls' end of fifth-grade Essential Learner Outcome math achievement scores (M = 113.88, $S.D.$ = 12.75) converted to standard scores for (a) number representations compared to boys' end of fifth-grade Essential Learner Outcome math achievement scores (M = 121.06, $S.D.$ = 12.05) converted to standard scores for (a) number representations after completing fifth-grade single-gender math program activities t(42) = 1.83, p = .08, r^2 = .08.

Sub-Question 3b. As seen in Table 14, the results of a repeated-measure t-test indicates that there was not a significant difference between girls' end of fifth-grade Essential Learner Outcome math achievement scores (M = 126.44, $S.D.$ = 10.40) converted to standard scores for (b) operations compared to boys' end of fifth-grade Essential Learner Outcome math achievement scores (M = 128.76, $S.D.$ = 10.56) converted to standard scores for (b) operations after completing fifth-grade single-gender math program activities t(42) = 0.71, p = .48, r^2 = .01.

Sub-Question 3c. As seen in Table 15, the results of a repeated-measure t-test indicates that there was not a significant difference between girls' end of fifth-grade Essential Learner Outcome math achievement scores (M = 117.32, $S.D.$ = 10.82) converted to standard scores for (c) geometry compared to boys' end of fifth-grade Essential Learner Outcome math achievement scores (M = 114.35, $S.D.$ = 6.90) converted to standard scores for (c) geometry after completing fifth-grade single-gender math program activities $t(42) = 1.00$, $p = .32$, $r^2 = .02$.

Sub-Question 3d. As seen in Table 16, the results of a repeated-measure t-test indicates that there was not a significant difference between girls' end of fifth-grade Essential Learner Outcome math achievement scores (M = 115.96, $S.D.$ = 8.55) converted to standard scores for (d) algebra compared to boys' end of fifth-grade Essential Learner Outcome math achievement scores (M = 121.76, $S.D.$ = 9.50) converted to standard scores for (d) algebra after completing fifth-grade single-gender math program activities, $t(42) = 2.07$, $p = .05$, $r^2 = .10$.

Sub-Question 3e. As seen in Table 17, the results of a repeated-measure t-test indicates that there was not a significant difference between girls' end of fifth-grade Essential Learner Outcome math achievement scores (M = 126.24, $S.D.$ = 12.49) converted to standard scores for (e) data analysis compared to boys' end of fifth-grade Essential Learner Outcome math achievement scores (M = 121.06, $S.D.$ = 10.44) converted to standard scores for (e) data analysis after completing fifth-grade single-gender math program activities, $t(42) = 1.41$, $p = .17$, $r^2 = .05$.

Sub-Question 3f. As seen in Table 18, the results of a repeated-measure t-test indicates that there was not a significant difference between girls' end of fifth-grade

Essential Learner Outcome math achievement scores (M = 112.80, $S.D.$ = 7.15) converted to standard scores for (f) problem solving compared to boys' end of fifth-grade Essential Learner Outcome math achievement scores (M = 113.88, $S.D.$ = 7.99) converted to standard scores for (a) problem solving after completing fifth-grade single-gender math program activities $t(42) = 0.46$, $p = .65$, $r^2 = .01$.

The following student achievement fifth-grade mathematics classroom grade score questions were addressed for girls and boys who participated in single-gender math program classroom activities.

Overarching Pretest-Posttest Achievement Research Question #4. Do girls who participated in single-gender math program classroom activities lose, maintain, or improve their end of first quarter mathematics classroom grades compared to their end of fourth quarter mathematics classroom grades?

Sub-question 4a. As seen in Table 19, the results of a repeated-measure t-test indicate that there was not a significant difference between girls' end of first quarter mathematics classroom grades (M = 2.04, $S.D.$ = 0.45) compared to girls' end of fourth quarter mathematics classroom grades (M = 1.88, $S.D.$ = 0.78), $t(25) = 1.28$, $p = .11$, $r^2 = .06$.

Overarching Pretest-Posttest Achievement Research Question #5. Do boys who participated in single-gender math program classroom activities lose, maintain, or improve their end of first quarter mathematics classroom grades compared to their end of fourth quarter mathematics classroom grades?

Sub-question 5a. As seen in Table 20, the results of a repeated-measure t-test indicate that there was not a significant difference between boys' end of first quarter

mathematics classroom grades (M = 2.18, $S.D.$ = 0.88) compared to their end of fourth quarter mathematics classroom grades (M = 2.06, $S.D.$ = 0.83), $t(17) = 0.62$, $p = .27$, $r^2 = .02$.

Overarching Posttest-Posttest Achievement Research Question #6. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fourth quarter posttest mathematics classroom grades.

Sub-question 6a. As seen in Table 21, the results of an independent-measure t-test indicates that there was not a significant difference between girls' end of fourth quarter mathematics classroom grades (M = 1.88, $S.D.$ = 0.78) compared to boys' end of fourth quarter mathematics classroom grades (M = 2.06, $S.D.$ = 0.83) $t(42) = 0.71$, $p = .48$, $r^2 = .01$.

The following student achievement fifth-grade science classroom grade score questions were addressed for girls and boys who participated in single-gender math program classroom activities.

Overarching Pretest-Posttest Achievement Research Question #7. Do girls who participated in single-gender math program classroom activities lose, maintain, or improve their end of first quarter science grades compared to their end of fourth quarter science grades?

Sub-question 7a. As seen in Table 22, the results of a repeated-measure t-test indicate that there was a significant difference between girls' end of first quarter science classroom grades (M = 1.72, $S.D.$ = 0.68) compared to their end of fourth quarter science classroom grades (M = 1.48, $S.D.$ = 0.59), $t(25) = 1.81$, $p = .04$, $r^2 = .12$.

Overarching Pretest-Posttest Achievement Research Question #8. Do boys who participated in single-gender math program classroom activities lose, maintain, or improve their end of first quarter science grades compared to their end of fourth quarter science grades.

Sub-question 8a. As seen in Table 23, the results of a repeated-measure t-test indicates that there was not a significant difference between boys' end of first quarter science classroom grades (M = 1.63, $S.D.$ = 0.62) compared to their end of fourth quarter science classroom grades (M = 1.38, $S.D.$ = 0.50) $t(17) = 1.46$, $p = .08$, $r^2 = .12$.

