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A Comparison of Student Performance in Single-Sex Education and Coeducational Settings in Urban Middle Schools

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A COMPARISON OF STUDENT PERFORMANCE IN SINGLE-SEX EDUCATION AND COEDUCATIONAL SETTINGS IN URBAN MIDDLE SCHOOLS

by

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(Under the Direction of Linda M. Arthur)

ABSTRACT

Since amendments to NCLB in 2004, public schools have not only established single-sex schools, but have also established single-sex classrooms within coeducational schools. Most of these modifications were adopted as a means to provide support to low-achieving students, many of who reside in urban settings. Proponents of single-sex instruction state that mostly African Americans, Hispanics, and females benefit most from this type of instructional setting because single-sex environments help to reduce gender stereotypes students encounter in coeducational settings. Opponents of single-sex instruction believe that accomplishments achieved in single-sex environments can be achieved in coeducational environments if the proper teaching strategies were in place. Opponents also feel that not enough studies have been conducted to make a strong claim that single-sex environments are better than coeducational environments.

This study compared GCRCT middle grades mathematics scores for three years at four middle schools within an urban school district in Georgia to determine if the instructional setting is a factor in student performance. Two single-sex schools were selected (one male and one female), and two coeducational schools (one traditional and one that incorporated homogeneous class groupings). In addition to the instructional

setting, student gender and grade level were examined to identify possible relationships with students' GCRCT mathematics achievement.

The results of this study indicated that sixth grade male coed single-sex students, and seventh grade female coed students in the sample group were more likely to pass the GCRCT in mathematics than their peers in the other instructional settings. A cohort group, which is a subset of the sample group, identified students who remained in one school for grades sixth through eight. The results indicated that sixth and eighth grade cohort female coed students were more likely to pass the GCRCT in mathematics than their peers in the other instructional settings. Results also indicated, over a three-year period female students of the sample group enrolled in coed classes, and female students of the cohort group enrolled in a single-sex school had the largest gains on the GCRCT in mathematics.

INDEX WORDS: Coeducational, Federal legislation, Gender issues, Heterogeneous classes, Homogeneous classes, Learning differences, Middle schools, Public schools, Single-sex classes, Single-sex instruction, Single-sex schools, Standardized tests, Stereotypes, Student achievement, Urban middle schools, Urban students.

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DEDICATION

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CHAPTER I

INTRODUCTION

According to the U.S. General Accounting Office on public education, public education evolved from primarily single-sex education for boys to primarily coeducation before the turn of the 20th century. In colonial America, formal public education was primarily available to boys; girls were typically educated informally and in the home. Gradually, girls began to be integrated into the public elementary or "common" schools, and by the middle of the 19th century, almost as many girls as boys were attending these schools (Steptoe & Arbor, 2004). Most of the common schools were small and located in rural areas where the economy of educating boys and girls together may have played a part in the coeducational model. During the 1800s, the desirability of coeducation in secondary schools was debated, and opponents cited the need to protect girls both from danger to their health and from boys. In addition, considerable discussion centered on the appropriate curriculum, including differences in abilities and learning styles of boys and girls and whether they should learn the same subjects in school. By 1890, coeducation was clearly the most common model for public schools. In 1972, nondiscrimination legislation was passed to protect students from discrimination in education based on gender (General Accounting Office, 1996).

Title IX of the Education Amendments of 1972 prohibits school districts from discriminating against students based on sex and sets legal limits to single-sex public education. In addition, several court cases in recent years have challenged single-sex public education under the Fourteenth Amendment of the U.S. Constitution. Although Title IX does not govern admissions practices at the elementary and secondary school

level except for vocational schools, it does require that school districts provide comparable facilities, courses, and services to boys and girls–separate, but equal (Sneed, 2009). Thus, Title IX does not preclude a school district from having single-sex schools. Title IX as implemented by the Department of Education (DOE) regulation; however, generally prohibits single-sex classrooms in coeducational schools. The regulation has some exceptions; for example, single-sex classes are permitted for portions of physical education classes when students are playing contact sports or portions of classes on human sexuality. It may also be possible for a school to have single-sex classrooms as a remedy for past discrimination or as a form of affirmative action under certain specific conditions (Sneed, 2009).

In 2001, Senator Hillary Clinton joined Senator Kay Bailey Hutchison in proposing an amendment to the No Child Left Behind (NCLB) Act that would eventually pass and allow any public school to implement single-sex programs with only a few regulations (Sax, 2002). Since the amendments to NCLB in 2004, public schools have not only established single-sex schools, but have also established single-sex classrooms within coeducational schools. These classes are voluntary and are aimed to promote academic achievement in subjects where boys and girls may find it difficult to excel in a coeducational setting. Students who attend these classes experience the bond of working in a same gender setting within a coeducational environment, thereby avoiding complete exclusivity of the opposite sex.

Some research has focused on whether single-sex education results in statistically significant improvements in achievement as compared to results obtained in coeducational classes. Within this body of research the emphasis has been on the type of

subject matter (e.g., English, science), teacher experience in implementation, the organizational elements of single-sex schools (e.g., school size, course offerings, climate for learning, leadership), student prior achievement and background, sex-role stereotyping, and student confidence and engagement (Bracey, 2007; Fergus & Noguera, 2010; Mael, Alonso, Gibson, Rogers, & Smith, 2005; Malacova, 2007; Salomone, 2005). Whether students are attending single-sex classes or schools, school districts are faced with the goal of making incremental gains in education. Urban middle school students are faced with challenges that affect them both academically and socially. These challenges affect the incremental gains both schools and school districts earn.

None of the limited number of empirical studies examines the viability of single-sex education or offer clear guidance related to best practices with respect to how education should be delivered or how such schools and classrooms should be managed and organized. Most specifically, the research on all-male schools is limited by a lack of attention to how assumptions about gender (e.g., what boys need) and their development influence the decisions to separate boys and underlie the choices in teaching and learning practices and classroom management techniques (Fergus & Noguera, 2010). Educators have used best practices to understand the nature of the urban middle school child in order to help students break through barriers and excel in areas of weakness. Historically, urban middle school students have experienced achievement gaps in their education. Many theories have elicit as to why single-sex schooling is a viable intervention model for the educational dilemma facing low-income, Black and Latino boys, or boys of color. Creating a nurturing school climate will positively affect the boys' social, emotional, and academic development that can help students rise above

some of the barriers that they face in life. These barriers include racism, low expectations, lack of relevant instruction, and monolithic instruction techniques that do not address the boys' learning styles (Fergus & Noguera, 2010).

Urban middle schools in some Georgia school districts experience similar challenges, as noted in the Georgia State School Report Card (Georgia Department of Education, 2010). Some districts have implemented school reform models, single-sex classrooms, and single-sex schools to address this problem. Some districts have reorganized schools and district offices, established partnerships, acquired graduation coaches, and implemented behavioral management programs. All of these programs require time, effort, funding, and buy-in. Therefore, it is important for the administrative team of a school district to determine the effectiveness of such programs and how to fund them.

Overview of Literature

Cable and Spradlin (2008) state that there has been less experimentation with same-sex education since the 1970s, when same-sex public schooling became prohibited for most situations by federal law. The option of single-sex schooling in public schools has emerged once again and only recently through federal policies associated with NCLB, allowing some parents who are disillusioned with their children's current educational experiences to explore a broader array of educational choices (Cable & Spradlin, 2008). Mead (2006) found that many parents are particularly worried about their male children because of recent reports proclaiming a *boys' crisis*. One concern of many is a belief that boys are far behind girls in achievement.

According to Hurst and Johansen (2006), the DOE has identified two important governmental objectives for educating students: (a) improving the educational achievement of students through diverse educational opportunities and (b) meeting the identified needs of students. The U.S. Department of Education analysis of the changed regulations makes it clear that the first objective, providing diverse educational opportunities is not satisfied by simply offering a single-sex class and declaring that it, by definition, promotes diversity and opportunity. At the local educational agencies level, single-sex and coeducational opportunities must be part of an array of options (Hurst & Johansen, 2006).

Based on the findings of Hurst and Johansen (2006), the arguments for single-sex schools and classrooms fall into two categories. The first category is pedagogical: advocates argue that teaching methods that take into account the social or biological differences between girls and boys can be more effective. The second category of arguments in favor of separate education for boys and girls centers on the perceived negative impact on learning resulting from social interactions between girls and boys. Some advocates of single-sex education worry that both girls and boys may suppress themselves intellectually to impress the opposite sex (Hurst & Johansen, 2006).

Throughout the primary grades, the performance of female students consistently exceeds that of male students in the areas of reading and writing. In science, boys and girls perform similarly at age nine; but beginning in middle school, girls start to fall behind. By the time they are 13, White boys begin to surpass White girls in science, and by age 17, both White and Hispanic males outshine their female counterparts. Some proponents of single-sex education view this achievement gap as evidence that

coeducation hurts female students, but the actual causes are hard to pinpoint (Hurst & Johansen, 2006).

In spite of their superior achievements in science, and perhaps math, the prevailing wisdom is now that male students are generally less successful academically than their female counterparts. Their higher failure rates at all levels of education gained publicity, as evidenced by a Newsweek cover story entitled, *The Trouble with Boys* (Tyre, 2006). In elementary school, boys are two times more likely than are girls to be diagnosed with learning disabilities and twice as likely to be placed in special education classes. High school boys are losing ground to girls on standardized writing tests. The number of boys who said they did not like school rose 71% between 1980 and 2001. Nowhere is the shift more evident than on college campuses. Thirty years ago, men represented 58% of the undergraduate student body. Now they are a minority at 44% (Hurst & Johansen, 2006).

Supporters of single-sex schooling in low-income areas believe that their students should have a right to opportunities that are generally only available to upper and middle class students. Many would agree that single-sex education in private or religious schools has promoted students' achievements more than hindered them, but the question is whether students at these schools have succeeded because of the specific structure of single-sex schooling or because of other factors, such as the socioeconomic status of the students (Cable & Spradlin, 2008).

The most commonly cited studies are those by Riordan (1994), who showed that African American and Hispanic students of both sexes do better in single-sex schools on all test scores nearly a year above their counterparts in coeducational schools. Moreover,

Riordan pointed out that the most important factor contributing to the observed gains may be the parents' and students' making a *proacademic choice*, not the single-sex setting (Riordan, 1994). One proacademic objective is to help the boys become responsible, successful people, and to build self-esteem through academic success. The standard middle school curriculum is taught with an emphasis on individual growth, academic success, social responsibility, and good citizenship. Special curriculum components include a mentoring program in which boys are counseled on subjects such as careers, gangs, family issues, and academics. In addition, the curriculum emphasizes culture, history, society, and technology (Steptoe, 2004).

The academic and developmental consequences of attending one type of school versus another type of school are virtually zero for middle-class and otherwise advantaged students; by contrast, the consequences are significant for students who are or have been historically or traditionally disadvantaged, minorities, low- and working-class youth, and low-income females (Noguera & Akom, 2004). Pollard (1999) researched voluntary afterschool single-sex programs at two African American schools. Pollard felt that the positive results were due to the stigma that traditional schools fail urban African Americans; whereas, single-sex classes consequently offer closer interactions with the African American culture and community (Pollard, 1999). Since the purpose of single-sex classes is to promote achievement for predominately low-income African American children, Pollard found that the focus was more on culture. As a result, positive effects may not be a result of the structure of single-sex schooling but results of influences such as the focus on culture, a strong supportive community, the provision of more successful

role models, and the provision of a greater number of leadership opportunities (Pollard, 1999).

Hubbard and Datnow (2005) believe that although the student composition of schools is clearly a significant determinant of program outcome, studies reveal the importance of understanding student-teacher relationships, the role of resources, and the single-sex school arrangement as an interrelated set of factors that jointly construct the educational experiences of low-income and minority students. Low teacher expectations have been shown to disadvantage African American males in public school classrooms. African American females fare better by comparison (Hubbard & Datnow, 2005). Teacher expectations are typically lower for low-income and African American students than for middle- and upper-income white students (Hubbard & Datnow, 2005). Similarly, Latino males and females each face academic pressures that differ from those of their White peers, and these pressures vary depending on whether the students live in urban or rural locations. Latinas perform less well than other racial and ethnic groups of girls on several key measures of educational achievement, but have "steadily increased their high school and college graduation rates over the last 20 years" (p. 53) moving ahead of their male peers (Cammarota, 2004).

Problem Statement

In today's economy, budget constraints are forcing school districts to cut back in all areas of education, from the central office to the classroom. Strategically, districts and schools are carefully examining ways to cut back on expenses without sacrificing their ability to provide a quality education to their students. As a possible solution to address the nature of the urban middle school student and to improve academic performance,

some districts have created single-sex schools. Within those same districts, coeducational schools have also adopted the single-sex classroom model to address middle school performance issues. If single-sex classrooms within coeducational schools show similar gains in academics as in single-sex schools, then the possible elimination of current and/or future single-sex schools could serve as a means to strategically cut back on the funding of buildings, certain professional developments, transportation, resources, administration, and staff for single-sex schools. Students must master mathematics in order to compete successfully in a global market. Therefore, the purpose of this study was to determine if differences in academic performance in mathematics exist among urban middle school students who attend coeducational classes, single-sex classes within a coeducational school, or a single-sex school.

Research Question

The study was guided by the following overarching question. What differences in academic performances in mathematics exist between students in coeducational urban middle schools who attend single-sex and coeducational classes and students who attend an urban single-sex middle school? The following supporting questions will be addressed.

1. In which academic setting (coeducational, single-sex in coeducational school, or single-sex school) do males perform best?
2. In which academic setting (coeducational, single-sex in coeducational school, or single-sex school) do females perform best?

Significance of Study

Middle schools play a significant role in a students' transition from elementary to high school. Understanding that there is a critical need for teachers to graduate students who are proficient to compete in a global market, school districts must implement proactive measures in order to meet this need. As schools move toward designing and implementing best practices, the design of establishing single-sex schools and single-sex classes within coeducational schools was the focus of this study.

The results of this study may be used to inform professional practice by identifying how best practices can fund teacher professional development to improve student academic performances. The results may help school districts determine the best allocation of teachers, administration, administration, and resources. The findings of this study may also support parents who favor the positive academic results of single-sex education, but are resistant to the single-sex school concept.

Based on the empirical literature, single-sex education is associated with improved academic and behavioral performance in students, but few large-scale studies report the advantages of single-sex classes in coeducational schools versus single-sex schooling, especially in urban school districts. Findings may show that both male and female students can co-exist within the same building and attend single-sex classes (i.e., mathematics and science) while improving academically. The findings may also show that urban middle school students are no more successful academically when attending single-sex classes for specific subjects, as compared to students in regular coeducational courses.

Method

This quantitative study involved an ex post facto causal-comparative research design. Different instructional settings (single-sex school, single-sex classes within a coeducational setting, and coeducational classes) for urban middle school students were compared to determine if mathematics achievement differences existed among the groups. Three years of Georgia Criterion-Referenced Competency Test (GCRCT) for mathematics were collected. The independent variables were the instructional setting, gender, and grade level in which the instruction took place. The dependent variable was performance on the mathematics section of the GCRCT. The researcher selected the subjects based on the courses at the four schools between the school years 2007–210.

The population for this study was a group of middle school students within an urban school district in Georgia during the 2007-2010 school years. The researcher included students from two single-gender urban middle schools and two coeducational urban middle schools. The schools are within the same school district, but are located in different areas of the district. One coeducational middle school conducts single-sex classes and the other coeducational middle school maintains coeducational courses for all students.

To investigate the research question for this study, the proportion of students who passed and failed the mathematics GCRCT in each of the instructional settings were compared by gender and grade. This comparison was made using an independent samples chi-square test. The statistical test was evaluated at an alpha level of $p < .05$ (Gall, Borg, & Gall, 2007).

Delimitations and Limitations

The study was delimited to single-sex and coeducational middle schools in an urban school district in Georgia. Hence, the findings may not be generalized to all schools. Data were limited based on the number of single-sex courses offered at an urban middle school. The researcher is limited to the schools' ability to identify accurately specific groups of students who were related to the mathematics classes. Data were limited to urban middle school students' scores on the mathematics GCRCT. As a final limitation, the researcher had no control over the educational setting of the students studied or the quality of the instruction received.

Definition of Terms

Academic performance. For the purposes of this study, student achievement is based on performance on the 2008, 2009, and 2010 mathematics portion of the Georgia Criterion-Referenced Competency Test.

Georgian Criterion-Referenced Competency Test (GCRCT). The GCRCT is designed to measure how well students acquire the skills and knowledge described in the Georgia Performance Standards (GPS). The assessments yield information on academic achievement at the student, class, school, system, and state levels. This information is used to diagnose individual student strengths and weaknesses as related to the instruction of the GPS, and to gauge the quality of education throughout Georgia (Georgia Department of Education, 2010).

No Child Left Behind Act (NCLB). The purpose and mission of the No Child Left Behind Act is to eliminate the achievement gap that exists between groups of students within our nation's schools. A disparity exists in the achievement of Black, Hispanic,

and students living in poverty when compared to White and more affluent students in the subjects of reading and mathematics (U.S. Department of Education, 2010).

Single-sex instruction. Class groupings of students of the same sex within a coeducational setting.

Single-sex schools. Students of the same sex who attend the same educational facility.

Title IX – Education Amendment of 1972. The Education Amendment of 1972 states that no person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance.

Urban middle school students. Students in Grades 6–8 living within a densely populated area or city.

Summary

NCLB states that by 2014 all children will excel in the areas of reading and mathematics. Schools districts have implemented school reform models and have created both single-sex schools and single-sex classes within coeducational schools as a means to increase student achievement. In order to minimize cost, school districts are eliminating positions and closing schools. Single-sex schools have been created as a means of improving student instruction, but questions arise about how effective the schools are in terms of funding and how the achievement rate of single-sex school students compare to students of single-sex classes offered in coeducational schools. Therefore, the purpose of this study was to determine if differences in academic performance in mathematics exist among urban middle school students who attend coeducational classes, single-sex classes

within a coeducational school, or a single-sex school. This was an Ex Post Facto causal-comparative study utilizing the Georgia Criterion Competency test in mathematics for students in urban middle schools. A three-year historical examination of GCRCT test scores were collected from three different instructional settings for urban middle school students. Chi-Square was used to examine if a relationship between groups (gender, grade, GCRCT achievement, or school year) exist. The researcher will use the Statistical Packages for Social Sciences to determine if differences in academic performance in mathematics exist among students who attend co-educational classes, students who attend single-sex classes within a co-educational middle school, and students who attend a single-sex middle school. The major findings might indicate (a) if there are significant differences in achievement amongst students who attend different instructional strategies based on gender; (b) the instructional settings in which certain genders, ethnic groups, and grades show increased academic performance; (c) how the results of this study may affect funding; (d) a need to provide professional development for teachers to focus on learning styles based on gender; (e) to parents if academic achievement can be achieved in a single-sex class without having to enroll their children in a single-sex school; and (f) that the findings may have implications for other school districts that have single-sex schools and single-sex classes within coeducational schools.

CHAPTER II

REVIEW OF THE LITERATURE

As school districts look for ways to improve student achievement, many instructional best practices and modifications to the learning environment have been used. School reform models have been implemented as a means to support NCLB. As a result, single-sex classes and schools have been created as a means to increase student achievement in both male and female students, especially in critical subject areas such as mathematics and science. With the creation of NCLB, single-sex classes and schools are allowed under specific conditions. This review of the literature addresses the legal aspects of single-sex instruction, the pros/cons of single-sex instruction, and identifies factors that may influence outcomes such as student achievement and successful single-sex instructional programs.

History of Single-Sex Schools

Coeducation was the norm for most public schools in the United States throughout the 19th and 20th centuries. In 1972, Title IX became law and prohibited discrimination based on sex in education programs and activities in federally funded institutions. What had been the norm was now the law. In 1975, the Department of Health, Education, and Welfare issued Title IX regulations barring single-sex classes or programs. During the 1970s and 1980s, the U.S. Supreme Court handed down decisions that affected Title IX. Federal courts consistently held that single-sex education did not violate Title IX, as long as comparable classes and facilities are available to males and females, single-sex public education is constitutional (Hughes, 2007).

NCLB paved the way for an aggressive approach to educational reform and included incentive grants for single-sex schools. NCLB gave schools the opportunity to revisit the idea of single-sex classrooms or single-sex schools. In 2002, The Department of Education began revising Title IX provisions to make it easier for schools to adopt single-sex policies. Recognizing that no guidelines existed to help public schools in the transition from the traditional coeducational to single-sex education, Senators Kay Bailey Hutchison and Hillary Rodham-Clinton sponsored a provision to provide direction to schools that wished to establish, under NCLB, single-sex classes or schools. Former U.S. Secretary of Education Rod Paige stated that this regulation was designed to provide educators and parents with a wider range of diverse education options in public as well as private schools that receive federal aid to meet the needs and interests of students (Hughes, 2007).

Following the amendment changes in NCLB in 2002, more public schools began offering single-sex education. In 1999, only four public schools offered single-sex education. By 2010, at least 540 schools offered single-sex programs. Most of these schools were coeducational and offered single-sex classes within the traditional coeducational setting. However, only 91 (17%) of the 540 schools were completely single-sex (Guarisco, 2010). According to Fergus & Noguera (2010), despite the increase in the number of single-sex classes, the research supporting the benefits of an intervention that isolates males from their female peers is sparse and at best inconclusive. Nonetheless, policymakers and educators have begun to embrace single-sex schools and classrooms for urban city students as an intervention they hope will solve some of the problems these groups of children face (Fergus & Noguera, 2010).

Some recent studies conducted by Gibb, Fergusson, and Horwood (2008), suggest that the ways in which schools are organized and structured can have a considerable impact on gender gaps in educational achievement. This suggests that one route to reducing gender differences in educational achievement may be for schools to adopt organizational practices that help to reduce gender biases in educational achievement. Single-sex schools are likely to differ from coeducational schools in a number of ways, including the gender mix of the student population, school ethos, competitiveness, academic focus, and discipline regime (Gibb, Fergusson, & Horwood, 2008).

Legal Issues

Traditionally, single-sex education has been provided in the form of private schooling. Title IX, which prohibits sexual discrimination, and Supreme Court decisions such as United States v. Virginia initially presented a hurdle to the widespread development of single-sex schools. Title IX regulations have loosened because of the NCLB legislation; therefore, public school districts now have the legal right to create single-sex classes or single-sex schools if they deem it to be in the best interest of their students. NCLB effectively endorsed single-sex education for students by identifying such programs as innovative assistance programs. The Department of Education subsequently enacted Title IX regulations in 2006 allowing for voluntary single-sex classes and activities; however, the regulations allow these classes and activities only when they were accompanied by *substantially equal* classes and activities available to both sexes or to the excluded sex (Guarisco, 2010).

Although both Title IX and the U.S. Constitution allow single-sex programs in appropriate circumstances, both require careful safeguards to ensure that these programs,

where offered, serve appropriate purposes and do not perpetuate sex discrimination. However, the new regulations lack these safeguards and could encourage schools to establish single-sex programs that turn the clock back to the time when girls were separate and unequal in education. Without adequate safeguards, single-sex programs can actually increase discrimination. When schools offer programs only to students of one sex, they are by definition using the gender of students of the other sex as the sole basis for excluding those students from educational opportunities from which they could benefit. By excluding students of one sex, moreover, schools risk reaffirming stereotypes about the interests, abilities or learning styles of both genders (National Coalition for Women and Girls in Education, 2008).

Under the new 2006 single-sex regulations, schools can exclude boys or girls from classrooms or schools based on vague goals such as "improving the educational achievement of students" by "providing diverse educational opportunities" (National Coalition for Women and Girls in Education, 2008, p. 40) or meeting the particular, identified educational needs of their students. Nothing in the regulations prevents schools from acting based on harmful sex stereotypes (i.e., that girls cannot learn in fast paced or competitive environments or that separating boys and girls is the only way to remedy sexual harassment). The new regulations even allow schools to create sex-segregated programs based on parent or student preferences–a practice that would never be allowed were the issue to be segregation based on race (National Coalition for Women and Girls in Education, 2008). Because single-sex education is not unconstitutional, school districts can take advantage of the option to create either single-sex schools or

single-sex classes along with coeducation if they conclude that it improves performance of students (Hughes, 2007).

Pros of Single-Sex Education

Some researches believe that single-sex schools would actually benefit boys the most–specifically, boys from minority groups and boys from poor families who may need more direct guidance (Guarisco, 2010). In public school single-sex environments, student achievement improves, especially for minority students or students in poverty, because of improved behaviors and teacher focus on learning-style differences (Guarisco, 2010). Females also benefit from single-sex environments. Sexual harassment is an unfortunate problem in coeducational environments (Guarisco, 2010). While the risk is still present in single-sex schools, some feel that the single-sex environment provides a safer environment for female students. School districts should give parents the choice of single-sex education or coeducation by offering single-sex classes or single-sex schools along with coeducation (Hughes, 2007).

Following several historical studies, Dale (1969, 1971, 1974) concluded that coeducational schools provide a more favorable social environment to both students and teachers, and that this advantage is not detrimental to academic progress. Many people disagreed and opposite views arose. Particularly for mathematics and sciences, many claimed that a single-sex rather than a coeducational environment is more favorable for the development of girls' self-concept and positive attitudes toward learning (Lawrie & Brown, 1992; Lee & Bryk, 1986; Lee & Lockheed, 1990).

In a recorded study documented by Burns (1997), the outcome of the changed classroom circumstances (single gender) in which the children and teachers were

observed, actually indicated an increase in social cohesion over the two-year observation. Such a finding is contrary to the expectation that had there been a Hawthorne effect in operation; such an effect would tend to diminish over time (Burns, 1997). The depth and detail of the study limits generalizations from the findings, but they do offer a high level of validity and provide a singular insight into the responses of the teachers and the children to their participation in single-gendered classrooms (Wills, 2007).

Similarly, the adversarial and oppositional relationships that commonly occur between genders and are evident in many coeducational classrooms (Millard, 1997) have the potential to negatively influence learning outcomes (Thorne, 1993). Another factor that may negatively influence learning outcomes is the understanding that attitudes gained at home and the community will remain dominant in the classroom. On the contrary, some teachers found children were influenced by the positive classroom group attitudes toward learning being encouraged in their classes (Wills, 2007). Single-sex classes can help reduce negative influences. The point was well made by the male teacher who argued that the single-gendered class had made a positive difference:

> Well, the single-gendered aspect of the class affects everything that happens in the room. The guys are just more settled, more relaxed, they're even here more, they don't get stressed out and stay away from school. They don't get sent out either. They're not trying to be cool fools. (Wills, 2007, p. 132)

Sax (2005, 2007) argues that boys and girls have a number of differences that are best accommodated by single-sex schooling. Sax (2008) reports that "in the coeducational classroom so many of the choices we make are to the advantage of girls, but disadvantage boys" (p. 1) and that schooling boys and girls separately is the best way to accommodate boys' needs without disadvantaging girls (Sax, 2008). Lee and Marks (1990), it was found that for males, mathematics SAT scores were higher amongst those

attending single-sex schools; while, for females, mathematics SAT scores were higher for those attending coeducational schools. For verbal SAT scores the pattern was somewhat different, with males having similar scores at single-sex and coeducational schools, and females having higher scores at single-sex schools (Gibb et al., 2008).

Cons of Single-Sex Education

If one accepts the idea that private schools use more demanding criteria for selecting students, it means that not only girls, but also boys who are selected are those who have higher achievement motivation. This may suggest that social comparison between boys and girls in mathematics might be particularly detrimental for girls who are enrolled in a more challenging environment with highly motivated and achieving boys. In a less competitive context, like public schools, where there is probably also more inter-individual differences, girls did not seem to be hampered by the presence of boys in mathematics classes (Chouinard, Vezeau, & Bouffard, 2008).

Some organizations and individuals do not agree that single-sex education meets federal criteria because it violates the 1954 Brown v. Board of Education ruling that separate is inherently unequal. An argument that is often brought up in opposition to single-sex schools is that such schools cannot adequately prepare students for the real world (Guarisco, 2010). According to Vail (2002), the "National Organization for Women (NOW) and the American Association of University Women (AAUW) worry that separating children by sex is similar to separating them by race" (p. 33). Some argue that allowing single-sex education would be a legal step backwards and feel strongly that the interpretation of the law is being violated. The NOW opposes single-sex education in the belief that "so-called 'separate but equal' policies rarely treat girls equally, often

relying on outdated sex-stereotypes about girls' and boys' interests and abilities" (Guarisco, 2010, p. 7). NOW also fears that "all-boys schools increase sexism and exacerbate feelings of superiority toward women" (Guarisco, 2010, p.8). NOW believes that the best way to achieve workplace equality in the future is to enhance, not eliminate, interaction between boys and girls in the classroom (Guarisco, 2010).

Opponents contend that separating by sex is no different than separating by race. To suggest single-sex education is comparable to separating by race, one must recall that in Brown v. Board of Education, choice was not an option. Students were segregated by race in an attempt to keep down the African American and non-White population. In contrast, the initiative behind single-sex education is to elevate both sexes to a higher level of achievement (Hughes, 2007). The American Association of University Women found that there is no evidence that single-sex education in general "looks" or is "better" than coeducation (Protheroe, 2009, p. 32). Single-sex educational programs produce positive results for some students in some settings. However, researchers do not know whether the benefits derive from factors unique to single-sex programs, or whether these factors also exist or can be reproduced in coeducational settings (Protheroe, 2009).

Smithers and Robinson (2006) conducted a review of studies that examined educating girls and boys together and separately, either in different schools or in different classes. They looked at studies from Australia, the United States, Canada, New Zealand, Ireland, and the United Kingdom and concluded that there were no consistent findings and that single-sex education is either advantageous or disadvantageous. Smithers and Robinson also noted that the influences of gender are far outweighed by ability, social background and race. Overall, they concluded that there are excellent coeducational

schools and excellent single-sex schools, and they are excellent for reasons other than that they separate, or bring together, the sexes for their education (Smithers & Robinson, 2006). Younger, Warrington, and McLellan (2005) studied the effects of single-sex classes in a coeducational school and found some positive effect. For example: boys and girls can feel more at ease in single-sex classes, feel more able to interact with learning and feel free to show real interest without inhibition. There can be positive effects on achievement particularly for boys in modern languages and English, and girls in the sciences and math (Protheroe, 2009).

Academic and Social Performance in Boys

Boys often face many areas of difficulty, such as lower achievement scores in most classes–especially among low-income and racially/ethnically diverse students. These difficulties exist because of particular problems in literacy and skills deficient in such areas as note taking and listening. Boys tend to struggle more with homework and have lower grades in all classes, except some math and most science classes. Because boys sometimes find little relevancy in the curriculum, they become less motivated to learn the subject matter. However, as a group, boys are much more likely than girls are to be graphic thinkers and kinesthetic learners and to thrive under competitive learning structures (King, Gurian, & Stevens, 2010). Research suggests that greater group cohesion may occur in a single-gendered group, as opposed to the divisions that frequently result from the in-group/out-group phenomenon so evident in the coeducational classes (Wills, 2007).

The development of an apparent disenchantment with school by many boys frequently begins in primary schools; or, as argued by Hickey and Keddie (2004, p. 59),

"the antecedents for this problem [of high school resistance] are set in place long before this time [adolescence]" (Hickey & Keddie, 2004). Boys from low socioeconomic areas are all too often the least likely to conform to the precise, middleclass norms of their teachers and schools (Wills, 2007). Working-class boys in coeducational classes are frequently drawn into a contest with girls that the boys simply cannot win (Thorne, 1993). Predictably, this one-sided competition results in boys becoming consciously aware that "the game" is rigged against them (Slade, 2002). Some teachers feel that boys are much less mature than girls are. Therefore, when boys and girls are in school together at the preadolescent/adolescent phase, boys will not perform as well as girls. It does not take long before the boys will not want to do as well as the girls (Wills, 2004). Consequently, many working-class boys, whose construction of masculinity has frequently been shaped by a culture of physicality and assertiveness, tend to become negative and resentful toward those whose skills they are often unable to match (Willis, 1981). Some boys express this negativity and resentfulness as aggression (Davy, 1995; Millard, 1997; Rowe, 2000).

Boys get very conflicting messages from everyone–parents, peers, teachers, coaches, and the media. Boys do, in fact, feel they are told not to show emotions; they are told, "Big boys don't cry." And when they hurt, they are told to walk it off. Boys receive strong messages that they must be in control and that any show of emotion is unacceptable, with the result that boys are trying to put their feelings someplace where they will not be betrayed by their own emotions (Kommer, 2006).

Nevertheless, the story is not yet finished, for it appears now the boys are also often the victims of our educational system. Consider the following gender questions:

1. Who is more likely to drop out of high school?
2. Who is more likely to be sent to the principal's office for a disciplinary referral?
3. Who is more likely to be suspended or expelled?
4. Who is more likely to be identified as a student needing special education?
5. Who is more likely to need reading intervention?

The answer to all of the above questions is *boys* (Kommer, 2006; Taylor & Lorimer, 2003).

On the National Assessment of Educational Progress writing test, 26% of 12th grade males scored below basic, compared with 11% of females. Just 16% of males achieved at the proficient/advanced levels, compared with 31% of females (Kleinfeld, 2009). In reading, one third of 12th grade males scored below basic on the National Assessment of Educational Progress tests, compared with 22% of females; fewer than one third of males (29%) were reading at the proficient/advanced levels, compared with 41 percent of females (Kleinfeld, 2009). Boys receive two thirds of the Ds and Fs in schools, but less than one half of the As (Kauchak & Eggen, 2005). Girls are more likely to attend and graduate from college. In 2003, 1.35 females for every male graduated from a four-year college (Goldin, Katz, & Kuziemko, 2006). These and many other gender gaps for boys have been widening over the last decade (Cataldi, Laird, & KewalRamani, 2009; Chudowsky & Chudowsky, 2010; King et al., 2010).

Academic and Social Performance in Girls

For years, research has provided evidence of achievement amongst girls. According to Whyte (1986), the oppositional climate between the genders that occurs in

some primary school classrooms may have its origins in the nature of the tasks that are given to primary school children. For example, girls are considered to be "good at the forms of writing valued in English classrooms" (Whyte, 1986, p. 562). Such forms of writing are, typically, the frequently requested fictional narrative in which "girls do seem to be very proficient" (Gilbert & Rowe, 1989, p. 67). Frequently, the *best work* in primary school classrooms is that of a girl (Thorne, 1993). Furthermore, Poynton (1989) argues, "Girls write about topics that their teachers can approve of, while boys' topics can and do upset teachers" (p. 36). By way of explanation, Kenway and Willis (1997) noted that the highly regarded abilities of girls derive from their socialization rather than a natural aptitude. Indeed, it may be the validation of their behavior that particularly encourages girls to strive for neatness, tidiness, even prettiness; getting it right is what counts in the controlled space of the home and the classroom (Kenway & Willis, 1997; Wills, 2007).

Girls begin to judge themselves relative to how they are perceived by the opposite gender. In the attempt to become what they feel others expect them to be, girls quickly lose their own. They hide their true selves to their friends and family (Pipher, 1994; Powell, 2004). Girls are "sugar and spice and everything nice." However, during adolescence, this message is lost in a bewildering array of swirling images. They must "be beautiful, but beauty is only skin deep. Be sexy, but not sexual. Be honest, but don't hurt anyone's feelings. Be independent, but be nice. Be smart, but not so smart that you threaten boys" (Pipher, 1994, pp. 35–36).

Studies comparing the relative efficacy of single-sex versus coeducational settings on girls' interest and achievement in physics allowed Hoffman (2002) and Gillibrand,

Robinson, Brawn, and Osborn (1999) to demonstrate that girls benefit more from a single-sex educational setting. Whereas boys' achievement was unaffected by a coeducational or single-sex environment, girls obtained higher grades under a single-sex environment. The advantages of single-sex contexts for girls are posited to result from increased contacts with their teachers; in coeducational context, boys tend to monopolize their teachers' attention, particularly in physics (Taber, 1992) and mathematics classes (Carpenter & Hayden, 1987; Leder, 1990; Lee, Marks, & Byrd, 1994). Two studies demonstrated that girls appreciate more the climate of single-sex classrooms (Jackson & Smith, 2000; Strange, Oakley, & Forrest, 2003).

In Jackson and Smith's (2000) study, involving a two-year investigation in a coeducational secondary school where single-sex mathematics classes were introduced for one cohort of pupils during five school terms, the authors showed that girls perceived single-sex mathematics classes more favorably than boys: 80% of girls, but only 36% of boys, preferred to continue with single-sex groups. The majority of boys (72%) enjoyed mixed classes more than single-sex classes (Chouinard, et al., 2008). Gibb et al. (2008) found that pupils in single-sex schools had higher levels of achievement than did pupils in coeducational schools, and that the advantages for single-sex schooling tended to be greater for girls than for boys.

In 1992, the American Association of University Women published a groundbreaking study about how schools were not meeting the needs of young girls. AAUW reported that schools shortchanged girls in many ways. When questioned in class, girls were less likely to receive a prompt to clarify thinking if they answered incorrectly; boys were more regularly called on, and if not, they were just as likely to

shout out an answer, leaving girls to sit quietly; and girls were not encouraged to take advanced math and science classes (AAUW, 1992). Perhaps not surprisingly, then, in their middle school years, girls stopped being successful in math and science. The AAUW (1992) study focused attention on the issue of educational equity. It was difficult to argue with the findings, and teachers all over the country began to reevaluate their teaching in light of the study. Several years later, the AAUW found that significant progress was made, as evidenced by gains in girls' success in math and science (Kommer, 2006).

A large concern that must be addressed by middle level educators is the decrease in confidence that girls experience through middle school. One study shows that just prior to their entry into preadolescence, 60% of girls had positive feelings about themselves and their ability. Only 29% of high school girls felt the same confidence. This compares with 67% of young boys feeling confident and 46% of high school-aged boys having the same confidence (Santrock, 2001).

Some findings suggest that girls' motivation and perceived support from parents and teachers are unaffected by the type of school setting in which they are involved. Yet, our conclusions are contrary to those who argue that, particularly for mathematics and science, a segregated environment is beneficial to girls (Chouinard et al., 2008). Leder and Forgasz (2002) recently showed that the stereotyping of mathematics as a male domain has significantly diminished during the past decade.

Advanced science and mathematics courses can be more attractive to girls, when masculine stereotypes are diminished. This could lead girls to consider career opportunities that were traditionally perceived as men's domains. Girls educated in a

single-sex school environment tend to have higher career aspirations in term of social status than girls educated in coeducational settings (Chouinard et al., 2008).

Girls sometimes face challenges such as lower learning and engagement in science and technology classes; relational aggression in school and in cyberspace; and problems with self-esteem development in adolescence (King et al., 2010). In March 2010, The Center on Education Policy examined state test data from all age groups in all 50 states and found good news for girls but bad news for boys. In math, girls are doing roughly as well as boys, and the differences that do exist in some states are small and show no clear national pattern favoring boys or girls. However, in reading, boys are lagging behind girls in all states with adequate data, and these gaps are greater than 10 percentage points in some states (Chudowsky & Chudowsky, 2010).

Academic Challenges Faced by Urban City Students

Many of the social and academic challenges faced by students in urban settings tend to affect Black and Latino boys more. The Black and Latino Male Schools Intervention Study (BLMSIS) was a longitudinal study (2006-2009) of seven single-sex schools serving primarily Black and Latino boys' ages 9 to 18. The BLMSIS focused on examining the components of these schools (e.g., instruction, leadership, curriculum, climate, out-of-school time activities) and their effect on the boys being served. The schools participating in the study varied in size, location, and other school organizational characteristics. Two overarching theories regarding Black and Latino boys guided the design of these schools: (a) schools need to understand and have a knowledge base of the social/emotional needs of Black and Latino boys and (b) schools need to understand how the academic needs of Black and Latino boys have surfaced and target strategies for

addressing those needs (Fergus & Noguera, 2010). The BLMSIS found three prevailing social/emotional strategies related to the needs of Black and Latino boys: changing boys' ideas of masculinity, incorporating an academic identity, and developing future and leadership (Fergus & Noguera, 2010).

As a measure to ensure the success of Black and Latino male students, schools must address the gaps in academic skills. These gaps were created based on minimal literacy, math, and critical thinking opportunities. Students must be adequately prepared for college by having access to rigorous curricula, high-quality teachers, stable school environments, and college information. Schools must also raise academic expectations and make curriculum relevant. Unfortunately, boys of color are commonly seen as unable to perform in public schools and are not given opportunities to do the type of work that will make them competitive with other college-bound students their age (Fergus & Noguera, 2010).

Some boys refer to school as something that girls do, and it is for this reason that some administrators claim it is necessary to separate the boys from female students in order to give them a space where they do not have to compete or feel the need to show off as "men" who are "too cool for school" (Fergus & Noguera, 2010, p. 17). Additionally, the boys in these single-sex schools face "the acting White stigma if they are trying to achieve too much or if they talk a certain way." (Fergus & Noguera, 2010, p. 17). Taking on a new identity for some boys of color is a challenge in and of itself. Black and Latino boys face a fear of breaking certain stereotypes and an identity that they have embraced and become comfortable with (Fergus & Noguera, 2010).

The House of Representatives Standing Committee on Education and Training's (HRSCET; 2002) indicated that a nationwide crisis in boys' education exists in both secondary and primary schools. However, Sukhnandan (1999) argued, "The general outperformance by girls of boys for pupils of all races is consistent for those pupils from working-class backgrounds" (p. 24). The Committee argued that educational deficiencies occurred most dramatically in schools situated in the lowest socioeconomic communities (HRSCET, 2002; Wills, 2007). Public school districts should take advantage of the opportunity to provide choice of single-sex classrooms or single-sex schools because it is beneficial to learners, particularly minorities and those in poverty, in that their learning-styles are more easily matched, their behaviors improve, and ultimately their academic performance improves (Hughes, 2007). Historically, families with money have had a choice to send their children to single-sex schools in the form of private schooling. By providing single-sex education in the public schools, all students, including those in poverty and minorities, will have the same choices as those who can afford private schools. Advocates of single-sex schooling argue that, "Poor parents should have the same opportunity as wealthy parents to send their children to all-girls or all-boys schools" (Vail, 2002, p. 33).

Riordan (1994) studied the data on students who attended private Catholic schools. