

THE EFFECTS OF SINGLE-SEX EDUCATION ON TCAP SCORES AND
DISCIPLINE IN ONE MIDDLE TENNESSEE MIDDLE SCHOOL

Matthew B. Coffey

THE EFFECTS OF SINGLE-SEX EDUCATION ON TCAP SCORES AND
DISCIPLINE IN ONE MIDDLE TENNESSEE MIDDLE SCHOOL

A Field Study Report
Presented to
The College of Graduate Studies
Austin Peay State University
In Partial Fulfillment
Of
The Requirements for the Degree
Educational Specialist

Matthew B. Coffey

December, 2014

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By

Matthew B. Coffey

A Field Study on the Use of Cameras and Discipline in One Middle School
This report was prepared as a final copy of this Field Study Report
in partial fulfillment of the
requirements for the degree of Master of Education in School Administration


Stephen J. Sanders, Committee Chair

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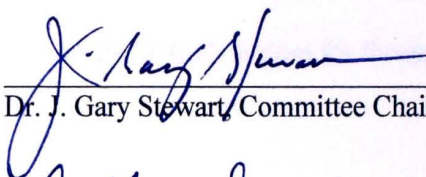

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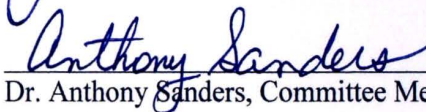
December, 2014

To the College of Graduate Studies:

We are submitting a Field Study Report written by Matthew B. Coffey entitled “The Effects of Single-Sex Education on TCAP Scores and Discipline in One Middle Tennessee Middle School”. We have examined the final copy of this Field Study Report for form and content. We recommend that it be accepted in partial fulfillment of the requirements for the degree of Educational Specialist Degree in School Administration and Leadership.



Dr. J. Gary Stewart, Committee Chair



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Accepted for the Graduate and Research Council:

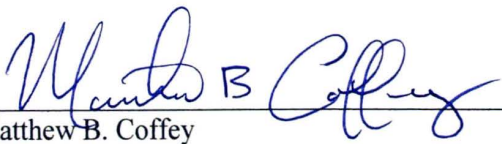


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DEDICATION

First, I would like that dedicate this project to my wonderful wife Patricia for all her support throughout this ordeal. It has been a long process and she has shown an immense amount of love and patience. She has helped me to be determined in finishing this, and I could have not completed it without her love and support. I also want to dedicate this to my five beautiful children who could always bring me a laugh when stressed. I love them with all of my heart.

I would also like to dedicate this project to my parents and my siblings, who have supported me and my family though out all of this as well. I am blessed to have such a caring and generous family, and that love and generosity is certainly appreciated and will never be forgotten.

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I thank Mr. Mike Davis and Dr. Linda Cash of the Robertson County Schools for allowing me to conduct this research and their support.

Lastly, I would like to thank GOD. Without out Lord and His mother Mary, I would have no reason to complete this work. They give me strength and hope, and the wisdom needed to work diligently and complete this project.

ABSTRACT

Matthew Coffey. "The Effects of Single-Sex Education on TCAP Scores and Discipline In One Middle Tennessee Middle School" (Under the direction of DR. J. GARY STEWART).

Tennessee and other states in the Union have worked tirelessly to improve reading comprehension among students throughout the years. According to the Tennessee State Education web-site, fifty-percent of grade three through eight students were proficient or advanced on Tennessee Comprehensive Assessment Program (TCAP) (Tennessee Department of Education, 2013). To most people, fifty-percent of students reading at a proficient level would not be considered an acceptable number. There have been many changes to curriculum in years past in order to improve reading scores, most recently the implementation of common core.

This study was conducted at Springfield Middle School in Robertson County, Tennessee. The purpose of the study was to determine whether or not the sixth grade, which is separated by gender, is scoring better on Tennessee Comprehensive Assessment Program (TCAP) tests of achievement since the change from mixed gender classes.

The school year 2009-2010 (the last year of mixed gender classes in the sixth grade) was compared to all subsequent school years, 2010-2011, 2011-2012, 2012-2013 and 2013-2014. The entire sixth grade was used as a comparison, as well as, girls in both settings and boys in both settings. With the exception of Reading, there was no statistically significant difference found between all sixth grades, but there was a statistical significance found in all core subjects when comparing girls to girls and boys

to boys. The null hypotheses were tested at the Alpha level, $\alpha = .05$, for determining if a statistical significance existed.

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CHAPTER I

INTRODUCTION

Statement of the Problem

Tennessee, as well as several other states, have worked diligently to improve Reading comprehension among students throughout the years. According to the Tennessee State Department of Education website, fifty-percent of third grade students through eighth grade students were proficient or advanced on the Tennessee Comprehensive Assessment Program (TCAP) (Tennessee Department of Education, 2013). Experientially, a considerable number of educators feel that even fifty-percent of their students reading at a proficient level would not be considered an acceptable number. There have been numerous changes to curriculum in recent years in an attempt to improve Reading scores, most recently the implementation of Common Core.

For many years, schools in the United States were separated by gender. Even though the majority of public schools are currently mixed by gender, there is a trend beginning, in which schools are returning to same sex education. This is in large part due to the No Child Left Behind Act of 2001 and the element of accountability associated with the law. Recently conducted research suggested that boys and girls brains operate in completely different ways which could account for the fact that they also learn differently. As a result of this, schools are educating boys and girls separately in many places in an effort to determine if the separation of the sexes has any associative properties relevant to academic achievement, social adjustment, and the level and extent of discipline issues in the classroom or at a particular grade level.

Kennedy (2005) suggested two studies in which research was conducted regarding the effectiveness of same-sex schools or classrooms. The first study did not produce any conclusive evidence that single-sex schools are better with regards to student academic achievement. Another study cited by Kennedy demonstrated that girls performed better in single-sex schools than girls in traditional coeducational schools on standardized tests.

Currently, at the school where the research study was conducted, the sixth grade is separated by gender for all of the core subjects, namely Mathematics, Reading, Social Studies, and Science. This organizational arrangement has been operational for the last five years. The separation of gender by grade level arrangement was implemented in order to help the sixth grade students academically and socially. No research has been conducted, other than a cursory review of the Tennessee Comprehensive Assessment Program (TCAP) scores each year to determine if the separate gender organizational arrangement has produced any benefits. Other than reviewing the yearly Tennessee Comprehensive Assessment Program (TCAP) scores, very little to no additional data or results have been used to determine whether the separate gender classroom organizational arrangement has produced any significant findings or results. Thus, research is necessary to determine if there has been any statistically significant differences, or whether changes in student academic achievement as reflected in their TCAP test scores based on before and after the adoption and implementation of the separate gender classroom organizational arrangement. Such a determination could have implications for the rest of the school and the district as a whole, not to mention the schools across the United States

should the separation of gender in classrooms by grade levels was adopted and introduced nation-wide.

Purpose of the Study

The purpose of this study was to determine if students in the sixth grade performed significantly better on the Tennessee Comprehensive Assessment Program (TCAP) achievement tests in Reading, Mathematics, Social Studies, and Science since the change from mixed-gender classrooms to same-gender organizational arrangement for the classrooms in the school studied for this research study. This determination was based on the percentage of students who scored proficient or advanced on the tests before the change was made as compared to the percentage of students who scored proficient or advanced on the tests after the change. The independent variable in this study was the percentage of students who scored proficient or advanced on the Tennessee Comprehensive Assessment Program (TCAP) achievement tests in Reading, Mathematics, Social Studies, and Science, while the dependent variable was the sixth grade students both from mixed gender classes and same gender classes.

Additionally, the study focused on the number of discipline referrals written for sixth grade students and were examined to provide insight into whether or not the change from coeducational or mixed-gender classrooms to the same-gender organizational arrangement in classrooms caused a decrease or increase in inappropriate behavior, as well as whether it caused an increase or decrease in those behaviors deemed as good or appropriate.

Significance of the Study

The results of this study have important implications for the school and the school system used for the research in this field study. Currently, the sixth grade at the school designated for the research in this study is the only school in the county that uses the same gender organizational arrangement in the core classes. If it is determined through the analyses of the data for this study that separate gender organizational classroom arrangements generate TCAP test scores that reflect a statistically significant improvement in achievement scores, then the school might entertain the prospects of using the separate gender arrangement as a viable alternative strategy in the seventh and eighth grades as well.

Furthermore, the school district may also want to consider introducing this strategy into other schools in the district if it is shown to produce statistically significant improvements in student academic achievement as determined by the Tennessee Comprehensive Assessment Program (TCAP) test scores in the core areas tested. If the study fails to determine any statistically significant improvement in achievement test scores, then the school may want to reconsider its practice, or further research other benefits of the separate-gender organizational arrangement, such as whether or not the arrangement has any positive influence on the emotional and social development and maturation of the students served by the separate-gender organizational arrangement.

Research Questions

1. Do male and female students in the sixth grade who participated in single-sex education perform significantly better on the Tennessee Comprehensive

- Assessment Program (TCAP) Reading/Language Arts (RLA) tests than sixth grade students who participated in the traditional coeducational classrooms?
2. Do male and female students in the sixth grade who participated in single-sex education perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Mathematics tests than sixth grade students who participated in the traditional coeducational classrooms?
 3. Do male and female students in the sixth grade who participated in single-sex education perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Science tests than sixth grade students who participated in the traditional coeducational classrooms?
 4. Do male and female students in the sixth grade who participated in single-sex education perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Social Studies tests than sixth grade students who participated in the traditional coeducational classrooms?
 5. Do students perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) tests in single-sex classrooms based on gender?
 6. Do students perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Mathematics tests in single-sex classrooms based on gender?
 7. Do students perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Science tests in single-sex classrooms based on gender?

8. Do students perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Social Studies tests in single-sex classrooms based on gender?
9. Do sixth grade students who participated in single-sex education have less discipline referrals than students in the sixth grade who were participants in the traditional coeducational classes?

Null Hypotheses

1. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.
2. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.
3. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.
4. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores between sixth grade

students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.

5. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.
6. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.
7. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.
8. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.
9. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms.

10. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms.
11. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms.
12. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms.
13. There will be no statistically significant difference in office referrals among sixth grader students who attended single-sex classes and sixth grader students who attended the traditional coeducational classes.

Limitations

The following limitations are appropriate for the conditions and demographics of the focus school for this Field Study:

1. The population for this study is very unique to the school situation. The findings are appropriate for schools with similar demographics as the research study focus school. Therefore, the results of this study cannot be applied to the general population of schools or students.

2. This study was only concerned with achievement scores on the Tennessee Comprehensive Assessment Program (TCAP) test.
3. This study will not research the possible maturation and social benefits of same-sex education, and it did not measure growth from year-to-year.
4. This study is unique to the school or possibly the State of Tennessee because the Tennessee Comprehensive Assessment Program (TCAP) test is being used as a measurement of comparison. TCAP is unique to the State of Tennessee.
5. Each school district and school has different procedures, rules and regulations. Offenses that warrant discipline referrals in the school of study might not be the same throughout the school district, within the State of Tennessee, or across the United States.
6. Only two years are being compared for this study. In order to complete a more thorough study, a longitudinal study using multiple years of data should be used for comparisons among the subgroups. This would make for a stronger analysis and the statistical findings would be stronger and more appropriate and accurate.

Assumptions

The following assumptions are appropriate to the population and the school used for the study:

1. One assumption for this study is that all students performed their very best on the annual Tennessee Comprehensive Assessment Program (TCAP) Reading test for all of the years being analyzed.

2. Another assumption is that the students under both classroom styles, mixed-gender or same-gender, had teachers who used differing effective strategies to ensure students were ready to perform well on the Tennessee Comprehensive Assessment Program (TCAP) academic achievement tests.
3. Another assumption is that all teachers were welcoming and supportive of the teaching arrangement whether it was same-gender or the traditional coeducational arrangement and whether or not they strived to do their best as professionals.
4. Another assumption is that the years used for this study were common with most years.
5. Another assumption is that each teacher was consistent when administering discipline referrals. Too often, teachers have different perceptions or beliefs about what constitutes a serious offence. The assumption is that all teachers considered the same offences to be serious enough to merit an office referral.

Definition of Terms:

The following definitions are provided for terms and ACRONYMS that are not used in a consistent manner from school to school, from school system to other systems, and from state to state:

1. **Tennessee Comprehensive Assessment Program (TCAP):** An annual assessment administered to students in grade 3-8 to determine growth and achievement in all the core subjects.
2. **TCAP scale score:** The raw score that a student scores on the TCAP assessment.

3. **Discipline Referrals:** The school of study ask teachers to write office or discipline referrals for serious offenses: namely physical in nature, threatening, blatant disrespectful language, skipping class, and consistent practice of minor offense

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

There has been a plethora of research conducted throughout the past several years on the organizational arrangement termed as same-sex or same gender education. Single-sex or same gender schools are currently becoming more common throughout the United States. Smyth (2010) explained that in many countries such as New Zealand, Australia, and Ireland, there are a large number of single-sex schools. In other countries such as Britain and the United States, there has been a growing movement toward the single-sex education in schools and in individual classrooms. In their report, Austin Independent School District (2011) maintained that historically in twentieth century America, the only schools that employed single-sex education were private schools. In 1972, the Title IX law was passed by the United States Government that made the segregation of sexes for any purpose, illegal. This changed in 2006 with a provision in the No Child Left Behind Act (NCLB) (Tennessee Department of Education, 2013). With the passage of this act, schools could not be segregated by sex in public school districts and in classrooms. The United States Department of Education allowed a provision for the implementation of same-sex classrooms in a school. The regulation noted that single-sex schools and classes would be allowed and deemed appropriate if student enrollment was completely voluntary and the opportunities afforded one gender was substantially equal to those provided to the other gender and the same-sex classrooms would afford substantially equal opportunities between the same-sex classrooms and the coeducational classes

(Tennessee Department of Education, 2013). Additionally, the provision must be substantially related to an important educational objective (Cohen and Levit, 2014). The Austin Independent School District (2011) noted that in 2009, there were 540 single-gender public schools in operation in the State of Texas. The exact numbers vary among researchers, however. Cohen and Levit (2014) maintained that there were over 5000 schools in the United States that offered some form of single-sex education.

There are specific laws that govern single-sex schools and classrooms in the United States. This has been done in an attempt to ensure equal opportunity education for boys and girls, whether they participate in traditional coeducational mixed-gender classroom arrangements or a single-gender classroom organizational arrangement. For instance, schools are allowed to employ single-sex classrooms if they have an important objective, such as improving student achievement for male students, female students, or a specific subgroup of students within the school population. Federal mandates dictate that the enrollment and participation in a special same-sex classroom or school arrangement must be voluntary (Tennessee Department of Education, 2013). Additionally, the coeducational classes and schools must provide conditions and opportunities that are of substantially equal quality and are available for students who do not attend single-sex education. The programs for both the single-sex classroom or school organizational structure, as well as the coeducational classroom or school organizational structure must be evaluated every two years in order to ensure that they are meeting federal laws, mandates, and structural and operational requirements (Weiss, 2007). The effectiveness of single-sex education arrangements, whether in an individual classroom setting or an entire school, has been researched at length with mixed results. The effectiveness, the

successes, the failures, the influences on student academic success, and the impact on other factors, including emotional and social aspects of students, have not been adequately reviewed or determined for either arrangement. An adequate comparison between the two organizational arrangements for all the factors mentioned has also been avoided or the results have been inconclusive and inadequate. It remains a controversial issue that will warrant future studies and analysis in order that anything concrete can be established that will be accepted as definitive for proof that one arrangement is better or more effective than the other.

Stanberry (2014) insisted that while same-sex education has existed for a long time in private schools, it is a fairly new idea in public education arena. Stanberry maintains that a driving force behind the new interest in same-sex education is the natural differences in way that males and females process information and thereby, learn. Operationalizing the concept and implementing classrooms and even schools with same-sex classrooms has been an extremely controversial issue. The concept has met with resistance due to political considerations, civil rights concerns, and numerous economic issues. Citizens of the United States are mixed on the issue. Stanberry (2014) references a survey conducted by Knowledge Networks. The findings of this survey were that more than one-third, thirty-three percent, of Americans feel that parents should have the option of send their children to same-sex schools. Only fourteen percent of these same respondents said they would send their own children to same-sex schools. Thus, single-sex schools are accepted by most citizens in America as a viable concept. The research conducted indicated benefits, as well as non-benefits associated with same-gender arrangements. Piechura-Couture (2013) indicated that schools are turning to

same-sex classrooms in order to help bridge the ever widening gap between black males and other students. Piechura-Couture also says that single-sex education is also used to help students excel, not just for remediation. Even though many schools are employing the single-sex education model, entities such as the ACLU are strongly against single-sex education because it promotes stereotypes among males and females. Arguments against this notion insist that in mixed-gender classrooms, boys are more prone to avoid tasks related to the arts, and girls are more likely to avoid tasks related to the sciences. When put into a single-gender educational scenario, girls are more interested in Mathematics and Science, while the boys consistently scored higher on Language Arts tasks (Klein, 2009).

Klein (2009) suggested that although there are many people who are concerned that single-gender schools promote stereotypes and gender segregation, the Title IX law allows for segregation based on gender as long as there is an equal opportunity option for coeducational arrangements as well. Piechura-Couture (2013) references a number of arguments in which educators claim that separating boys and girls in the classroom has the same effect on the students as did segregating them by race or ethnicity. He says it's the typical melting pot argument, an argument that insists that all students should go to school together and learn about each other's cultures and differences because as adults they will have to deal with these very issues as participants in the work-place. Detractors of single-gender education consistently contend that it is very expensive to run separate schools for boys and girls. The detractors maintain that administrators and educators should employ strategies that have already been proven to create results such as smaller class sizes and professional development (Piechura-Couture (2013). The idea of single-

gender arrangements in education is certainly not a novel idea. However, it is an idea that has always been controversial among parents, educators, and administrators. One of the catalysts of the controversy is that the research shows both positive benefits and no benefits.

Proponents on both sides of the issue also point to research on brain development when making their argument. Rhoads (2012) contends that from birth, the male and female brains are different with regards to social connection, different regarding sports interests, and completely different in their approaches to sexuality. The author also contends that in the first years of school, ninety-five percent of the teachers that boys have are women. Because of the significant differences in the male and female brain connections and their approaches to and views of the world around them, they female teachers can have significant trouble connecting with boys and what they need in order to succeed.

On the other hand, Sparks (2012) cites evidence that supports the premise that although the brain functions of both the male and female students are inherently different, there are a lot of areas where they tend to overlap and there is nothing that suggests that boys and girls learn differently. These scientists posit that the most important factor in brain development is experience, which can be the same for both boys and girls (Sparks, 2012).

Mixed Results

The Federal Department of Education released a study in 2005 called *Single-sex versus coeducational schooling: A systematic review* (Tennessee Department of

Education, 2013). In this study, the results were not conclusive either way. One of the reasons for this was, apparently, because the study was not completed randomly. Some general trends were found from the data, test results and the analysis of the data that this study suggests are noteworthy. Most studies examined from the available research regarding academic accomplishment for males and females in the public school setting, often yielded results that were more strongly in support of same-sex schools classrooms and schools in contrast to the more traditional mixed-gender classrooms and school organizational arrangement (Tennessee Department of Education, 2013).

In terms of outcomes for stakeholders such as parents and teachers, the studies mentioned and examined in the report found a slight edge for same-sex schools in the categories of academic achievement, self-concept, and long-term success. Studies conducted that tended to favor both same-sex schools and coeducational schools were mentioned more favorably with regards to involvement in extra-curricular activities and leadership roles. Overall, the Federal Department of Education maintains that it is difficult to conduct such a study randomly due to the legal implications, but would such a study would be worth the effort of conducting if there was a way to make it a possibility. The Federal Department of Education study from 2005 called *Single-sex versus coeducational schooling: A systematic review*, found that it is more common to find studies that contend that there is no difference between same-sex schooling and coeducational schooling than to find contrasting studies that maintain that coeducational schooling to be more beneficial than single-gender classroom arrangements (Tennessee Department of Education, 2013).

The study conducted found that in the eight elementary and middle schools that were a part of the visitation for the study group, the site observers found more positive academic and behavioral interactions between teachers and students in the same-sex classrooms and schools than in the contrasting coeducational schools. Principals and teachers interviewed for the 2005 Federal Department of Education the study believed that the main benefits for single-sex or same-sex classrooms and schools were that there tended to be decreasing distractions in learning and the resulting improvement of student academic achievement (Tennessee Department of Education, 2013). Another interesting discovery or finding of the study was that teachers in single-sex high schools rated problems with student behavior as less serious than teachers in the coeducational or mixed-gender arranged schools. Conversely, the researchers also found that the exact opposite was true for the middle schools that were a part of the study; the teachers in the middle schools rated problems with student behavior in a coeducational or mixed-gender arrangement as less serious than the behavior problems in a single-sex environment. There were no statistically significant differences in the ratings of school teachers concerning single-sex and coeducational school problems at the elementary school level (Tennessee Department of Education, 2013).

Furthermore, the Department of Education discovered that overall, most studies reported positive effects for same-sex schools on all-subject matter achievement tests. Performance on Mathematics, Science, English, and Social Studies achievement tests were all found to have similar data results. The research indicated that approximately a third of all studies reported findings that favored same-sex schools with the remainder of the studies split between mixed-gender arrangements and also null-gender results.

Overall, the research indicated remarkable positive findings for same-sex schooling, no differences for the null findings, while the coeducational schooling had little to no support from the respondents.

Similarly, Mael, Alonso, Gibson, Rogers, and Smith (2005) in reviewing studies that have been conducted, found that in the categories of achievement and emotional development, the results were mixed, but overall the respondents from the studies and the researchers were not in support of single-sex education. They contended that it is more common to find studies that report no differences between same-sex education and gender mixed education than to find outcomes that support gender mixed education. They also note the difficulty in conducting randomized studies with regards to single-sex education.

Robinson and Smith (2006) also conducted a review of many studies completed regarding single-sex education. Their assessment was that the balance of the evidence overall, was that research on single-sex education versus mixed-gender education has failed to demonstrate that one strategy is superior in any way to the other. Robinson and Smith (2006) speak of a paradox in which the beliefs are so strong and the evidence is so weak. Furthermore, there are a multiplicity of other factors that can cause students to achieve or fail in schools such as leadership, teacher quality, class size, and the curriculum. These factors, quite possibly, may have more effect on student achievement than having single-sex classrooms. Some of these factors include racial differences, as well as, socio-economic differences. Research clearly indicates that racial differences and socio-economic differences, in addition to the numerous other factors that may exist

to influence achievement, have more to do with the achievement gap than does the segregation of boys and girls.

Smyth (2010) compared several studies researching the benefits of mixed-gender and same-sex schools from all over the world. The results clearly pointed to considerable variation within countries. According to Smyth's research, there appears to be very little consensus on whether single-sex education is beneficial to boys and girls with regards to student achievement. In many countries, single-sex education are highly selective based on ability. This would certainly skew any data when making comparisons.

Sather (2014) writes about the advantages and disadvantages of same-sex classroom schools on both male and female students. For females, there are many advantages, including: Principals are usually women, so this sets a good example for the female students; girls report higher self-esteem as a result of their academic achievement rather than popularity; and the curriculum is likely to include women in non-traditional roles. Some of the disadvantages include: All-girl schools can push gender stereotypes; and girls can be cliquish. Sather (2014) maintains that for male students there are also many benefits to the single-sex classrooms and schools. The advantages include: all-boy schools give males a chance to speak up without the fear of being embarrassed in front of girls; single-sex classrooms and schools can be very effective for boys from high-poverty backgrounds; and single-sex classrooms and schools can meet the unique needs of boys. The disadvantages for male students include: all-male classrooms and schools could possibly reinforce gender stereotypes as well as a contempt for girls; and all-male classrooms and schools in the past, have been used as punishment by teachers and parents

as a way to deal with male students who misbehave in the traditional mixed-gender school.

The Connecticut State Education Resource Center (SERC) (2014) in the review of past conducted research, maintains that single-sex education makes boys less competitive and more collaborative. Single-sex schools allow girls to feel less pressure as they develop and mature. Single-sex or same-sex schools increase staff sensitivity and awareness of gender differences. They improve peer interaction, provide same-gender role models, and are less distracting than coeducational learning environments. Conversely, single-sex schools promote gender stereotyping, undermines gender equality. Additionally, single-sex classrooms or schools are touted as not preparing students for work or family life. Furthermore, single-sex schools deprive students' access to mainstream programs, makes exclusion acceptable, and becomes expensive due to the fact that two separate programs have to be operated and funded at equal levels according to Title IX statutes (Tennessee Department of Education, 2013). Similar arguments are made by Cohen and Levit (2014) who maintain that there is overwhelming evidence which indicates that single-sex classrooms strongly promote gender stereotyping in schools, which then is carried over into the business world, into marriages and relationships, and influences both genders as they grow into adults.

The National Education Association (NEA) (2014) also weighed the pros and cons of single-sex education and found similar results to the aforementioned studies. In its review, the National Education Association (NEA) (2014) discovered that males who attended and were instructed in same-sex classrooms, are more successful in school and are more likely to pursue a wide-range of interests and activities. Girls who participated

and were instructed in same-sex classrooms are believed to be more comfortable responding to questions and giving their opinions. They are also more inclined to pursue their interests, even if they are considered to be non-traditional. The National Education Association (NEA) (2014) also makes note of the arguments against same-sex education. They note that a lot of research indicates that boys and girls will succeed in school if they have small class sizes, equitable teaching practices, and a strongly focused curriculum, regardless if the schools are same-sex.

Gross-Loh (2014) insists that single-sex education is being championed to combat the high dropout rates among Black and Latino urban male students. The suspected benefits for girls are that they would be learning in an environment in which they are encouraged to participate more in class and not overshadowed by confident, outspoken boys (Gross-Loh, 2014). However, there is great disagreement and controversy over the benefits of single-sex education due to the methodology employed by the researchers. The author argues that a randomized study would consist of having students being assigned to single-sex or coeducational schools, which is legally impossible and unethical. Currently, students who participate in single-sex education are participating voluntarily. Under federal laws and mandates, the government and governmental oversight agencies allow for it but with caveats. In 2006, the *No Child Left Behind Act* amended Title IX laws in order to allow for single-sex classes, schools, and extra-curricular activities as long as there is a coeducational option.

The Gender and Education Association (GEA) has published similar facts as the aforementioned (Tennessee Department of Education, 2013). The GEA review maintains that there are numerous variables that influence academic achievement, more than just

single-sex or coeducational classroom arrangements. The GEA also speak about the social implications of single-sex schooling, which has not been researched nearly as much as the academic implications. There is very little research on the long-term social consequences of single-sex and coeducational schooling (GEA, 2013) (Tennessee Department of Education, 2013). The minimal research that does exist shows no consistent differences in the development of boys and girls. More research needs to be conducted in order to produce any conclusive evidence.

Like many of the other studies mentioned, Clark County Schools (CCS) (2011) in Nevada, conducted an archival data study of four single-sex schools in their county and found mixed results. Boys in single-sex classrooms performed just as well as students in coeducational classrooms and girls in single-sex classrooms. One school reported higher marks on achievement tests for fifth grade students in single-sex schools. Overall, some single-sex schools affected learning positively, but only in specific situations. The researchers in the county do not believe their conclusions can apply to larger studies. They believe that evidence is lacking to support the superiority of single-sex schools.

Haynes (2011) researched the effects of single-sex education in schools in Florida. Reading and Mathematics scores for the Florida Comprehensive Assessment Test (FCAT) were analyzed and compared. This research was conducted in one Florida public school consisting of third, fourth, and fifth graders. Differences were explored for students who enrolled in single-gender all boy classrooms, single-gender all girl classrooms, and mixed classrooms that contained the traditional set up of both boys and girls. The data studied in this research were inconclusive with regards to students in same-sex classrooms as well as coeducational classrooms. The level of achievement was

relatively the same among single-sex classrooms and coeducational classrooms. The only class that reflected large level of statistical significance was in the area of boys Mathematics achievement scores in the single-sex classroom setting. Haynes (2011) did suggest that a single-gender program may be a viable option for at-risk students, failing schools, or failing school systems. Teachers in this study credited four factors in overall achievement gains: professional development, reflective teaching, environment, and gender-specific activities.

Zubrzyzcki (2012) writes about the benefits of single-sex education when citing a study conducted in Trinidad and Tobago. This particular study found that while single-sex schools benefit females who prefer such an organization for school and classroom, same-sex schools do not inherently help all boys and girls. Even though this study was completed in another country, its finding do have implications for schools in the United States. Kirabo Johnson, the lead researcher for the study, studied 123 schools and 219,849 students in Trinidad and Tobago. His study found that although same-sex schools benefited girls more than boys, it did not benefit all girls. He also noted that girls in the all-girl classroom settings were less likely to take Mathematics and Science courses (Zubrzyzcki, 2012).

Benefits of Single-Sex Education

Novotney (2011) suggests that there are several obstacles that exist in determining distinct trends within the research on single-sex education. The obstacle at the forefront is the issue of socio-economic status. According to the Novotney, there exists a significant lack of research on males in single-sex schools. However, research does

indicate that all-girls schools do create benefits on many different levels. All the research that Novotney reviewed and analyzed clearly indicated that there are either benefits for boys or negligible to no effects on boys. However, the research reviewed did determine that there were no negative effects of single-sex education on girls. Importantly all the research cited does not indicate that there are any negative effects for students who participate in single-sex education.

Smith (2012) researched and argued for the use of science to support single-sex schooling. In the study, Smith argues that those who dismiss the science of the difference in learning between boys and girls are wrong, and that the science should be taken seriously.

Herrick (2009) compared single-sex and coeducational classrooms and their effects on achievement, assessment, and gender bias through studying past research. The studies showed that teachers do treat boys and girls differently. Teachers were perceived as having lower expectations for the boys than for the girls. Boys were perceived as underachieving while the girls were perceived as overachieving. Gender stereotyping was also apparent. Because of all the aforementioned factors, the research indicated that same-sex education was more effective for girls than for boys.

Mead (2006) argued for same-sex education due to the differences in the learning styles of males and females. Mead consistently insists that females, in general, tend to have higher scores on tests requiring verbal ability skills, while males perform better on tests that require visual-spatial abilities and skills; skills and abilities that are non-verbal in nature. Mead (2006) also noted that new technologies allow researchers to study more closely the brain and observe its activities. These studies have shown that there are many

differences between the sexes in the size of various brain structures and the parts of the brain used by males and females when performing tasks. Mead also noted that it is important to understand that one sex is not smarter than the other. In general, males and females, on average, score the same on tests of general intelligence.

Novotney (2011) reported data from a study that was conducted at Chicago's Urban Prep Academy in 2006. In this particular school, only 4% of the male students could read at or above grade level in the beginning of the school year. By May of the same school year, 100% of the boys were able to read at or above grade level. There are many factors that attributed to this success, but one of the largest factors was the fact that Urban Prep Academy is an all-male school. Coeducational advocates disagreed with this assertion, and attribute the differences to other factors. Novotney (2011) continued on by comparing the beliefs of pro same-sex schools versus the pro coeducational schools. The two positions do agree that all students learn differently, and that parents should have a choice with regards to the type of school that their children attend. Research provides sufficient evidence and differing results supporting either, and both sides of the issue.

Small (2012) researched student engagement and achievement of middle school Black males in single-gender and coeducational Reading classes. The results of his research study indicated that student achievement for the single-gender Reading class showed statistically significant gains in comparison to the coeducational classrooms. Small (2012) also found specific trends that effect student engagement in the classroom, such as: cultural understanding, cultivating an instructional community, and psychosocial needs. The single-sex classroom environment also increased the self-esteem of Black males in school. With regards to student engagement, the numbers were about the same

for coeducational classrooms and single-gender classrooms. Piechura-Couture (2013) found similar results in her research. Piechura-Couture discovered that students in single-sex classrooms improved academically and they also improved in their independence, which is a sign of effective learning.

Herrelko, Jeffries, and Robertson (2009), conducted a study on single-gender Mathematics classes in urban elementary schools in Ohio. Single-gender classes were implemented for a year and the results follow: 1. The older students who were disgruntled with the change in classes did not produce a significant change; 2. the students in the lower grades did improve with the male students raising their test scores on standardized tests by 36.5 percent; 3. females improved by 40 percent on standardized tests. Teachers also observed that female students learned differently and were able to concentrate. They also learned that the male students preferred to use manipulatives to learn new concepts, while females preferred repetition and modeling. Teachers and parents were also asked about their feelings or perceptions on the effectiveness of single-sex education for their children. Seventy-two percent of 22 teachers agreed that single gender classrooms had a positive effect on achievement. Parents were also asked about their feelings or perceptions and from the parents of the male students, 46 percent agreed that the single-sex classroom experience was positive while 38 percent believed it was not a positive experience. The parents of the female students had similar responses with 54 percent agreeing on the effectiveness of single-sex education and 38 percent believing that it was not necessarily a positive experience.

Whitlock, (2006) found from her research that although Title IX has worked diligently and effectively to stop single-sex education in schools, the single-sex

environment produced for middle school girls in her study boosted efficacy levels and provided a better learning environment than coeducational classes with regards to their experiences in the physical education classes. Whitlock, (2006) also references several studies that strengthen her position by showing that although male and female students have equal access to physical education, females and males benefit more physically and emotionally from single-sex education. The purpose of Whitlock's study was to research the effects of single-sex education on the self-esteem of girls and boys. All the teachers were female, and the students were divided into four classes; two being mixed-gender evenly, and two being separated by boys and girls; single-sex classrooms. The results led the researchers to conclude from qualitative data that single-sex classes had a more supportive learning environment and had better conduct from both genders than those in the coeducational classes. The teachers surveyed believed that girls in the single-sex classes excelled more than girls in the coeducational environment; especially lower-skilled and non-athletic girls who tended to challenge themselves more and developed more skill competency.

Foster (2012) studied the effects of single-sex education on short-term and long-term extra curricula participation. Her results concluded that males who participated in single-sex classrooms, were 8.4% more likely to participate in college activities. Single-sex education is associated with a 34.8% increase in the likelihood of participating in extra-curricular activities among female students. Using a regression model, Foster (2012) was also able to predict some outcomes. Her predictions suggested that male students at single-sex schools are predicted to be 44% more likely to be a leader in high school activities and are 40.9% more likely to participate in high school sports. Females

who participated in single-sex education were predicted to be 55% more likely to hold a leadership position, and 57.6% more likely to participate in high school sports. Both male and female students who participated in single-sex education in high school were more likely to participate in extra-curricular activities in College. According to the regression models used, girls who attended same-sex school are predicted to participate in roughly 3.376 more activities than girls at coeducational high schools. Students at all-girl high schools were predicted to spend roughly 3.565 more hours per week on activities. The overall results of her regression studies indicated that there is a large impact on decisions regarding whether or not to participate in extracurricular activities as a result of attending a same-sex school.

Bradley (2014) focused her study on same-sex education in the public schools. Most schools that employ single-sex education are private schools. For this study, archival data from the 2007-2008 school year were used in this investigation. Two single-sex, first and second grade male classes, one single-sex first and second grade females' class and three coeducational first and second grade classes from a public elementary school in the southeastern United States were the source of this archival data (Bradley, 2014). The data researched consisted of academic achievement measures in Mathematics and Reading, discipline referral frequency, and attendance. The results of this study were mixed in regards to males and females in Mathematics and Reading improvement. The researcher found a statistically significant difference among Mathematics and Reading improvement for females in single-sex schools compared to females in coeducational schools. In the investigation of academic outcomes, the researcher recommends same sex education for female students but not for male students. Evidence was also found that

suggests that gender-based grouping is an effective strategy to use for increasing school attendance.

Blake (2012) researched and analyzed the difference in end-of-year exams for middle school students in the core subjects (Mathematics, Reading, Science, and Social Studies). One group was taught in mixed-gender classes, and the other group was taught in single-sex classrooms. For this study, each group that volunteered to attend each site were taken from a population of students in two Georgia counties. The results of the study found that there were significant differences between students who received instruction in a single-sex classroom and students who received instruction in the mixed-gender classrooms. The differences included students in Reading, Science and Social Studies. The differences in scores were statistically significant for both the male students who received instruction in single-sex classrooms and the female students who received instruction in single-sex classrooms. Similarly, Hopkins (2001) researched the effectiveness of single-sex education and discovered that students who attended single-sex classes scored higher on the end-of-year exams than did the students who were taught in the coeducational classroom.

Booth, Cardona-Sosa, and Nolen (2013) analyzed test scores among female university students who participated in single-sex education courses as well as females who participated in the mixed-gender classes. The results for the study indicated that females assigned to all-female classes are more likely to pass the introductory Economics course than females assigned to coeducational classes. They also found that educating females for one hour a week in a single-sex setting while attending a coeducational school is quite beneficial. The study also found that females in all female courses are

more likely to attend classes while females with lower IQ's and who are more likely to do poorly, were the ones who benefited from being assigned to all female courses.

Eisenkopf, Fischbacher, Heinrich, and Ursprung (2011) conducted a study in Sweden with female secondary school students in mixed-classes and in single-sex classrooms. In this study, randomization was used. Female students were placed into different learning environments randomly. The results of the study found benefits to single-sex education. There was a positive effect found in single-sex education on Mathematics proficiency scores but not in German scores. Interestingly, the positive effect on females in Mathematics was even stronger if the teacher was a male. The researchers in this study claim that their experiment is natural and thus it is unlikely that there is any selection bias.

Hartman (2010) conducted a study on the benefits of single-sex education for high school girls. The sample surveyed was 100 female students who attended Providence College. Forty females attended single-sex high schools while sixty females attended coeducational schools. Achievement and attitudes were tested in this study. The females that attended a same-sex school had a less traditional view of a woman's role. The study also showed that the female students who attended single-sex schools have higher self-esteem than the students who attended coeducational schools. The females who attended same-sex schools also scored higher on the SAT overall. One limitation of this study is that the sample only included females from a Catholic College in the Northeast.

Hammel (2013) wrote about the benefits of single-sex education in the state of South Carolina. Every year, student, parent, and teacher surveys are administered to all involved in single-sex education in the state. Overall, 75 percent of teachers and 68

percent of parents answered on the survey that they saw an increase in students in the categories of self-confidence, motivation, participation, and a desire to work hard. Other interesting facts were that in Mathematics, 14 schools showed higher achievement scores than coeducational schools, and 14 single-sex schools outperformed coeducational schools in Reading. In the area of discipline, seven out of ten single-sex schools submitting data had a lower number of discipline referrals than coeducational schools.

O'Connell (2012) reported the effects of single-sex education in the state of Wisconsin. The state of Wisconsin started organizing and funding single-sex classrooms in 2006. Teachers at these schools were interviewed and queried about varying issues, such as student motivation and achievement. Legally, single-sex schools must be optional for students and the teachers that were interviewed viewed the classrooms positively. Interestingly, in the single-sex classrooms, teachers changed their styles to fit the learning styles of male and females. The teachers also noted the ability to cover curriculum more in-depth because there were less distractions in the classroom. Overall, teachers also noted the sense of community-building that was created as a result of education in single-sex classrooms. Achievement gains were also apparent. Girls' achievement grades were eight to twelve percentage points higher than girls in coeducational classrooms, and boys scored five to eight percent higher than boys in coeducational classrooms. Teachers discovered that the overall improvement in grades, as well as an increase in motivation. Although one of the organizational drawbacks to single-sex classrooms was scheduling, all teachers found social benefits to single-sex education. Students developed a larger sense of community, and worked much better in cooperative groups. The teachers in this study all preferred single-sex education to

coeducational classrooms. They noticed increases in student confidence and greater participation among students. Separating students by gender allowed the teachers to cover the curriculum more fully while creating opportunities for character-building, which sometimes is not found in coeducational classrooms. The teachers in this study all favored single-sex classroom or school education because overall, it created a better learning environment.

Mills (2011) studied the effects of single-sex education on the self-efficacy of college students taking introductory Physics. Mills determined that the data revealed that women who attended an all-female college, performed better in Physics than did their male counterparts who attended an all-male college. The results of this study were based on the administration of both qualitative and quantitative research. The field sites that were surveyed were two all-female colleges, one all-male college, and one coeducational college. Surveys were administered to students in these colleges. The surveys included multiple choice questions regarding their efficacy and confidence regarding Physics. The surveys utilized a Likert scale, and the results were analyzed using bar graphs. An ANOVA test was used in analyzing the data. Overall, as was previously stated, the data indicated that women felt more confident and had higher self-efficacy in single-sex education than did the men. Similarly, the National Association for Single Sex Public Education (NASSPE) (2014) claimed that there are numerous benefits for girls who receive single-sex education. Girls who are educated in the single-sex educational setting have many more educational opportunities. In the single-sex classroom setting, girls are more likely to explore non-traditional subjects like Physics and Mathematics. The National Association for Single Sex Public Education (NASSPE) (2014) maintained that

girls have had a wider breadth of educational opportunities in the single-sex educational setting. In the various studies completed in the United States, United Kingdom, Australia, New Zealand, Iceland, and Kenya, all discovered that girls embraced the non-traditional subjects while participants in the single-sex education setting. Girls are more likely to be more daring, adventurous, and take risks when they are surrounded by members of the same sex. Similarly, Sax (2009) found conducted research on the effects of single-sex education in the sequence of brain development and discovered that single-sex education does produce positive outcomes, especially with regards to confidence, engagement, aspirations, and female success in Mathematics and Science courses. Sax (2009) also found statistically significant differences among female alumnae of The coeducational versus single-sex schools. Female graduates of single-sex schools displayed greater academic engagement, higher SAT scores, greater interest in graduate school, higher academic self-confidence, higher confidence in mathematical ability and computer skills, great interest in engineering careers, and greater political engagement.

Doris, O'Neill, and Sweetman (2012) studied single-sex schooling and Mathematics achievement. The study was conducted in Ireland among nine year old male and female students who attended single-sex classrooms, and a number different tests were administered which yielded p -values that indicated that there were a number of significantly varied results. The analyses of the data indicated that there was no appreciable or statistically significant differences between the achievement of boys and girls in the subject of Reading. In Mathematics, there was a statistically significant difference in achievement scores. The data indicated that twenty-nine percent of the boys were in the top quartile, versus only twenty-two percent of the girls in the same quartile.

The research also suggested that the achievement gap was widened by single-sex education, not made smaller. The research also indicated that boys performed significantly better in single-sex classrooms than boys in coeducational classrooms, while there was not a statistically significant difference in the performance among the girls that were part of the study.

The CRC Health Group (2011) insisted that single-sex classrooms and schools benefited female students in a number of ways. Numerous studies were examined and analyzed that were completed in recent years. The CRC Health Group (2011) insisted that teachers should use the latest teaching techniques that are proven to be best practices methodologies and that are proven to work well with the female learning style. The textbooks and other learning materials utilized do not contain male bias. The female participation rate for a single-sex classroom setting, exceeded the level normally observed and expected for females who conversely participated in a coeducational setting. As a result, female students in the single-sex classroom setting demonstrated a higher level of self-confidence.

Furthermore, having female adult role models and a lack of male favoritism, served to help girls to be quite successful in school. Girls also tended to become the natural leaders in a single-sex school, which is quite beneficial for their self-confidence. They are also more likely to major in Mathematics or Science when they attend college. The CRC Health Group (2011) also references a number of studies that, overall, support a significantly higher level of sexual harassment, as much as ninety percent of girls, in a coeducational classroom or schools. They maintain that the percentage of girls who experience some degree of sexual harassment in a coeducational setting is appreciably

higher than would expect. This is naturally absent from the educational experience when girls participate in schools that are structured as same-sex educational classrooms.

Girls who attended single-sex schools were also much more successful in life. The CRC Health Group (2011) suggested that at least a quarter of the female members of Congress and one-third of all female members of Fortune 100 boards graduated from colleges that were organized as same-sex institutions. Adult graduates of all-girl high schools and colleges reported extreme satisfaction with their education (CRC Health Group, 2011)

A research study conducted by Che and Wiegert in 2010 at a moderately sized sixth through eighth grade middle school in an urban setting in the South, focused on a student population of approximately 120 students at the school. Students, as well as parents and teachers, were asked to complete a survey with varying questions about the experience of education in a single-gender school. The results of the study indicated that all three groups surveyed, (parents, teachers, and students) addressed two aspects of the survey more than others. These two aspects were a more focused academic setting, and an improved social classroom environment. Parents also liked the fact that class sizes were smaller, and this a result of the decreased class sizes when the students were separated based on gender. Parents also responded to the survey questions and they responded that they appreciated the fact that there were less distractions for their students in the single-gender classroom setting. Teachers answered responded that they found it interesting that teaching boys and girls separately due to their different learning styles and behaviors had such an impact on their achievement, as well as their social and emotional development. It gave the teachers a different perspective about the differences

in educating males versus females and the differences in the social and emotional needs of both groups (The CRC Health Group, 2011).

In another study conducted on the effects of single-sex education, Murphy (2013) found positive effects for single-gender schools among young, low income African-American students. In this qualitative study, Murphy discovered that the students and their parents perceived that they were loved and treated very well by the staff. Furthermore, this high level of social and emotional support increased the academic success for its young, low-income, African-American students. According to Murphy (2013), high expectations, extra help before and after school for students who needed it, and emotional support at school helped the young men in the single-gender school to excel academically. In contrast, students in the traditional coeducational public school believed the environment to be too big, less personal, distracting, and indifferent to the needs of boys. Young African-American boys from low-income families were able to succeed academically, socially, and emotionally better in the single-gender school environment. Hammel (2013) researched the effects of single-sex instruction on 8th grade students in Mathematics. The researcher found that overall, that instruction in Mathematics in the single-sex setting could be beneficial.

Reed (2014) cited a study conducted by the University of California Los Angeles (UCLA). In this study, researchers found that female students who attended single-gender classrooms performed better in various different categories when compared to their coeducational counterparts. The study from the University of California Los Angeles (UCLA) indicated that female students who attended single-sex schools tended to outperform their coeducational counterparts. Their Mean SAT composite scores for

verbal and Mathematics were 43 points higher for female graduates from single-sex schools in the independent school sector and 28 points higher for single-sex alumnae in the Catholic school sector. Additionally, according to Reed (2014), 35 percent of female graduates of single-sex Catholic schools rate their computer skills as above average or in the highest 10 percent compared with 27 percent for their coeducational counterparts. There were also other categories in which the female students in single-gender schools performed higher than students in coeducational schools. The study also indicated that female students who attend single-gender schools had more confidence in varying categories than that of female students in coeducational classrooms. The Long Beach Unified School District (2011) researched studies that had been conducted on single-sex education, and their summary found that none of the studies found negative effects on the achievement and attitudes of girls in single-gender classrooms. Some of the studies found positive effects, but none were negative. They also found that single-sex education was more advantageous for boys and girls who come from disadvantaged backgrounds. The studies suggested that students in single-sex schools are more involved in the classroom in terms of attention, participating in discussions, and completing additional homework (Long Beach Unified Schools, 2011). Similarly, Denny, Stotsky, and Tschepikow (2010) studied the effects of single-sex classrooms on two classes in an Arkansas school. The students were from the fifth and sixth grades and the results were based on the end-of-year Reading assessment. In both cases, the students who were in the single-gender classes outperformed their counterparts in the coeducational settings. The gains in trends for both classes tended to favor the single-gender classes. Daniels, Gurian, and Stevens (2009) reviewed a study using a school in Oklahoma City,

Oklahoma, that serves nine-hundred students in the sixth, seventh and eighth grades. One of the schools, Roosevelt, had a gender gap of seventeen percent. Boys only scored fifty-five percent satisfactory on the end-of-year assessments. The school made the change to single-gender classrooms for a year and as a result, the gender gap was decreased from seventeen percent to nine percent, and eighty percent of boys scored satisfactory. The school was also removed from the state's At-Risk list according to Daniels, Gurian, & Stevens, 2009.

No Apparent Benefits of Single-Sex Education

Friend (2006) researched the positive effects of single-gender grouping on the climate and academic achievement of boys and girls as opposed to mixed-gender or coeducational classes. Her research found that single-gender classes did not produce any significant difference in climate or academic achievement. The researcher also cited incidences from her observations in which gender stereo-typing occurred. In many of the cases, the students and teachers were not aware that they were using such stereotypes in the classroom. Saunders (2014) is not a proponent of same-sex education. Saunders maintains that same-sex education promotes sexism, promotes poor social skills, and deprives students of valuable life-experiences with the opposite gender. When males and females are taught separately, they often, wrongly, conclude that one gender is better than another. Thus, gender stereotyping is promoted and practiced. Saunders believes that same-sex education promotes poor social skills because the students miss opportunities to communicate with the opposite sex. She also argues that same-sex classrooms and schools violate the intent of Title IX laws, which make segregated education illegal. She

argues that even though female and male brains work differently, they can help each other and learn from each other in a mixed-gender classroom setting. Saunders (2014) contends that the American Psychological Association proposes that school is preparation for adult life and how males and females learn to interact with each other will dictate how successful they are in the work-place. Robbed of the opportunities of being able to interact with each other in school can have significant adverse effect on the boys and girls in their later years.

The website *Science Daily* (2014) cited a study conducted at Arizona State University with led researcher Halpern. Fabes, Pahlke, Martina, and Hanisha (2012) discovered that differences among the sexes can grow in same-sex classrooms, making interactions between females and males strained. Furthermore, their study claimed that separating boys and girls makes gender very salient and can lead to sexism between males and females. Fabes, Pahlke, Martina, and Hanisha (2012) further maintain that there is not sufficient science that supports single-sex education. They also claim that neuroscientists do not support the notion that male and female brains work differently making single-sex education necessary.

Fabes, Pahlke, Martina, and Hanisha (2012) tested 365 middle school students who attended a school that offers both gender segregated and coeducational classes. Their research found that the more that males and females attended gender segregated classes, they tended to be more gender stereotyped. The researchers maintained that since their research indicated that same-sex education makes students more likely to stereotype members of the opposite sex, gender separated classrooms are not a good solution to increasing academic achievement. The researchers also posit that the more

time males and females spend time with members of their same sex, the more likely they are to adopt the collective norms, beliefs, and behaviors of the two groups and the more they become exaggerated. Their research not only says that gender separation is not a solution to learning problems among males and females, it is part of the problem and thus should be avoided. Fabes, Pahlke, Martina, and Hanisha (2012) recommended that instead of separating students by gender, educators and parents should find ways to create more efficient coeducational settings by actively promoting positive male and female interactions in the coeducational classroom settings.

Fabes, et al. (2012) conducted another study that was longitudinal in nature. The purpose of the study was to investigate the correlates and the consequences of single-gender versus mixed-gender classes. This study was conducted with 226 boys from the seventh and eighth grade students. The school offered both mixed-gender and single-gender classes. The measurement used for measuring achievement was the Arizona's Instrument to Measure Standards (AIMS). The data implied that single-sex classrooms had a negative effect on the test scores of the boys in the classroom in both Mathematics and Reading. Their research also indicated that the more single-sex classes students participated in, the more gender stereotyped they became. Although the authors conceded that there are still questions related to single-sex education, such as private versus public, income levels of parents, and pre-adolescent and post-adolescent education, they believe that the conclusions would be similar to what they found in their study. They contend that single-sex schooling is not the remedy to any educational difficulties boys and girls might be having.

Allison, Hyde, and Pahlke (2014) conducted a study and administered a Meta-Analysis to quantitatively synthesize the results of the studies that have compared single-sex with coeducational schooling for a wide array of student outcomes including Mathematics and attitudes, Science performance and attitudes, self-concept, and body image. With the methods used to get the results, there was no statistically significant differences between same-sex schools and coeducational schools in any category. In regard to age and grade in school, their study found no advantage for either boys or girls who attended same-sex schools. Overall, Allison, Hyde, and Pahlke (2014) found that same-sex schools do not confer any of the advantages claimed by single-sex school proponents. Another problem the researchers cited is the problem with conducting such studies with random samples of students. Most of the study consisted of non-random samples. The researchers Meta-Analyzed data from 184 studies, representing 1.6 million students in grades kindergarten through grade twelve from 21 nations for multiple outcomes. They recommend that for future studies, controlled studies that use random assignment of control for selection effects should be utilized. This can be done by using a variety of designs, including longitudinal designs. Their ideal study would include random assignment of both same-sex classrooms and coeducational classrooms. Their research also claimed that the students in the single-sex classrooms were more prone to fostering stereotypes. Allison, Hyde, and Pahlke (2014) maintain that federal regulations permit single-sex schooling in public schools only if there is a compelling educational interest. The kids would have to perform better and, according to Tenebaum (2014), the evidence does not show that they do.

Blake, (2014) reinforced all the aforementioned points that imply that there are no benefits to single-sex education. Blake cited a plethora of research from 2011 and before which concluded that there is strong evidence of negative consequences when segregating male and female students. Building meaningful friendships and romantic relationships become virtually impossible. Furthermore, single-sex education promotes gender stereotyping. With regards to learning disabilities, opponents argue that students in different socio-economic and racial groups have a larger achievement gap than boys and girls.

Cohen and Levit (2014) contend that single-sex education in the public schools is unconstitutional, and therefore, should not be allowed at all. Since the federal government allowed single-sex education in 2006, there have been multiple schools that have experimented with single-sex education. They argue that:

Sex-segregated education is patently unconstitutional and is a violation of the Equal Protection Clause. It has no exceedingly persuasive justification and instead exacerbates outdated stereotypes, while creating and perpetuating the legal, social, and economic inferiority of women. It is time for the nation's judges and educators to stop this unconstitutional experiment.

(Cohen and Levit, 2013, p. 2)

Keller (2011) conducted a study which researched the correlation between teaching methods at single-sex high schools and the biological differences in boys and girls brains. A survey was created that asked questions regarding teaching methods in the classroom. Instructors were asked about their knowledge regarding cognitive differences

in boys and girls, and the frequency of exposure to such methods. A total of 17 factors were tested. According to Keller (2013), they include:

Volume of voice during instruction; use of visual aids; use of media, language and lecture; use of handouts and lesson reiteration, kinetic learning, experiential learning; use of guiding questions; following strict outlines for class; collaboration; one-on-one instruction; peer instruction; use of multiple stimuli at once; peer grading and competition; use of formality, association with the real-world; and the value of rote memorization. (p. 3)

Of the measures tested, only two were found to be statistically significant. The formality measure and the memorization measure were the two factors that showed statistical significance. Three single-sex high schools were given the survey. The results of the study indicated that there was no statistically significant differences in teaching methods at all-boys and all-girls schools. She concluded that teaching methods and sex differences are not nearly as important as people usually perceive them to be.

Guglielmi (2011) conducted a study with qualitative data comparing the self-esteem of girls in same-sex schools and girls in co-educational classrooms. For this study, 60 out of 437 female students from a single-sex catholic preparatory school and 10 female students out of 750 females and males from a coeducational public high school completed a survey of 25 questions. The survey had four categories which all dealt with issues of self-esteem. The students were high school students (9-12) who attended school in the state of Connecticut. Using a *t*-test to determine statistical significance, the researcher found that there was no statistically significant differences between girls in the single-sex classrooms and the girls in co-educational classrooms in the area of self-

esteem. Overall, there was no statistically significant differences in self-esteem between girls in same-sex classrooms and girls in co-educational classrooms. Furthermore, the researcher found that one of the largest driving forces in helping girls achieve in school is competition. This was true for girls in same-sex classrooms and coeducational classrooms as well.

Lafleur (2010) conducted research on the benefits of single-gender education among two seventh grade middle school classrooms. One classroom contained all girls, while the second classroom consisted of all boys. The results of the study indicated that there was no real benefit to single-gender classrooms with regards to attitude towards Mathematics, participation, and teaching methods. Similarly, Hill (2013) studied the effects of single-gender education and the achievement of sixth grade Mathematics students. Using Measures of Academic Progress scores (MAP), the researcher found that there was no statistically significant differences between academic growth and gender. The level of significance for this study was set at the Alpha level, $p < .05$ level of statistical significance.

In another study conducted by Whalen (2012), classes were changed from mixed-gender to single-sex in order to increase test scores and decrease discipline referrals. The researcher concluded that there was no statistically significant differences in the academic achievement between the single-gender and mixed-gender classes. Students in the single-gender classes did report a higher level of confidence and self-concept, but this did not create higher test scores compared to the students in the mixed-gender classrooms.

Smith (2011) conducted a study of 1,106 students' attitudes towards their own single-sex education in junior college. The results of this study indicated that the majority of students questioned through the survey preferred the coeducational system. The results indicated that students who attended single-sex classrooms in college had an unfavorable attitude towards themselves as compared to students who attend co-educational colleges. The study also found that out of a total of 1,106 students, 79.6% of the students were in favor of coeducation. Both boys and girls from coeducational junior colleges had higher attitudes toward self, opposite-sex, teachers, parents and college as compared to boys and girls from single sex institutions, according to Smith, 2011. Strain (2011) studied Mathematics students and their end-of-year exam scores for third through eighth graders in North Carolina middle schools. Using archival data, the researcher found that the practice of single-sex classrooms actually resulted in lower performance on the end-of-course exams. The researcher also found no evidence that the offering of single-sex classes in Reading led to increased end-of-year test scores. Overall, the researcher stated that the implementation of single-sex classes in North Carolina did not affect the end-of-year course exams in a positive way.

Behavior and Same Sex Education

Many schools utilize same-sex classes or same-sex schools in hopes of creating an environment with better behavior.

The National Association for Single Sex Public Education (NASSPE) (2014) cited a study conducted in the year 2000 in Seattle Washington. In this particular study, the principal was concerned about the high number of office referrals. About thirty

children a day were being sent to the office for discipline reasons, and eighty percent of the students were boys. He decided to make the switch to single-sex classrooms. As a result, discipline referrals dropped from thirty a day to about 2 a day on the average. The teachers and subjects remained the same. The only change was separating the boys and the girls. The boys' behavior improved drastically. They were able to focus more, and as a result, they also scored very high on their achievement tests.

Ahmed Boukranaa conducted a 2014 study that cited a study by the United States Department of Education conducted in 2008. The findings of this study noted that same-sex schools tended to decrease distractions in learning, reduced inappropriate student behavior, and provided more leadership opportunities, which also leads to more positive behavior in the school. Furthermore, same-sex education reduces the incidences of sexual harassment among students, provides for a more positive student role models, and allows for more opportunities for schools to allow moral and social guidance (National Education Association, 2014). The study found that among 10 schools visited, students in the single-sex elementary and middle schools exhibited a stronger sense of community, interacted more positively with one another, showed greater respect for their teachers, were less likely to initiate classroom disruptions, and were more positive with regards to acting as role models than student in co-educational schools. The study was descriptive in nature, and the perceived benefits of principals and teachers were a greater degree of order and control, as well as fewer distractions in the classroom.

Allison, Hyde, and Pahlke (2014) found similar results with regards to behavior in same-sex classrooms. In their archival study, they cited past research studies that demonstrated a reduction in the discipline problems and an increase in student academic

focus. Similarly, Hill (2013) contends that single-gender schools are beneficial because girls who mature more quickly than boys, do not have to deal with the distractions from the consequences boys receive for their acting out in class. She also advocates for the single-sex education and notes that social behaviors, such as showing off during class, is greatly reduced if students are separated by gender.

Mills (2010) found in her research of her high school Mathematics classes that there were far less behavior issues for both genders when the students were in a single-gender environment. Additionally, Mills believes that the teachers involved in her research also perceived that there were less behavior problems in classes that were single-gender.

In the opening of the 2009-2010 school year, there were 230 single-gender schools in the state of South Carolina. These single-sex classes are mostly offered in grades K-2, 1-5, sixth grade, and ninth grade (Rex & Chadwell, 2009). Early results of this experiment indicate that there was significant academic growth for both boys and girls in single-gender classrooms, as well as improved behavior. Overall, South Carolina reported decreased disciplinary issues for boys and girls in single-gender classrooms. One example is Taylors Elementary School. The school reported a drop in discipline referrals from 0.36 referrals per student to 0.06 referrals per student in 2008-2009.

Whalen (2012) did not find much evidence in support of single-gender classes for achievement purposes, but did find that in two single-gender seventh grade Mathematics classes, that the level of participation for boys and girls increased in single-gender classrooms. Boys performed much better in a competitive environment while girls performed better in a more empathetic environment.

The National Education Association (2014) cited a study from 1993 in which American University professors visited one-hundred schools and researched the way both boys and girls were treated. During the three year study, the researchers found that boys showed dominance in the mixed-gender classrooms and were generally treated better than girls. For example, teachers valued comments made by boys more than the comments made by girls. Boys were praised after answering correctly, while girls were given a simple nod or an ok. Furthermore, boys were encouraged to solve problems on their own while teachers helped girls who were stuck on a problem.

Kennedy (2014) researched the effect of single-gender classrooms on the educational experiences of boys within a school that has mixed gender classes as well. The study lasted three years and used data collected from interviews with students, their teachers, and samples of graded in-class work and homework. Teachers involved in this study answered across the board that there were not as many discipline problems in the single-gender classrooms as there were in the mixed-gender classrooms. The study also concluded that there was a decrease in office referrals for boys who attended single-gender classes. Similarly, Hopkins (2001) found that the students in single-sex classrooms had fewer incidents of bad behavior reported than coeducational classes. The single-sex female class in the study had the least amount of office referrals, and the coeducational classes had more overall. Piechura-Couture (2013) used survey data for single-gender schools and found that fifty-nine percent of boys reported that their behavior improved after being put into a single-sex classroom. Fifty-six percent of the parents reported that their sons' behavior improved after being put into a single-sex classroom. Seventy percent of teachers who made the switch from coeducational

classrooms to single-sex classes reported improvement in behavior once the switch was made. Increased participation and a more positive attitude among the boys was also reported by eighty-six percent of the teachers involved in the survey.

In another qualitative study including surveys, Casky (2011) studied the effectiveness of single-sex education among stakeholders. More specifically, the study surveyed teachers in urban schools who switched from coeducational classrooms to single-gender classrooms. The results, which are qualitative in nature, found that teachers were less satisfied with their involvement in single-gender education by the end of the year. There could have been a lot of factors that attributed to this attitude of dissatisfaction. However, of the surveys answered, 61% of the teachers felt that students were more comfortable in single-gender classes, and 68% felt that there was greater participation among students in single-gender classrooms. Similarly, Daniels, Gurian, and Stevens (2009) reported that in four years of implementing single-sex classes in Carolina Day School, the school was very successful and saw some of the following outcomes, especially for teachers: stronger mentoring relationships, a better environment, more direct ways to deal with students' social and emotional pressures, more effective classroom instruction because of better behavior, and a new energy for teachers.

No Effect on Behavior for Single-Sex Education

Bradley (2010) and Bradley (2014) researched the effect of single-sex education on first and second grade public school students. Bradley researched the effects on Mathematics and Reading achievement, as well as discipline referrals. Her research

indicated that there was no statistically significant differences between single-gender and mixed-gender students with regards to office referrals. In fact, the actual number of referrals was the same.

Whalen (2012) studied the effect of single-gender classrooms on seventh graders in Massachusetts schools. The researcher hypothesized that the students in the single-gender classroom would be less likely to be referred to the office because they were in a class with the same-gender and thus not as prone to act out for attention. Interestingly, there was no statistically significant differences among students in single-gender classrooms and students in mixed-gender classrooms with regards to office referrals. These findings were true for both girls and boys in single-gender classroom. Cohen and Levit (2014) cited evidence that implies separating by gender has a negative effect on behavior. They cited research which explains that when two groups are separated, the out-group homogeneity effect becomes dominant and therefore, takes control. This effect causes the in-group to perceive anyone who is not part of their group as all the same. Thus boys will think that girls are all the same, and girls will think that boys are all the same. With the aforementioned argument in mind, detractors of single-sex education argue that the out-group homogeneity effect causes gender stereotyping.

CHAPTER III

METHODOLOGY

Overview

The purpose of this chapter is to explain the methodology that was used in conducting research with archival data. The purpose of this study was to determine if there was a statistically significant impact in Tennessee Comprehensive Assessment Program (TCAP) Reading, Mathematics, Social Studies, and Science achievement scores between students who attended the sixth grade in single-gender classrooms, and students who received their education in the coeducational classroom setting. Additionally, the study attempted to determine if there was a statistically significant difference in the amount of disciplinary office referrals for students in single-gender classrooms compared to students in coeducational classroom settings. The statistical significance for both the coeducational and single-gender settings was tested by studying the number of students who were proficient or advanced in Mathematics, Reading, Science, and Social Studies. Multiple years of data were studied including the school years 2009-2010, 2010-2011, 2011-2012, and 2012-2013. The 2009-2010 school year, was the last school year for the coeducational classrooms in the sixth grade. The 2010-2011 school year was the first school year for single-sex education. The achievement data for the areas tested were analyzed for these two school years and the appropriate comparisons were made to determine statistical significance for the school years, as well as following school years, for single-gender education compared to coeducational achievement data for the last school year the organizational arrangement was used. The population of students for

each school year was approximately 200 students, and by studying consecutive years, there was a significantly better chance of maintaining the same teachers for each school year as well.

Research Design

For this study, a simple t -test was utilized in order to compare the test data for the population for the school years 2010 through 2014 for each of the main subjects, namely, Reading, Mathematics, Science, and Social Studies. For this study, the median Alpha level of $p < .5$ was used to determine whether statistical significance existed between any of the comparison groups. This helps to clarify possible errors that arise with using the simple t -tests. Each core area tested on the Tennessee Comprehensive Assessment Program (TCAP) test, Reading, Mathematics, Science, and Social Studies, were compared to the TCAP test scores from the 2010-2011 school year, which was the last school year where the classroom setting was classified as mixed-gender or coeducational classes.

Participants

Archival data was used consisting of two populations of sixth graders from the school years 2009-2010, 2010-2011, 2011-2012, and 2012-2013. The participants were sixth graders at Springfield Middle School, a middle school in Robertson County, TN. Each school year data set consisted of approximately two-hundred students from the sixth grade that was collected and analyzed for statistical significance for the Tennessee

Comprehensive Assessment Program (TCAP) test for the areas tested by the state of Tennessee.

Data Collection Procedures

Approval was obtained from the Institutional Review Board of Austin Peay State University to conduct this study. Approval was also obtained from Robertson County Schools to use archival data. Data was obtained from the Robertson County Data Specialist Administrator and from Robertson County Schools. The data was collected by the system testing administrator and was coded by the School System Specialist with all student identifiers removed prior to submitting the data to the researcher. This strict policy of complete anonymity was adhered to with rigor and diligence.

The Tennessee Comprehensive Assessment Program (TCAP) test scores are common knowledge and can easily be found and accessed on the state website. The website contains all of the achievement data and growth data for each student. The information is also broken down by gender, ethnicity, and socio-economic status. The raw scale scores in Reading, Mathematics, Science, and Social Studies were compared for the 2009-2010 and 2010-2011 school year, and 2009-2010 and other years (up to 2013-2014) since the change to single-sex education. The grade that was studied was the sixth grade, since they were the only grade affected by the change from coeducational classrooms to single-sex classrooms. The school year 2009-2010 was the last year of mixed-gender classes, and the school year 2013-2014 was the most recent year of single-sex classes. These data in the tested areas were tested and analyzed making appropriate comparisons between the 2009-2010 school year data with coeducational classroom

arrangements and the latest school year for the single-sex classrooms. The statistics were computed using Excel and the JMP Statistical package.

The data for office referrals was obtained from the STAR Student Program, which Robertson County schools utilized as the official system for grades and discipline until the 2013-2014 school year. The data for office referrals from the STAR Student Program was not readily available, so the researcher contacted the Robertson County technology department and a representative from the technology department was able to locate the discipline data for the necessary years. The data from the STAR Student Program indicates the number of office referrals by grade level. This data also describes the offense, but for this study, the offense is irrelevant.

Data Analysis Plan

When reviewing the archival data in order to determine if there was a statistical difference between the Tennessee Comprehensive Assessment Program (TCAP) achievement scores between students who attended coeducational classes and students who attended same-sex classrooms, a simple *t*-Test was utilized to compare student test data for Reading, Mathematics, Science, and Social Studies before and after the implementation of the single-sex classrooms. The *t*-Test was also used to compare the scores between the boys and the girls. Null Hypotheses were tested for statistical significance at the Alpha level, $p < .05$, for determining statistical significance. The school years compared for this study were 2009-2010 and 2013-2014. The TCAP test areas used for analysis were Mathematics, Reading, Science, and Social Studies.

Appropriate comparisons were made between single-sex classrooms and coeducational classrooms for boys and girls.

Discipline data was available for only five years. Therefore, a narrative was used to describe the observational analyses of the data and for a thorough discussion of the differences in discipline referral number for each year and comparing the referral data between the boys and the girls.

Research Questions

1. Do male and female students in the sixth grade who participated in single sex education perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) tests than sixth grade students who participated in the traditional coeducational classrooms?
2. Do male and female students in the sixth grade who participated in single sex education perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Mathematics tests than sixth grade students who participated in the traditional coeducational classrooms?
3. Do male and female students in the sixth grade who participated in single sex education perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Science tests than sixth grade students who participated in the traditional coeducational classrooms?
4. Do male and female students in the sixth grade who participated in single sex education perform significantly better on the Tennessee Comprehensive

Assessment Program (TCAP) Social Studies tests than sixth grade students who participated in the traditional coeducational classrooms?

5. Do students perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) tests in single sex classrooms based on gender?
6. Do students perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Mathematics tests in single sex classrooms based on gender?
7. Do students perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Science tests in single sex classrooms based on gender?
8. Do students perform significantly better on the Tennessee Comprehensive Assessment Program (TCAP) Social Studies tests in single sex classrooms based on gender?
9. Do sixth grade students who participated in single sex education have less discipline referrals than students in the sixth grade who were participants in the traditional coeducational classes?

Null Hypotheses

1. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores between sixth grade students who participated in single sex education and sixth grade students who participated in the traditional co-educational classrooms.

2. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores between sixth grade students who participated in single sex education and sixth grade students who participated in the traditional co-educational classrooms.
3. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores between sixth grade students who participated in single sex education and sixth grade students who participated in the traditional co-educational classrooms.
4. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores between sixth grade students who participated in single sex education and sixth grade students who participated in the traditional co-educational classrooms.
5. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores among female students who participated in single sex education and female students who participated in the traditional co-educational classrooms.
6. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores among female students who participated in single sex education and female students who participated in the traditional co-educational classrooms.
7. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores among female students who

participated in single sex education and female students who participated in the traditional co-educational classrooms.

8. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores among female students who participated in single sex education and female students who participated in the traditional co-educational classrooms.
9. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores among male students who participated in single sex education and male students who participated in the traditional co-educational classrooms.
10. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores among male students who participated in single sex education and male students who participated in the traditional co-educational classrooms.
11. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores among male students who participated in single sex education and male students who participated in the traditional co-educational classrooms.
12. There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores among male students who participated in single sex education and male students who participated in the traditional co-educational classrooms.

13. There will be no statistically significant difference in office referrals among sixth grader students who attended single sex classes and sixth grader students who attended the traditional co-educational classes.

CHAPTER IV

DATA ANALYSIS AND RESULTS

This study was conducted in order to determine if there was a statistically significant difference in the percentage of students proficient or advanced in the core subjects between mixed-gender, or the traditional coeducational, sixth grade classes and six grade classes categorized as single-gender classrooms. The study used archival data taken from sixth grade students who attended Springfield Middle School in Robertson County. The school years studied were 2009-2010, 2010-2011, 2012-2013, and 2013-2014. The school year 2009-2010, the last school year of mixed-gender classes, and the school year 2013-2014, the most recent year of single-sex classes were compared for this study. Additionally, the number of discipline referrals were also studied for the same school years and the same students in sixth grade. Permission to conduct this study was granted by the Austin Peay State University Institutional Review Board (IRB) and permission to collect the data and conduct the study was also granted by the Robertson County School District Board of Education. This study utilized descriptive statistics in order to analyze the thirteen Null Hypotheses.

Hypothesis 1

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -Test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) achievement scores between 6th grade students who attended mixed-gender classes in the school year 2009-2010, and 6th grade students who attended single-gender classes in the 2013-2014 school year. There were 181 participants in the 2009-2010 school year, and the Mean score was 712.007 with a Standard Deviation of 92.45. In the school year 2013-2014, there were 209 participants. The Mean score was 744.244 with a Standard Deviation of 74.90. After administering the t -Test with an Alpha level of $p < .05$, the p value was .0001. This number indicated that there was a statistically significant difference between TCAP Reading achievement scores. The results led the researcher to reject Null Hypothesis 1. (See TABLE 1 for Mean scores, Standard Deviations, and t -Test p values)

TABLE 1

Simple t-Test, Alpha Level, $p < .05$ Used to Evaluate Achievement Scores on the Reading Tennessee Comprehensive Assessment Program (TCAP) Assessment between Students in Mixed-Gender Classrooms (2009-2010) and Single-Gender Classrooms (2013-2014)

Reading Test	Participants	Mean	Standard Deviation	p -Value
2010 mixed	181	712.007	92.4542	.0001*
2014 single	209	744.244	74.9090	

*Significant at $p < .05$

Null Hypothesis 2

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.

The researcher utilized a simple *t*-Test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Mathematics achievement scores between 6th grade students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade students who attended single-gender classes during the 2013-2014 school year. There were 181 participants in the 2009-2010 school year, with a Mean score of 724.117 and a Standard Deviation of 94.72. During the 2013-2014 school year, there were 207 participants. The Mean score was 728.48 with a Standard Deviation of 72.30. After administering the *t*-Test with an Alpha level set at $p < .05$, the *p* value generated was .3097. This number indicated that there is not a statistically significant difference in the Mathematics TCAP achievement scores between students in mixed-gender classes and students in single-gender classes when comparing the test data for the 2009-2010 school year and the 2013-2014 school year. The results led the researcher to retain the null hypothesis, there will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms. (See TABLE 2 for Mean scores, Standard Deviations, and *t*-Test *p* values)

TABLE 2

Simple t-Test, Alpha Level, $p < .05$ Used to Evaluate Achievement Scores on the Mathematics Tennessee Comprehensive Assessment Program (TCAP) Assessment between Students in Mixed-Gender Classrooms (2009-2010) and Single-Gender Classrooms (2013-2014)

Math Test	Participants	Mean	Standard Deviation	p-Value
2010 mixed	181	724.117	94.7204	.3097
2014 single	207	728.478	72.3007	

Significant at $p < .05$

Null Hypothesis 3

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.

The researcher administered a simple *t*-Test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Science achievement scores between 6th grade students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade students who attended single-gender classes during the 2013-2014 school year. There were 181 participants during the 2009-2010 school year, yielding a Mean score of 705.414 with a Standard Deviation of 91.8356. During the 2013-2014 school year, there were 209 participants. The Mean score was 732.632 with a Standard Deviation of 81.592. After administering a *t*-test, with an Alpha level set at $p < .05$, the *p* value was .0011. This number indicated that

there is a statistically significant difference in the Science TCAP achievement scores between students in mixed-gender classes and students in single-gender classes in the area of Science. The results led the researcher to reject the Null Hypothesis 3, there will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms. (See TABLE 3 for Mean scores, Standard Deviations, and *t*-Test *p* values)

TABLE 3
Simple t-Test, Alpha Level, $p < .05$ Used to Evaluate Achievement Scores on the Science Tennessee Comprehensive Assessment Program (TCAP) Assessment between Students in Mixed-Gender Classrooms (2009-2010) and Single-Gender Classrooms (2013-2014)

Science Test	Participants	Mean	Standard Deviation	<i>p</i> -Value
2010 mixed	181	705.414	91.8356	.0011*
2014 single	209	732.632	81.592	

*Significant at $p < .05$

Null Hypothesis 4

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -Test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Social Studies achievement scores between 6th grade students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade students who attended single-gender classes during the 2013-2014 school year. There were 181 participants during the 2009-2010 school year, which yielded a Mean score of 205.354 with a Standard Deviation of 27.6234. During the 2013-2014 school year, there were 209 participants. The Mean score was 202.665 with a Standard Deviation of 23.6508. After administering a simple t -Test with an Alpha level set at $p < .05$, the extracted p value was .8469. The value for the p value exceeded the Alpha level of 0.05. Therefore, the p value indicated that there is not a statistically significant difference in Social Studies TCAP achievement scores between students in mixed-gender classes and students in single-gender classes.

TABLE 4

Simple t -Test, Alpha Level, $p < .05$ Used to Evaluate Achievement Scores on the Social Studies (SS) Tennessee Comprehensive Assessment Program (TCAP) Assessment between Students in Mixed-Gender Classrooms (2009-2010) and Single-Gender Classrooms (2013-2014)

SS Test	Participants	Mean	Standard Deviation	<i>p</i> -Value
2010 mixed	181	205.354	27.6234.	.8469
2014 single	209	202.665	23.6508	
Significant at <i>p</i> < .05				

The results led the researcher to retain the Null Hypothesis 4, there will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms. (See TABLE 4 for Mean scores, Standard Deviations, and t -Test p values)

Null Hypothesis 5

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -Test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) achievement scores between 6th grade female students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade female students who attended single-gender classes during the 2013-2014 school year. There were 84 participants during the 2009-2010 school year, yielding a Mean score of 724.143 with a Standard Deviation of 73.7740. During the 2013-2014 school year, there were 109 participants. The Mean score was 746.101 with a Standard Deviation of 69.8338. After administering the t -Test with an Alpha level set at $p < .05$, the program extracted p value was .0187. The value for the p value exceeded the Alpha level of 0.05. Therefore, the p value indicated that there is not a statistically significant difference in Reading/Language Arts (RLA) TCAP achievement scores between students in mixed-gender classes and students in single-gender classes. The results led the researcher to

retain the Null Hypothesis 5, there will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms. (See TABLE 5 for Mean scores, Standard Deviations, and t -Test p values)

TABLE 5

Simple t -Test, Alpha Level, $p < .05$ Used to Evaluate Achievement Scores on the Reading Tennessee Comprehensive Assessment Program (TCAP) Assessment between Female Students in Mixed-Gender Classrooms for (2009-2010) and Female Students in Single-Gender Classrooms for (2013-2014)

Reading Test	Participants	Mean	Standard Deviation	p -Value
2010 mixed	84	724.143	73.7740	.0187
2014 single	109	746.101	69.8338	

Significant at $p < .05$

Null Hypothesis 6

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -Test to determine if there was a statistically significant difference for TCAP Mathematics achievement scores of 6th grade female

students who attended mixed-gender classes in the 2009-2010 school year as compared to 6th grade female students who attended single-gender classes in the 2013-2014 school year. There were 84 participants during the 2009-2010 school year, and the Mean score was 734.143 with a Standard Deviation of 77.1378. During the 2013-2014 school year, there were 108 participants. The Mean score was 730.315 with a Standard Deviation of 68.6096. After administering a simple t -Test with an Alpha level set at $p < .05$, the analysis of the data yielded a p value of .6396. The value for the p value exceeded the Alpha level of 0.05.

TABLE 6

Simple t -Test, Alpha Level, $p < .05$ Used to Evaluate Achievement Scores on the Mathematics Tennessee Comprehensive Assessment Program (TCAP) Assessment between Female Students in Mixed-Gender Classrooms for (2009-2010) and Female Students in Single-Gender Classrooms for (2013-2014)

Math Test	Participants	Mean	Standard Deviation	p -Value
2010 mixed	84	734.143	77.1378	.6396
2014 single	108	730.315	68.6096	

Significant at $p < .05$

Therefore, the p -value indicated that there is not a statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics achievement scores between students in mixed-gender classes and students in single-gender classes. The results led the researcher to retain the Null Hypothesis 6, there will

be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms. (See TABLE 6 for Mean scores, Standard Deviations, and t -Test p values)

Null Hypothesis 7

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -Test to determine if there was a statistically significant difference for TCAP Science achievement scores of 6th grade female students who attended mixed-gender classes in the 2009-2010 school year as compared to 6th grade female students who attended single-gender classes in the 2013-2014 school year. There were 84 participants during the 2009-2010 school year, and the Mean score was 710.238 with a Standard Deviation of 76.7711. During the 2013-2014 school year, there were 108 participants. The Mean score was 732.312 with a Standard Deviation of 67.9152. After administering a simple t -Test with an Alpha level set at $p < .05$, the analysis of the data yielded a p value of .0195. This number indicates that there is a statistically significant difference in Science TCAP achievement scores between female students in mixed-gender classes and female students in single-gender classes. The results led the researcher to reject the Null Hypothesis 7, there will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science

test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms. (See TABLE 7 for Mean scores, Standard Deviations, and *t*-Test *p* values)

Table 7

Simple t-Test, Alpha Level, $p < .05$ Used to Evaluate Achievement Scores on the Science

Tennessee Comprehensive Assessment Program (TCAP) Assessment between Female Students in Mixed-Gender Classrooms for (2009-2010) and Female Students in Single-Gender Classrooms for (2013-2014)

Science Test	Participants	Mean	Standard Deviation	p-Value
2010 mixed	84	710.238	76.7711	.0195*
2014 single	108	732.312	67.9152	

***Significant at $p < .05$**

Null Hypothesis 8

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.

The researcher utilized a simple *t*-test to determine if there was a statistically significant difference for TCAP Social Studies achievement scores of 6th grade female students who attended mixed-gender classes in the 2009-2010 school year as compared to

6th grade female students who attended single-gender classes in the 2013-2014 school year. There were 84 participants during the 2009-2010 school year, and the Mean score was 203.274 with a Standard Deviation of 25.9965. During the 2013-2014 school year, there were 108 participants. The Mean score was 201.257 with a Standard Deviation of 25.7619. After administering a simple t -Test with an Alpha level set at $p < .05$, the analysis of the data yielded a p -value of .7039.

TABLE 8

Simple t -Test, Alpha Level, $p < .05$ Used to Evaluate Achievement Scores on the Social Studies Tennessee Comprehensive Assessment Program (TCAP) Assessment between Female Students in Mixed-Gender Classrooms for (2009-2010) and Female Students in Single-Gender Classrooms for (2013-2014)

SS Test	Participants	Mean	Standard Deviation	p -Value
2010 mixed	84	203.274	25.9965	.7039
2014 single	108	201.257	25.7619	

Significant at $p < .05$

The p -value indicated that there is not a statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies achievement scores between female students in mixed-gender classes and female students in single-gender classes. The results led the researcher to retain the Null Hypothesis 8, there will be no statistically significant difference in Tennessee Comprehensive Assessment

Program (TCAP) Social Studies test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms. (See TABLE 8 for Mean scores, Standard Deviations, and t -Test p -values)

Null Hypothesis 9

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -Test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) achievement scores between 6th grade male students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade male students who attended single-gender classes during the 2013-2014 school year. There were 97 participants during the 2009-2010 school year, yielding a Mean score of 701.629 with a Standard Deviation of 105.280. During the 2013-2014 school year, there were 100 participants. The Mean score was 742.220 with a Standard Deviation of 80.383. After administering a simple t -Test with an Alpha level set at $p < .05$, the analysis of the data yielded a p -value of .0014. This number indicated that there is a statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) achievement scores between male students in mixed-gender classes and male students in single-gender classes. The results led the researcher to reject the Null Hypothesis 9, there will be no statistically significant difference in Tennessee

Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms. (See TABLE 9 for Mean scores, Standard Deviations, and *t*-Test *p*-values)

Table 9

Simple t-Test, Alpha Level, $p < .05$ Used to Evaluate Achievement Scores on the Reading Tennessee Comprehensive Assessment Program (TCAP) Assessment between Male Students in Mixed-Gender Classrooms for (2009-2010) and Male Students in Single-Gender Classrooms for (2013-2014)

Reading Test	Participants	Mean	Standard Deviation	<i>p</i> -Value
2010 Mixed	97	701.629	105.280	.0014
2014 single	100	742.220	80.383	

Significant at $p < .05$

Null Hypothesis 10

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms.

The researcher utilized a simple *t*-test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP)

Mathematics achievement scores between 6th grade male students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade male students who attended single-gender classes during the 2013-2014 school year. There were 97 participants during the 2009-2010 school year, yielding a Mean score of 715.546 with a Standard Deviation of 107.331. During the 2013-2014 school year, there were 100 participants. The Mean score was 726.475 with a Standard Deviation was 76.425. After administering a simple *t*-Test with an Alpha level set at $p < .05$, the analysis of the data yielded a *p*-value of .2067.

Table 10

Simple t-Test, Alpha Level, $p < .05$ Used to Evaluate Achievement Scores on the Mathematics Tennessee Comprehensive Assessment Program (TCAP) Assessment between Male Students in Mixed-Gender Classrooms for (2009-2010) and Male Students in Single-Gender Classrooms for (2013-2014)

Math Test	Participants	Mean	Standard Deviation	<i>p</i> -Value
2010 mixed	97	715.546	107.331	.2067
2014 single	100	726.475	76.425	

Significant at $p < .05$

The value for the *p*-value exceeded the Alpha level of 0.05. Therefore, the *p*-value indicated that there is not a statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics achievement scores between

students in mixed-gender classes and students in single-gender classes. The results led the researcher to retain the Null Hypothesis 10, there will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms. (See TABLE 10 for Mean scores, Standard Deviations, and *t*-Test *p*-values)

Null Hypothesis 11

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms.

The researcher utilized a simple *t*-test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Mathematics achievement scores between 6th grade male students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade male students who attended single-gender classes during the 2013-2014 school year. There were 97 participants during the 2009-2010 school year, yielding a Mean score of 701.237 with a Standard Deviation of 103.342. During the 2013-2014 school year, there were 100 participants. The Mean score was 732.980 with a Standard Deviation of 94.627. After administering a simple *t*-Test with an Alpha level set at $p < .05$, the analysis of the data yielded a *p*-value of .0129. The *p*-value which was less than the Alpha level led the researcher to determine that there was a statistically significant difference in Tennessee

participated in single-sex education and male students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Mathematics achievement scores between 6th grade male students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade male students who attended single-gender classes during the 2013-2014 school year. There were 97 participants during the 2009-2010 school year, yielding a Mean score of 207.155 with a Standard Deviation of 28.9717. During the 2013-2014 school year, there were 100 participants. The Mean score was 204.200 with a Standard Deviation was 21.134. After administering a simple t -Test with an Alpha level set at $p < .05$, the analysis of the data yielded a p -value of .7921.

Table 12

Simple t -Test, Alpha Level, $p < .05$ Used to Evaluate Achievement Scores on the Social Studies Tennessee Comprehensive Assessment Program (TCAP) Assessment between Male Students in Mixed-Gender Classrooms for (2009-2010) and Male Students in Single-Gender Classrooms for (2013-2014)

SS Test	Participants	Mean	Standard Deviation	p -Value
2010 mixed	97	207.155	28.9717	.7921
2014 single	100	204.200	21.134	

Significant at $p < .05$

The value for the p -value exceeded the Alpha level of 0.05. Therefore, the p -value indicated that there is not a statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies achievement scores between students in mixed-gender classes and students in single-gender classes. The results led the researcher to retain the Null Hypothesis 12, there will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms. (See TABLE 12 for Mean scores, Standard Deviations, and t -Test p -values)

Null Hypothesis 13

There will be no statistically significant difference in office referrals among sixth grader students who attended single-sex classes and sixth grader students who attended the traditional coeducational classes.

The data pertaining to the student discipline referrals from 2009-2010, the last school year when the mixed-gender classroom arrangement existed compared to the 2013-2014 school year which was the latest school year under the single-gender classroom instruction organizational arrangement was collected for those two years and all school years in between. The data indicated that the number of student discipline referrals were much lower when the classes were separated by gender (2009-2010, 2010-2011, 2011-2012, 2012-2013, and 2013-2014), as opposed to the 2009-2010 school year, when the students participated in mixed-gender classrooms. TABLES 14-17 display the

data collected for the number of office referrals based on gender for each school year, 2009-2010 through 2013-2014.

Table 14

Descriptive Results for Office Referrals by Gender for the 2009-2010 School Year for Mixed-Gender Classrooms

Gender	Number of referrals
Female	69
Male	423

Table 15

Descriptive Results for Office Referrals by Gender for the 2010-2011 School Year for Single-Gender Classrooms

Gender	Number of referrals
Female	30
Male	244

Table 16

Descriptive Results for Office Referrals by Gender for the 2011-2012 School Year for Single-Gender Classrooms

Gender	Number of referrals
Female	31
Male	112

Table 17

Descriptive Results for Office Referrals by Gender for the 2012-2013 School Year for Single-Gender Classrooms

Gender	Number of referrals
Female	142
Male	353

CONCLUSIONS AND RECOMMENDATIONS

Table 18

Descriptive Results for Office Referrals by Gender for the 2013-2014 School Year for Single-Gender Classrooms

Gender	Number of referrals
Female	127
Male	319

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to investigate and determine the impact of single-gender education on the sixth grade student academic achievement as measured by the Tennessee Comprehensive Assessment Program (TCAP) academic achievement test scores in Language Arts/Reading, Mathematics, Science, and Social Studies at Springfield Middle School. Five school years of scholastic test data were studied, tested, and analyzed, which focused on the number of students proficient or advanced on the TCAP achievement test for Reading/Language Arts, Mathematics, Social Studies, and Science. The school years from which the TCAP test data were taken consisted of the 2009-2010 school year which was compared to the TCAP achievement test data from the 2010-2011, 2011-2012, 2012-2013, and the 2013-2014 school year. Additionally, the number of student discipline referrals were collected, collated, and analyzed observationally using the last year students participated in the mixed-gender classrooms (2009-2010 school year) and making comparisons to the subsequent school years when they were active participants in an experimental single-gender classroom arrangement for instructional purposes (2010-2014 school years). The data were analyzed and comparisons made to determine statistical significance using *t*-tests. The study was focused on the analysis and testing of 13 Null Hypotheses to determine the level of statistical significance where the Alpha level was set at $p < .05$, for determining statistical significance. The JMP Statistics package and the EXCELL statistical software were used

to analyze all of the data for boys and girls, in single-gender versus mixed-gender classroom settings, for the 2009-2010, 2010-2011, 2011-2012, 2012-2013, and 2-13-2014 school years. Additionally, Tennessee Comprehensive Assessment Program scholastic achievement data for Reading/Language Arts (RLA), Mathematics, Science, and Social Studies were used to make the appropriate comparisons between the two groups, the two organizational units, and for the years listed to determine if any statistically significant differences existed between the subsets.

Findings

The main purpose of this study was to determine if the utilizing of single-gender education in the sixth grade had a statistically significant difference on TCAP achievement scores.

Null Hypothesis 1

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.

The researcher utilized a simple *t*-test to determine if there was a statistically significant difference among TCAP Reading achievement scores between 6th grade students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade students who attended single-gender classes during the 2013-2014 school year.

The statistics indicated that there is a statistically significant difference between TCAP Reading achievement scores. The results led the researcher to reject the null hypothesis.

Null Hypothesis 2

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.

The researcher utilized a simple *t*-test to determine if there was a statistically significant difference among TCAP Mathematics achievement scores between 6th grade students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade students who attended single-gender classes during the 2013-2014 school year. The statistics indicated that there is not a statistically significant difference in Mathematics Tennessee Comprehensive Assessment Program (TCAP) achievement scores between students in mixed-gender classes and students in single-gender classes. The results led the researcher to retain the null hypothesis.

Null Hypothesis 3

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.

The researcher utilized a simple *t*-test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Science achievement scores between 6th grade students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade students who attended single-gender classes during the 2013-2014 school year. The statistics indicated that there is a statistically significant difference in Science TCAP achievement scores between students in mixed-gender classes and students in single-gender classes. The results led the researcher to reject the null hypothesis.

Null Hypothesis 4

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores between sixth grade students who participated in single-sex education and sixth grade students who participated in the traditional coeducational classrooms.

The researcher utilized a simple *t*-test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Social Studies achievement scores between 6th grade students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade students who attended single-gender classes during the 2013-2014 school year. The statistics indicated that there is not a statistically significant difference in Social Studies TCAP achievement scores between students in mixed-gender classes and students in single-gender classes. The results led the researcher to retain the null hypothesis.

Null Hypothesis 5

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) achievement scores between 6th grade female students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade female students who attended single-gender classes during the 2013-2014 school year. The statistics indicated that there is a statistically significant difference in Reading TCAP achievement scores between female students in mixed-gender classes and female students in single-gender classes. The results led the researcher to reject the null hypothesis.

Null Hypothesis 6

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Mathematics achievement scores between 6th grade female students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade female students who attended single-gender classes during the 2013-2014 school year. The statistics indicate that there is not a statistically significant difference in Math TCAP achievement scores

between female students in mixed gender classes and female students in single-gender classes. The results led the researcher to retain the null hypothesis.

Null Hypothesis 7

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.

The researcher utilized a simple *t*-test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Science achievement scores between 6th grade female students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade female students who attended single-gender classes during the 2013-2014 school year. The statistics indicated that there is a statistically significant difference in Science TCAP achievement scores between female students in mixed-gender classes and female students in single-gender classes. The results led the researcher to reject the null hypothesis.

Null Hypothesis 8

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores among female students who participated in single-sex education and female students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Social Studies achievement scores between 6th grade female students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade female students who attended single-gender classes during the 2013-2014 school year. The statistics indicated that there is not a statistically significant difference in Social Studies TCAP achievement scores between female students in mixed-gender classes and female students in single-gender classes. The results led the researcher to retain the null hypothesis.

Null Hypothesis 9

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Reading/Language Arts (RLA) achievement scores between 6th grade female students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade female students who attended single-gender classes during the 2013-2014 school year. This statistics indicated that there is a statistically significant difference in Reading/Language Arts (RLA) TCAP achievement scores between male students in mixed-gender classes and male students in single-gender classes. The results led the researcher to reject the null hypothesis.

Null Hypothesis 10

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Mathematics test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Mathematics achievement scores between 6th grade male students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade male students who attended single-gender classes during the 2013-2014 school year. The statistics indicated that there is not a statistically significant difference in Mathematics TCAP achievement scores between male students in mixed-gender classes and male students in single-gender classes. The results led the researcher to reject the null hypothesis.

Null Hypothesis 11

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Science test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Science achievement scores between 6th grade male students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade male students who attended

single-gender classes during the 2013-2014 school year. The statistics indicated that there is a statistically significant difference in Science TCAP achievement scores between male students in mixed-gender classes and male students in single-gender classes. The results led the researcher to reject the null hypothesis.

Null Hypothesis 12

There will be no statistically significant difference in Tennessee Comprehensive Assessment Program (TCAP) Social Studies test scores among male students who participated in single-sex education and male students who participated in the traditional coeducational classrooms.

The researcher utilized a simple t -test to determine if there was a statistically significant difference among Tennessee Comprehensive Assessment Program (TCAP) Social Studies achievement scores between 6th grade male students who attended mixed-gender classes during the 2009-2010 school year, and 6th grade male students who attended single-gender classes during the 2013-2014 school year. The statistics indicated that there is not a statistically significant difference in Social Studies TCAP achievement scores between male students in mixed-gender classes and male students in single-gender classes. The results led the researcher to retain the null hypothesis.

Null Hypothesis 13

There will be no statistically significant difference in office referrals among sixth grader students who attended single-sex classes and sixth grader students who attended the traditional coeducational classes.

Data was collected for four school years and the data for student discipline referrals indicated that all the school years after the 2009-2010 school year, had less discipline referrals overall than the last year for the mixed-gender classrooms. The number of referrals by gender was also lower each school year when compared to the 2009-2010 school year, which was the final school year that the mixed-gender classrooms were used.

Conclusions

The purpose of this study was to determine if there was a statistically significant difference on Tennessee Comprehensive Assessment Program (TCAP) achievement scores in Reading, Mathematics, Science, and Social Studies, between students in the sixth grade who attended mixed-gender classes versus sixth grade students who attended single-gender classes. Additionally, the study was designed to observationally determine whether student discipline referrals were significantly changed due to the change in the classroom instructional arrangement comparing the office referrals for 2009-2010 to the subsequent school years that employed the single-gender classroom arrangement. The study used five school years of data from sixth graders at Springfield Middle School in Robertson County, Tennessee. Based on the findings of this study, the following conclusions were presented:

1. There was a statistically significant difference in the achievement scores on the TCAP Reading and Science between students in mixed gender classes and students in single-gender classes.

2. There was a statistically significant difference on achievement scores for females who attend single-gender classes and females who attend single-gender classes in Reading, and Science.
3. There was a statistically significant difference on achievement scores for males who attend single-gender classes and males who attend single-gender classes in Reading, and Science.
4. Discipline referrals were the highest in the four years of data studied when the gender was mixed in the sixth grade.
5. Statistical significance does not mean causality. The Reading and Science scores improved, but it cannot be proven by this study that single-gender education was the reason.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Further research should be conducted on the subject of single-gender education in Robertson County with other schools and demographics.
2. Further research should be conducted in order to determine how the sixth grade students in single-gender classes performed on the TCAP once they enter mixed gender classes again in seventh and eighth grade.
3. Further research should be conducted other schools that have similar demographics in order to see if there are similarities among scores.
4. Further research should be conducted to determine why Reading and Social Studies were statistically different in all categories.

5. Further research should be conducted with regards to discipline data which includes the sixth grade students once they have entered seventh and eighth grade.
6. Springfield Middle School should pilot a single-gender class for both boys and girls in the seventh and eighth grade in order to see if it helps increase test scores.
7. Teachers' attitudes towards single-gender education was not researched. This information could have an effect on how these teachers perform in the classroom.

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APPENDICES

Appendix A: Institutional Review Board

August 25, 2014

The Robertson County School Board and the Director of Schools hereby authorize Mr. Matthew Coffey permission to conduct a research project using archival data from Springfield Middle School for his EDS Field Study at Austin Peay State University in Clarksville, Tennessee.

Matthew's topic pertains to "The Effects of Single-Sex Education on TCAP Reading Scores in One Middle Tennessee Middle School". The data for his study will be provided by our system-wide accountability officer charged with maintaining all achievement data for the students in the Robertson County Schools.

A handwritten signature in black ink, appearing to read 'Linda Cash', with a long, sweeping horizontal line extending to the right.

Dr. Linda Cash

Assistant Director of Schools

Robertson County Schools

AUSTIN PEAY STATE UNIVERSITY HUMAN RESEARCH REVIEW BOARD

Appendix A: FCAP Reading Scores in One Middle

Appendix B: Research review process at Austin Peay State

has been reviewed and approved for exemption
under the 45 CFR 46.101 (b) (4); the
data is recorded in such a manner that the

Appendix B

Letter of Approval to Conduct Research

Robertson County School Board



**AUSTIN PEAY STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD**

Date: 6/2/2014

RE: 14-024 -The Effects of Single Sex Education on TCAP Reading Scores in One Middle Tennessee Middle School

Dear Matthew Coffey,

We appreciate your cooperation with the human research review process at Austin Peay State University.

This is to confirm that your research proposal has been reviewed and approved for exemption from further review. Exemption is granted under the Common Rule 45 CFR 46.101 (b) (4); the research involves only the study of existing data, the data is recorded in such a manner that the subjects cannot be identified directly or through identifiers.

You may conduct your study as described in your application, effective immediately. Please note that any changes to the study have the potential for changing the exempt status of your study, and must be promptly reported and approved by APIRB before continuing. Some changes may be approved by expedited review; others require full board review. If you have any questions or require further information, you can contact me by phone (931-221-6106) or email (shepherd@apsu.edu).

Again, thank you for your cooperation with the APSU IRB and the human research review process.

Sincerely,

Omie Shepherd, Chair
Austin Peay Institutional Review Board

Cc: Dr. Gary Stewart