Overarching Posttest-Posttest Achievement Research Question #9. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fourth quarter posttest science classroom grades.

Sub-question 9a. As seen in Table 24, the results of a repeated-measure t-test indicates that there was not a significant difference between girls' end of fourth quarter science classroom grades (M = 1.48, $S.D.$ = 0.59) compared to boys' end of fourth quarter mathematics classroom grades (M = 1.35, $S.D.$ = 0.49) $t(42) = 0.73$, $p = .47$, $r^2 = .01$.

The following student Life Skills fifth-grade classroom grade score questions were addressed for girls and boys who participated in single-gender math program classroom activities.

Overarching Pretest-Posttest Achievement Research Question #10. Do girls who participated in single-gender math program classroom activities lose, maintain, or improve their Life Skills as measured by ending of first quarter fifth-grade teacher

administered rubric scores for exceeds expectations (score = 1), satisfactory/meets expectations (score = 2), and needs improvement (score = 3) for (a) completes tasks in a timely manner, (b) responds appropriately to oral/written directions, (c) identifies a problem and seeks better solutions, (d) cooperates with others to complete a task or goals, (e) uses good work skills, (f) demonstrates responsibility, (g) sets and pursues goals, (h) finds answers to questions and concerns, (i) is trustworthy and honest (j) has a positive attitude, (k) demonstrates self-control over emotions and body, (l) keeps trying, (m) takes pride in classroom and school, (n) respects individual differences, (o) respects the rights of others, and (p) uses kind words and actions?

Sub-question 10a. As seen in Table 25, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest ($M = 2.12$, $S.D. = 0.33$) compared to their end of fourth quarter posttest ($M = 1.44$, $S.D. = 0.58$) teacher administered Life Skills rubric scores for (a) Completes tasks in a timely manner after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(25) = 7.41$, $p < .01$, $r^2 = .70$.

Sub-question 10b. As seen in Table 26, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest ($M = 1.68$, $S.D. = 0.48$) compared to their end of fourth quarter posttest ($M = 1.56$, $S.D. = 0.51$) teacher administered Life Skills rubric scores for (b) Responds appropriately to oral/written directions after participating in single-gender math program classroom activities $t(25) = 1.81$, $p = .04$, $r^2 = .12$

Sub-question 10c. As seen in Table 27, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter

pretest (M = 1.92, $S.D.$ = 0.40) compared to their end of fourth quarter posttest (M = 1.48, $S.D.$ = 0.59) teacher administered Life Skills rubric scores for (c) Identifies a problem and seeks best solutions after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(25) = 4.34$, $p < .01$, $r^2 = .44$.

Sub-question 10d. As seen in Table 28, the results of a repeated-measure t-test indicates that there was not a significant difference between girls' end of first quarter pretest (M = 2.20, $S.D.$ = 0.41) compared to their end of fourth quarter posttest (M = 2.04, $S.D.$ = 0.54) teacher administered Life Skills rubric scores for (d) Cooperates with others to complete a task or goal after participating in single-gender math program classroom activities $t(25) = 1.45$, $p = .08$, $r^2 = .08$.

Sub-question 10e. As seen in Table 29, the results of a repeated-measure t-test indicates that there was not a significant difference between girls' end of first quarter pretest (M = 2.00, $S.D.$ = 0.00) compared to their end of fourth quarter posttest (M = 2.00, $S.D.$ = 0.00) teacher administered Life Skills rubric scores for (e) Uses good work skills after participating in single-gender math program classroom activities $t(25) = 0.00$, $p = .50$, $r^2 = .00$.

Sub-question 10f. As seen in Table 30, the results of a repeated-measure t-test indicates that there was not a significant difference between girls' end of first quarter pretest (M = 1.60, $S.D.$ = 0.50) compared to their end of fourth quarter posttest (M = 1.60, $S.D.$ = 0.50) teacher administered Life Skills rubric scores for (f) Demonstrates responsibility after participating in single-gender math program classroom activities $t(25) = 0.00$, $p = .50$, $r^2 = .00$.

Sub-question 10g. As seen in Table 31, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest ($M = 2.00$, $S.D. = 0.00$) compared to their end of fourth quarter posttest ($M = 1.84$, $S.D. = 0.37$) teacher administered Life Skills rubric scores for (g) Sets and pursues goals after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(25) = 2.14$, $p = .02$, $r^2 = .16$.

Sub-question 10h. As seen in Table 32, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest ($M = 2.00$, $S.D. = 0.00$) compared to their end of fourth quarter posttest ($M = 1.64$, $S.D. = 0.49$) teacher administered Life Skills rubric scores for (h) Finds answers to questions and concerns after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(25) = 3.67$, $p = .01$, $r^2 = .36$.

Sub-question 10i. As seen in Table 33, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest ($M = 1.92$, $S.D. = 0.28$) compared to their end of fourth quarter posttest ($M = 1.64$, $S.D. = 0.49$) teacher administered Life Skills rubric scores for (i) Is trustworthy and honest after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(25) = 3.06$, $p = .01$, $r^2 = .28$.

Sub-question 10j. As seen in Table 34, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest ($M = 1.96$, $S.D. = 0.20$) compared to their end of fourth quarter posttest ($M = 1.76$, $S.D. = 0.44$) teacher administered Life Skills rubric scores for (j) Has a positive attitude

after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(25) = 2.45$, $p = .01$, $r^2 = .20$.

Sub-question 10k. As seen in Table 35, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest ($M = 2.00$, *S.D.* = 0.00) compared to their end of fourth quarter posttest ($M = 1.76$, *S.D.* = 0.44) teacher administered Life Skills rubric scores for (k) Demonstrates control over emotions and body after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(25) = 2.75$, $p = .01$, $r^2 = .24$.

Sub-question 10l. As seen in Table 36, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest ($M = 2.00$, *S.D.* = 0.00) compared to their end of fourth quarter posttest ($M = 1.68$, *S.D.* = 0.48) teacher administered Life Skills rubric scores for (l) Keeps trying after participating in single-gender math program classroom activities. The posttest scores were significantly higher $t(25) = 3.36$, $p < .01$, $r^2 = .32$.

Sub-question 10m. As seen in Table 37, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest ($M = 2.00$, *S.D.* = 0.00) compared to their end of fourth quarter posttest ($M = 1.88$, *S.D.* = 0.33) teacher administered Life Skills rubric scores for (m) Takes pride in classroom and school after participating in single-gender math program classroom activities, $t(25) = 1.81$, $p = .04$, $r^2 = .13$.

Sub-question 10n. As seen in Table 38, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest ($M = 2.00$, *S.D.* = 0.00) compared to their end of fourth quarter posttest ($M = 1.64$,

S.D. = 0.49) teacher administered Life Skills rubric scores for (n) Respects individual differences after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(25) = 3.67$, $p < .01$, $r^2 = .36$.

Sub-question 10o. As seen in Table 39, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest (*M* = 2.08, *S.D.* = 0.28) compared to their end of fourth quarter posttest (*M* = 1.64, *S.D.* = 0.57) teacher administered Life Skills rubric scores for (o) Respects the rights of others after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(25) = 4.34$, $p < .01$, $r^2 = .44$.

Sub-question 10p. As seen in Table 40, the results of a repeated-measure t-test indicates that there was a significant difference between girls' end of first quarter pretest (*M* = 1.92, *S.D.* = 0.28) compared to their end of fourth quarter posttest (*M* = 1.52, *S.D.* = 0.51) teacher administered Life Skills rubric scores for (p) Uses kind words after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(25) = 4.00$, $p < .01$, $r^2 = .40$.

Overarching Pretest-Posttest Achievement Research Question #11. Do boys who participate in single-gender math program classroom activities lose, maintain, or improve their end of first quarter Life Skills markings compared to their end of fourth quarter Life Skills markings for (a) completes tasks in a timely manner, (b) responds appropriately to oral/written directions, (c) identifies a problem and seeks better solutions, (d) cooperates with others to complete a task or goals, (e) uses good work skills, (f) demonstrates responsibility, (g) sets and pursues goals, (h) finds answers to questions and concerns, (i) is trustworthy and honest (j) has a positive attitude, (k)

demonstrates self-control over emotions and body, (l) keeps trying, (m) takes pride in classroom and school, (n) respects individual differences, (o) respects the rights of others, and (p) uses kind words and actions?

Sub-question 11a. As seen in Table 41, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants ($M = 2.06$, $S.D. = 0.24$) compared to their end of fourth quarter Life Skills determinants ($M = 1.59$, $S.D. = 0.51$) for (a) Completes tasks in a timely manner after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(17) = 3.77$, $p < .01$, $r^2 = .47$.

Sub-question 11b. As seen in Table 42, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants ($M = 1.88$, $S.D. = 0.33$) compared to their end of fourth quarter Life Skills determinants ($M = 1.59$, $S.D. = 0.51$) for (b) Responds appropriately to oral/written directions after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(17) = 2.58$, $p = .01$, $r^2 = .29$.

Sub-question 11c. As seen in Table 43, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants ($M = 1.94$, $S.D. = 0.24$) compared to their end of fourth quarter Life Skills determinants ($M = 1.47$, $S.D. = 0.51$) for (c) Identifies a problem and seeks best solutions after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(17) = 3.77$, $p < .01$, $r^2 = .47$.

Sub-question 11d. As seen in Table 44, the results of a repeated-measure t-test indicates that there was not a significant difference between boys' end of first

quarter Life Skills determinants (M = 2.24, $S.D.$ = 0.44) compared to their end of fourth quarter Life Skills determinants (M = 2.18, $S.D.$ = 0.53) for (d) Cooperates with others to complete a task or goals after participating in single-gender math program classroom activities $t(17) = 0.44$, $p = .34$, $r^2 = .01$.

Sub-question 11e. As seen in Table 45, the results of a repeated-measure t-test indicates that there was not a significant difference between boys' end of first quarter Life Skills determinants (M = 2.00, $S.D.$ = 0.00) compared to their end of fourth quarter Life Skills determinants (M = 2.00, $S.D.$ = 0.00) for (e) Uses good work skills after participating in single-gender math program classroom activities $t(17) = 0.00$, $p = .50$, $r^2 = .00$.

Sub-question 11f. As seen in Table 46, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants (M = 1.76, $S.D.$ = 0.44) compared to their end of fourth quarter Life Skills determinants (M = 1.59, $S.D.$ = 0.51) for (f) Demonstrates responsibility after participating in single-gender math program classroom activities $t(17) = 1.85$, $p = .04$, $r^2 = .18$.

Sub-question 11g. As seen in Table 47, the results of a repeated-measure t-test indicates that there was not a significant difference between boys' end of first quarter Life Skills determinants (M = 2.00, $S.D.$ = 0.00) compared to their end of fourth quarter Life Skills determinants (M = 1.88, $S.D.$ = 0.33) for (g) Sets and pursues goals after participating in single-gender math program classroom activities $t(17) = 1.46$, $p = .08$, $r^2 = .12$.

Sub-question 11h. As seen in Table 48, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants ($M = 2.00$, $S.D = 0.00$) compared to their end of fourth quarter Life Skills determinants ($M = 1.59$, $S.D. = 0.51$) for (h) Finds answers for questions and concerns after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(17) = 3.35$, $p < .01$, $r^2 = .41$.

Sub-question 11i. As seen in Table 49, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants ($M = 2.00$, $S.D. = 0.00$) compared to their end of fourth quarter Life Skills determinants ($M = 1.65$, $S.D. = 0.49$) for (i) Is trustworthy and honest after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(17) = 2.95$, $p = .01$, $r^2 = .35$.

Sub-question 11j. As seen in Table 50, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants ($M = 2.00$, $S.D. = 0.00$) compared to their end of fourth quarter Life Skills determinants ($M = 1.76$, $S.D. = 0.44$) for (j) Has a positive attitude after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(17) = 2.22$, $p = .02$, $r^2 = .24$.

Sub-question 11k. As seen in Table 51, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants ($M = 2.00$, $S.D. = 0.00$) compared to their end of fourth quarter Life Skills determinants ($M = 1.76$, $S.D. = 0.44$) for (k) Demonstrates self-control over

emotions and body after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(17) = 2.22$, $p = .02$, $r^2 = .24$.

Sub-question 11l. As seen in Table 52, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants ($M = 2.00$, $S.D. = 0.00$) compared to their end of fourth quarter Life Skills determinants ($M = 1.76$, $S.D. = 0.44$) for (l) Keeps trying after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(17) = 2.22$, $p = .02$, $r^2 = .24$.

Sub-question 11m. As seen in Table 53, the results of a repeated-measure t-test indicates that there was not a significant difference between boys' end of first quarter Life Skills determinants ($M = 2.00$, $S.D. = 0.00$) compared to their end of fourth quarter Life Skills determinants ($M = 1.88$, $S.D. = 0.33$) for (m) Takes pride in classroom and school after participating in single-gender math program classroom activities $t(17) = 1.46$, $p = .08$, $r^2 = .12$.

Sub-question 11n. As seen in Table 54, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants ($M = 1.94$, $S.D. = 0.24$) compared to their end of fourth quarter Life Skills determinants ($M = 1.76$, $S.D. = 0.44$) for (n) Respects individual differences after participating in single-gender math program classroom activities $t(17) = 1.85$, $p = .04$, $r^2 = .18$.

Sub-question 11o. As seen in Table 55, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants ($M = 1.94$, $S.D. = 0.24$) compared to their end of fourth quarter

Life Skills determinants (M = 1.65, $S.D.$ = 0.49) for (o) Respects the rights of others after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(17) = 2.58$, $p = .01$, $r^2 = .29$.

Sub-question 11p. As seen in Table 56, the results of a repeated-measure t-test indicates that there was a significant difference between boys' end of first quarter Life Skills determinants (M = 2.00, $S.D.$ = 0.00) compared to their end of fourth quarter Life Skills determinants (M = 1.65, $S.D.$ = 0.49) for (p) Uses kind words after participating in single-gender math program classroom activities. The pretest scores were significantly higher $t(17) = 2.95$, $p = .01$, $r^2 = .35$.

Overarching Posttest-Posttest Achievement Research Question #12. Do girls who participated in single-gender math program activities and boys who participated in single-gender math program activities have congruent or different end of fourth quarter Life Skills rubric scores for (a) completes tasks in a timely manner, (b) responds appropriately to oral/written directions, (c) identifies a problem and seeks better solutions, (d) cooperates with others to complete a task or goals, (e) uses good work skills, (f) demonstrates responsibility, (g) sets and pursues goals, (h) finds answers to questions and concerns, (i) is trustworthy and honest (j) has a positive attitude, (k) demonstrates self-control over emotions and body, (l) keeps trying, (m) takes pride in classroom and school, (n) respects individual differences, (o) respects the rights of others, and (p) uses kind words and actions?

Sub-question 12a. As seen in Table 57, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' (M = 1.44, $S.D.$ = 0.58) and fifth grade boys' (M = 1.59, $S.D.$ = 0.51) end of fourth quarter Life

Skills determinants for (a) Completes tasks in a timely manner after participating in single-gender math program classroom activities $t(42) = 0.85$, $p = .40$, $r^2 = .02$.

Sub-question 12b. As seen in Table 58, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' ($M = 1.56$, $S.D. = 0.51$) and fifth grade boys' ($M = 1.59$, $S.D. = 0.51$) end of fourth quarter Life Skills determinants for (b) Responds appropriately to oral/written directions after participating in single-gender math program classroom activities $t(42) = 0.18$, $p = .86$, $r^2 = .00$.

Sub-question 12c. As seen in Table 59, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' ($M = 1.48$, $S.D. = 0.59$) and fifth grade boys' ($M = 1.47$, $S.D. = 0.51$) end of fourth quarter Life Skills determinants for (c) Identifies a problem and seeks best solutions after participating in single-gender math program classroom activities $t(42) = 0.05$, $p = .96$, $r^2 = .00$.

Sub-question 12d. As seen in Table 60, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' ($M = 2.04$, $S.D. = 0.54$) and fifth grade boys' ($M = 2.18$, $S.D. = 0.53$) end of fourth quarter Life Skills determinants for (d) Cooperates with others to complete a task or goals after participating in single-gender math program classroom activities $t(42) = 0.81$, $p = .42$, $r^2 = .02$.

Sub-question 12e. As seen in Table 61, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' ($M = 2.00$, $S.D. = 0.00$) and fifth grade boys' ($M = 2.00$, $S.D. = 0.00$) end of fourth quarter Life

Skills determinants for (e) Uses good work skills of others after participating in single-gender math program classroom activities $t(42) = 0.00$, $p = 1.00$, $r^2 = .00$.

Sub-question 12f. As seen in Table 62, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' ($M = 1.60$, *S.D.* = 0.50) and fifth grade boys' ($M = 1.59$, *S.D.* = 0.51) end of fourth quarter Life Skills determinants for (f) Demonstrates responsibility after participating in single-gender math program classroom activities $t(42) = 0.07$, $p = .94$, $r^2 = .00$.

Sub-question 12g. As seen in Table 63, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' ($M = 1.84$, *S.D.* = 0.37) and fifth grade boys' ($M = 1.88$, *S.D.* = 0.33) end of fourth quarter Life Skills determinants for (g) Sets and pursues goals after participating in single-gender math program classroom activities $t(42) = 0.38$, $p = .71$, $r^2 = .00$.

Sub-question 12h. As seen in Table 64, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' ($M = 1.64$, *S.D.* = 0.49) and fifth grade boys' ($M = 1.59$, *S.D.* = 0.51) end of fourth quarter Life Skills determinants for (h) Finds answers for questions and concerns after participating in single-gender math program classroom activities $t(42) = 0.33$, $p = .74$, $r^2 = .00$.

Sub-question 12i. As seen in Table 65, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' ($M = 1.64$, *S.D.* = 0.49) and fifth grade boys' ($M = 1.65$, *S.D.* = 0.49) end of fourth quarter Life Skills determinants for (i) Is trustworthy and honestrs after participating in single-gender math program classroom activities $t(42) = 0.05$, $p = .96$, $r^2 = .00$.

Sub-question 12j. As seen in Table 66, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' (M = 1.76, $S.D.$ = 0.44) and fifth grade boys' (M = 1.76, $S.D.$ = 0.44) end of fourth quarter Life Skills determinants for (j) Has a positive attitude after participating in single-gender math program classroom activities $t(42) = 0.03$, $p = .97$, $r^2 = .00$.

Sub-question 12k. As seen in Table 67, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' (M = 1.76, $S.D.$ = 0.44) and fifth grade boys' (M = 1.76, $S.D.$ = 0.44) end of fourth quarter Life Skills determinants for (k) Demonstrates self-control over emotions and body after participating in single-gender math program classroom activities $t(42) = 0.03$, $p = .97$, $r^2 = .00$.

Sub-question 12l. As seen in Table 68, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' (M = 1.68, $S.D.$ = 0.48) and fifth grade boys' (M = 1.76, $S.D.$ = 0.44) end of fourth quarter Life Skills determinants for (l) Keeps trying after participating in single-gender math program classroom activities $t(42) = 0.59$, $p = .56$, $r^2 = .01$.

Sub-question 12m. As seen in Table 69, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' (M = 1.88, $S.D.$ = 0.33) and fifth grade boys' (M = 1.88, $S.D.$ = 0.33) end of fourth quarter Life Skills determinants for (m) Takes pride in classroom and school after participating in single-gender math program classroom activities $t(42) = 0.02$, $p = .98$, $r^2 = .00$.

Sub-question 12n. As seen in Table 70, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' (M = 1.64, $S.D.$ = 0.49) and fifth grade boys' (M = 1.76, $S.D.$ = 0.44) end of fourth quarter Life Skills determinants for (n) Respects individual differences after participating in single-gender math program classroom activities $t(42) = 0.85$, $p = .40$, $r^2 = .02$.

Sub-question 12o. As seen in Table 71, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' (M = 1.64, $S.D.$ = 0.57) and fifth grade boys' (M = 1.65, $S.D.$ = 0.49) end of fourth quarter Life Skills determinants for (o) Respects the rights of others after participating in single-gender math program classroom activities $t(42) = 0.04$, $p = .97$, $r^2 = .00$.

Sub-question 12p. As seen in Table 72, the results of a repeated-measure t-test indicates that there is not a significant difference between fifth grade girls' (M = 1.52, $S.D.$ = 0.51) and fifth grade boys' (M = 1.65, $S.D.$ = 0.49) end of fourth quarter Life Skills determinants for (p) Uses kind words after participating in single-gender math program classroom activities $t(42) = 0.80$, $p = .43$, $r^2 = .02$.

Table 1

Number Representation Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Number Representation	117.76	8.61	113.88	12.75	1.65	.06	.10

Table 2

Operations Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Operations	122.16	12.11	126.44	10.39	2.23	.02	.17

Table 3

Geometry Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Geometry	121.12	9.41	117.32	10.82	1.64	.06	.10

Table 4

Algebra Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Algebra	118.64	10.55	115.96	8.55	1.00	.17	.04

Table 5

Data Analysis Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Data Analysis	119.92	12.22	126.24	12.50	2.41	.01	.19

Table 6

Problem Solving Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Problem Solving	118.56	14.37	112.80	7.15	2.36	.02	.19

Table 7

Number Representation Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Number Representation	121.00	8.57	121.06	12.05	0.02	.49	.00

Table 8

Operations Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Operations	120.00	11.91	128.76	10.56	3.27	< .01	.40

Table 9

Geometry Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Geometry	115.82	7.73	114.35	6.90	0.69	.25	.03

Table 10

Algebra Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Algebra	119.88	10.24	121.76	9.49	0.52	.31	.02

Table 11

Data Analysis Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Data Analysis	116.41	12.12	121.06	10.44	1.59	.07	.14

Table 12

Problem Solving Pretest/Posttest Essential Learner Outcome Mathematics Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Problem Solving	115.06	7.89	113.88	7.99	0.58	.29	.02

Table 13

Number Representation Posttest/Posttest Essential Learner Outcome Mathematics Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Number Representation	113.88	12.75	121.06	12.05	1.83	.08	.08

Table 14

Operations Posttest /Posttest Essential Learner Outcome Mathematics Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Operations	126.44	10.40	128.76	10.56	0.71	.48	.01

Table 15

Geometry Posttest /Posttest Essential Learner Outcome Mathematics Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Geometry	117.32	10.82	114.35	6.90	1.00	.32	.02

Table 16

Algebra Posttest /Posttest Essential Learner Outcome Mathematics Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Algebra	115.96	8.55	121.76	9.50	2.07	.05	.10

Table 17

Data Analysis Posttest /Posttest Essential Learner Outcome Mathematics Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Data Analysis	126.24	12.49	121.06	10.44	1.41	.17	.05

Table 18

Problem Solving Posttest /Posttest Essential Learner Outcome Mathematics Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Problem Solving	112.80	7.15	113.88	7.99	0.46	.65	.01

Table 19

Mathematics Classroom Grades Pretest /Posttest Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Mathematics Classroom Grades	2.04	0.45	1.88	0.78	1.28	.11	.06

Table 20

Mathematics Classroom Grades Pretest /Posttest Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Mathematics Classroom Grades	2.18	0.88	2.06	0.83	0.62	.27	.02

Table 21

Mathematics Classroom Grades Posttest /Posttest Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Mathematics Classroom Grades	1.88	0.78	2.06	0.83	0.71	.48	.01

Table 22

Science Classroom Grades Pretest /Posttest Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Science Classroom Grades	1.72	0.68	1.48	0.59	1.81	.04	.12

Table 23

Science Classroom Grades Pretest /Posttest Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Science Classroom Grades	1.63	0.62	1.38	0.50	1.46	.08	.12

Table 24

Science Classroom Grades Posttest /Posttest Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Science Classroom Grades	1.48	0.59	1.35	0.49	0.73	.47	.01

Table 25

Completes tasks in a timely manner Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Completes tasks in a timely manner	2.12	0.33	1.44	0.58	7.41	< .01	.70

Table 26

Responds appropriately to oral/written directions Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Responds appropriately to oral/written directions	1.68	0.48	1.56	0.51	1.81	.04	.12

Table 27

Identifies a problem and seeks best solutions Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Identifies a problem and seeks best solutions	1.92	0.40	1.48	0.59	4.34	< .01	.44

Table 28

Cooperates with others to complete a task or goal Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Cooperates with others to complete a task or goal	2.20	0.41	2.04	0.54	1.45	.08	.08

Table 29

Uses good work skills directions Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Uses good work skills	2.00	0.00	2.00	0.00	0.00	.50	.00

Table 30

Demonstrates responsibility Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Demonstrates responsibility	1.60	0.50	1.60	0.50	0.00	.50	.00

Table 31

Sets and pursues goals Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Sets and pursues goals	2.00	0.00	1.84	0.37	2.14	.02	.16

Table 32

Finds answers to questions and concerns Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Finds answers to questions and concerns	2.00	0.00	1.64	0.49	3.67	< .01	.36

Table 33

Is trustworthy and honest Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Is trustworthy and honest	1.92	0.28	1.64	0.49	3.06	.01	.28

Table 34

Has a positive attitude Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Has a positive attitude	1.96	0.20	1.76	0.44	2.45	.01	.20

Table 35

Demonstrates control over emotions and body Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Demonstrates control over emotions and body	2.00	0.00	1.76	0.44	2.75	.01	.24

Table 36

Keeps trying after participating Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Keeps trying after participating	2.00	0.00	1.68	0.48	3.36	< .01	.32

Table 37

Takes pride in classroom and school Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Takes pride in classroom and school	2.00	0.00	1.88	0.33	1.81	.04	.13

Table 38

Respects individual differences Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Respects individual differences	2.00	0.00	1.64	0.49	3.67	< .01	.36

Table 39

Respects the rights of others Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Respects the rights of others	2.08	0.28	1.64	0.57	4.34	< .01	.44

Table 40

Uses kind words Pretest /Posttest Life Skills Standard Scores for Girls

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Uses kind words	1.92	0.28	1.52	0.51	4.00	< .01	.40

Table 41

Completes tasks in a timely manner Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Completes tasks in a timely manner	2.06	0.24	1.59	0.51	3.77	< .01	.47

Table 42

Responds appropriately to oral/written directions Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Responds appropriately to oral/written directions	1.88	0.33	1.59	0.51	2.58	.01	.29

Table 43

Identifies a problem and seeks best solutions Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Identifies a problem and seeks best solutions	1.94	0.24	1.47	0.51	3.77	< .01	.47

Table 44

Cooperates with others to complete a task or goals Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Cooperates with others to complete a task or goals	2.23	0.44	2.18	0.53	0.44	.34	.01

Table 45

Uses good work skills Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Uses good work skills	2.00	0.00	2.00	0.00	0.00	.50	.00

Table 46

Demonstrates responsibility Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Demonstrates responsibility	2.00	0.00	1.59	0.51	1.85	.04	.18

Table 47

Sets and pursues goals Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Sets and pursues goals	2.00	0.00	1.88	0.33	1.46	.08	.12

Table 48

Finds answers for questions and concerns Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Finds answers for questions and concerns	2.00	0.00	1.59	0.51	3.35	< .01	.41

Table 49

Is trustworthy and honest Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Is trustworthy and honest	2.00	0.00	1.65	0.49	2.95	.01	.35

Table 50

Has a positive attitude directions Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Has a positive attitude	2.00	0.00	1.76	0.44	2.22	.02	.24

Table 51

Demonstrates self-control over emotions Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Demonstrates self-control over emotions	2.00	0.00	1.76	0.44	2.22	.02	.24

Table 52

Keeps trying Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Keeps trying	2.00	0.00	1.76	0.44	2.22	.02	.24

Table 53

Takes pride in classroom and school Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Takes pride in classroom and school	2.00	0.00	1.88	0.33	1.46	.08	.12

Table 54

Respects individual differences Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Respects individual differences	1.94	0.24	1.76	0.44	1.85	.04	.18

Table 55

Respects the rights of others Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Respects the rights of others	1.94	0.24	1.65	0.49	2.58	.01	.29

Table 56

Uses kind words Pretest /Posttest Life Skills Standard Scores for Boys

	Pretest		Posttest				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Uses kind words	2.00	0.00	1.65	0.49	2.95	.01	.35

Table 57

Completes tasks in a timely manner Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Completes tasks in a timely manner	1.44	0.58	1.59	0.51	0.85	.40	.02

Table 58

Responds appropriately to oral/written directions Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Responds appropriately to oral/written directions	1.56	0.51	1.59	0.51	0.18	.86	.00

Table 59

Identifies a problem and seeks best solutions Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Identifies a problem and seeks best solutions	1.48	0.59	1.47	0.51	0.05	.96	.00

Table 60

Cooperates with others to complete a task or goals Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Cooperates with others to complete a task or goals	2.04	0.54	2.18	0.53	0.81	.42	.02

Table 61

Uses good work skills Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Uses good work skills	2.00	0.00	2.00	0.00	0.00	1.00	.00

Table 62

Demonstrates responsibility Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Demonstrates responsibility	1.60	0.50	1.59	0.51	0.07	.94	.00

Table 63

Sets and pursues goals Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Sets and pursues goals	1.84	0.37	1.88	0.33	0.38	.71	.00

Table 64

Finds answers for questions and concerns Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Finds answers for questions and concerns	1.64	0.49	1.59	0.51	0.33	.74	.00

Table 65

Respects the rights of others Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Respects the rights of others	1.64	0.49	1.65	0.49	0.05	.95	.00

Table 66

Is trustworthy and honest Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Is trustworthy and honest	1.76	0.44	1.76	0.44	0.03	.97	.00

Table 67

Demonstrates self-control over emotions and body Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Demonstrates self-control over emotions and body	1.76	0.44	1.76	0.44	0.03	.97	.00

Table 68

Keeps trying after participating Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Keeps trying after participating	1.68	0.48	1.76	0.44	0.59	.56	.01

Table 69

Takes pride in classroom and school Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Takes pride in classroom and school	1.88	0.33	1.88	0.33	0.02	.98	.00

Table 70

Respects individual differences Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Respects individual differences	1.64	0.49	1.76	0.44	0.85	.40	.02

Table 71

Respects the rights of others Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Respects the rights of others	1.64	0.57	1.65	0.49	0.04	.97	.00

Table 72

Uses kind words Life Skills Standard Scores for Girls and Boys

	Girls		Boys				
	M	*SD*	*M*	*SD*	*t*	*p*	r^2
Uses kind words	1.52	0.51	1.65	0.49	0.80	.43	.02

CHAPTER FIVE

CONCLUSIONS AND DISCUSSIONS

The Purpose of the Study

The purpose of this study is to find the ways that boys and girls learn and act differently in school and find the structure, support, and instructional strategies that optimize learning for all students enabling them to reach their greatest potential, academically and socially. Learning about how boys and girls learn differently does not mean that students need to be segregated into single-gender classes and schools. That may be ideal, but educators can optimize learning by becoming more aware of these differences and use this knowledge when planning and teaching whether boys are girls are together in coeducational or separated into single-gender classes.

This chapter presents the conclusion and discussion of the findings from this study, the significance of the findings, and the recommendations for future research.

Conclusions

The following conclusions may be drawn from the study of each of the sub-questions for Research Question #1: The results of a repeated-measure t-test indicates that girls' Essential Learner Outcome math scores converted to standard scores posttest scores were statistically significantly higher than pretest scores for the concepts of Operations, Data Analysis, and Problem Solving while there were no significant differences for the concepts of Number Representation, Geometry, and Algebra.

The following conclusions may be drawn from the study of each of the sub-questions for Research Question #2: The results of a repeated-measure t-test indicates that boys' Essential Learner Outcome math scores converted to standard scores posttest

scores were statistically significantly higher than pretest scores for the concept of Operations while there were no significant differences for the concepts of Number Representation, Geometry, Algebra, Data Analysis, and Problem Solving.

The following conclusions may be drawn from the study of each of the sub-questions for Research Question #3: The results of a repeated-measure t-test indicates that Essential Learner Outcome math scores converted to standard scores for boys were statistically significantly higher than girls' scores for the concept of Algebra while there were no significant differences for the concepts of Number Representation, Geometry, Operations, Data Analysis, and Problem Solving between boys and girls.

The following conclusions may be drawn from the study of each of the sub-questions for Research Question #4: The results of a repeated-measure t-test indicate that there was not a significant difference between girls' end of first quarter mathematics classroom grades compared to girls' end of fourth quarter mathematics classroom grades.

The following conclusions may be drawn from the study of each of the sub-questions for Research Question #5: The results of a repeated-measure t-test indicate that there was not a significant difference between boys' end of first quarter mathematics classroom grades compared to boys' end of fourth quarter mathematics classroom grades.

The following conclusions may be drawn from the study of each of the sub-questions for Research Question #6: The results of a repeated-measure t-test indicate that there was not a significant difference between girls' end of fourth quarter mathematics classroom grades compared to boys 'end of fourth quarter mathematics classroom grades.

The following conclusions may be drawn from the study of each of the sub-questions for Research Question #7: The results of a repeated-measure t-test indicate that

there was a significant difference between girls' end of first quarter science classroom grades compared to girls' end of fourth quarter science classroom grades.

The following conclusions may be drawn from the study of each of the sub-questions for Research Question #8: The results of a repeated-measure t-test indicate that there was not a significant difference between boys' end of first quarter mathematics classroom grades compared to their end of fourth quarter mathematics classroom grades.

The following conclusions may be drawn from the study of each of the sub-questions for Research Question #9: The results of a repeated-measure t-test indicate that there was not a significant difference between girls' end of fourth quarter science classroom grades compared to boys' end of fourth quarter science classroom grades.

The following conclusions may be drawn from the study of each of the sub-questions for Research Question #10: The results of a repeated-measure t-test indicate that teacher administered Life Skills rubric scores were statistically significantly higher between girls' end of first quarter pretest compared to their end of fourth quarter posttest for Completes tasks in a timely manner, Identifies a problem and seeks best solutions, Finds answers to questions and concerns, Keeps trying, Respects individual differences, Respects the rights of others, and Responds appropriately to oral/written directions, Sets and pursues goals, Uses kind words, Is trustworthy and honest, Has a positive attitude, Demonstrates control over emotions and body, and Takes pride in classroom and school while there were no significant differences for Cooperates with others to complete a task or goal, Demonstrates responsibility, and Uses good work skills.

The following conclusions may be drawn from the study of each of the sub-questions for

Research Question #11: The results of a repeated-measure t-test indicate that teacher administered Life Skills rubric scores were statistically significantly higher between boys' end of first quarter pretest compared to their end of fourth quarter posttest for Completes tasks in a timely manner, Identifies a problem and seeks best solutions, Finds answers to questions and concerns, Respects individual differences, Respects the rights of others, Is trustworthy and honest, Has a positive attitude, Responds appropriately to oral/written directions, Demonstrates control over emotions and body, Demonstrates responsibility, Uses kind words, and Keeps trying and while there were no significant differences for Cooperates with others to complete a task or goal, Sets and pursues goals, Takes pride in classroom and school, and Uses good work skills.

The following conclusions may be drawn from the study of each of the sub-questions for

Research Question #12: The results of a repeated-measure t-test indicate that teacher administered Life Skills rubric scores were not statistically significant differences between boys and girls for Completes tasks in a timely manner, Responds appropriately to oral/written directions, Identifies a problem and seeks best solutions, Cooperates with others to complete a task or goals, Uses good work skills, Demonstrates responsibility, Sets and pursues goals, Finds answers for questions and concerns, Respects the rights of others, Is trustworthy and honest, Demonstrates self-control over emotions and body, Keeps trying after participating, Takes pride in classroom and school, Respects individual differences, Respects the rights of others, and Uses kind words. There were no Life Skills determinants between boys and girls that were statistically significant different.

Discussion

Students at the researched school spent a year in 5th grade in single-gender math classes. The data would suggest that for the most part, being in single-gender classes did not have a large impact on the students' academic education. There were four subtests on the district math Essential Learner Outcomes which were higher after a year of the single-gender math course for both boys and girls. There were twelve subtests, six for boys and the same six for girls. There was no subtests out of six that was higher for the boys compared to the girls after a year of the single-gender math course. In looking at the six math subtests and comparing the boys in 4th grade (the pretest) to the same boys in 5th grade (the posttest), the girls in 4th grade (the pretest) to the same girls in 5th grade (the posttest), and comparing the boys to the girls (posttest to posttest), there was little significant difference between the groups.

Math grades were also not significantly different between the first quarter (pretest) and the fourth quarter (posttest) for both boys and girls after a year in the single-gender math class. Grades were also not significant different between the boys' fourth quarter grades (posttest) and the girls' fourth quarter (posttest) after a year in the single-gender math class.

Science grades were also not significantly different between the first quarter (pretest) and the fourth quarter (posttest) for the boys after a year in the single-gender math class. Grades were not significant different between the boys' fourth quarter grades (posttest) and the girls' fourth quarter (posttest) after a year in the single-gender math class. The fourth quarter (posttest) science classroom grades were significantly higher than the first quarter (pretest) science classroom grades.

This study looked at Life Skills for the boys and girls that spent a year in the single-gender math class. There are 16 Life Skill determinants or indicators for fifth graders. Teachers score the students each quarter with a letter grade of one of the following: exceeds expectations (score = 1), satisfactory/meets expectations (score = 2), and needs improvement (score = 3). When looking at the girls' first quarter Life Skills determinants (pretest) compared to their fourth quarter determinants (posttest) there were 13 Life Skills that were significantly different and three that were not after a year in the single-gender math class.

When looking at the boys' first quarter Life Skills determinants (pretest) compared to their fourth quarter determinants (posttest) there were 12 Life Skills that were significantly different and four that were not after a year in the single-gender math class.

Finally, when comparing boys' fourth quarter determinants (posttest) to girls' fourth quarter determinants (posttest) of 16 Life Skills determinants, there were none that were significantly different. A score of one is a higher or better score than a score of three.

In looking at the data from the district math assessment and grades for math and science, it would appear that the single-gender math classes had little impact on the academic growth of the students. There is research that supports both academic growth and a lack of growth as can be seen in chapter two and elsewhere. If this study reinforces the research, one might wonder the reasons for single-gender schools and classes. Research states the need for teacher training (Spielhagen, 2008).

The idea to implement single-gender math classes at the researched school began in the spring prior to the year of implementation. At that time, there was little time to train the teachers for single-gender instruction to the extent that research would favor. Additionally, training for single-gender instruction is limited in the area where the school is located. As the school year progressed, inservices at the school were provided, but limited, and the teachers involved in the single-gender teaching began to discuss what they learned. The plan was to send four teachers to a four-day institute that specializes in single-gender instructional strategies including the benefits of single-gender schools and classes that aren't easily measured as was written in chapter two, the review of the literature.

In the area of life skills, there appeared to be a greater impact on like skill determinants compared to assessments and grades. Several of the Like Skills determinants were statistically significant different between the first quarter (pretest) and the fourth quarter (posttest). On the other hand, there were no Life Skills determinants between boys (posttest) and girls (posttest) that were statistically significant different. Apparently, there was some growth for the boys and girls in the single-gender classes in several areas of the Life Skills. As was stated earlier, a score of one is a higher or better score than a score of three.

As previously stated, there are advantages that can't easily be measured, at least not in the time the students are in one class or one school. It was shown that there was growth for both genders in the area of Like Skills, such as completing tasks in a timely manner. Research doesn't easily measure the comfort level that students may feel in a single-gender class. There are anecdotal comments made by many girls about the ease

and comfort they feel when the boys aren't around. Findings were discovered in a study conducted in Tasmania. Interviews, observations and surveys formed the basis of the evidence. Wills, Kilpatrick, and Hutton (2006) report gender-specific positive benefits from the class organization. The teachers noticed increased confidence and higher self-esteem among the girls. Boys developed increased motivation and more commitment to homework. The subjects of very different ages and ability levels were involved. Teachers found that the boys' accountability and self-discipline improved. The attitudes of the teachers improved as well. Teachers found more satisfaction from single-gender teaching and adopted different instructional strategies.

A superintendent in South Carolina reported the benefits of single-gender classes after expanding the magnet program in his school district to include single-gender magnet schools. He noticed that girls were more attracted to the idea than boys. The same was true of the girls' parents. The girls felt more comfortable in a single-gender classroom (Hefner, 2009). He observed that girls, who were shy and self-conscious 6th graders, grew into confident and bold 9th graders after experiencing single-gender classes in middle schools in his district.

Interviews with teachers and students indicate that girls appear to do better socially in a single-gender class and that boys do better socially in a co-ed class (Jackson & Smith, 2000). One might say boys needed the girls. These interviews were part of a ten-year longitudinal study of two Australian secondary schools which had been single-gender schools and became co-ed schools over a two-year period.

The author of this dissertation visited the single-gender classes every day. The girls were taught by a third-year female teacher who wasn't much older than the girls.

The teacher provided a role model for the girls showing that women use math and can be very proficient at it. There was a feeling of comfort in the class that was a delight to observe. They were quiet, attentive, and hard at work. On the other hand, the boys in the research school were noisy, moving, and engaged. In other words, they were being boys. Their male teacher let them be boys and fostered their creative movement and competitive spirit.

Implications for Further Research

To search the Internet, college book shelves and data bases, it is easy to find a wide range of resources on educational topics such as early education, literacy intervention, response to intervention, No Child Left Behind, and many other relevant topics. However, when searching for information on single-gender schools, classes, and instruction, the selection of research is fewer by comparison. One reason is most likely due to the low number of students and schools involved in this. As stated previously, the number of public schools with single-gender classes or the number of single-gender public schools is less than 500. That is a less than ½ of 1 % of all the public schools in the United States. Adding to this is the lack of sustainability of these schools. For a variety of reasons, many of these schools do not operate more than a few years. That said, it is hard to collect data when there so few schools that have had single-gender programs in place for many years.

Lack of single-gender schools is not a barometer of the lack of need for such schools. Chapter two illustrated the common knowledge that girls had been second-class citizens in the U.S. for most of our history. However, beginning in the 1990's changes were coming about in our society that was placing boys at an educational disadvantage.

These trends have created concerns and debate about the lack of academic progress of boys. Studies from around the world have reported on this gender gap. Studies have shown that instructional strategies exist that may increase the academic achievement of boys, thus reducing the gender gap between boys and girls.

The debate on the gender gap has been intensified in recent publications by clinical psychologists over the last decade revealing the difficulties that young boys experience in adjusting to a school climate that seems geared toward girls, with the verbal rich environment (Salomone, 2006) and the increasingly structured primary classrooms. The kindergarten class of 2011 is more like the first grade class of years ago. Blocks and playtime have been replaced by books and phonemic drilling in preparation of assessments given very early in the young boys' academic careers.

Final Conclusions

From the research, one can draw a variety of conclusions. There is research that shows that organizing single-gender classes or schools can lead to greater student achievement. There is also research that shows minor effects on achievement. However, as in most of the studied schools, the single-gender configuration had not been in place long enough to change the culture and truly see its impact. On the other hand, one positive impact that did not need years to manifest itself was the attitudes of students who enjoyed the opportunity to learn in an environment where they felt success. With proper training and an open attitude on the minds of parents, teachers, and administrators, boys and girls and flourish in an environment that best meets their needs. A single-gender school or classroom may be that environment.

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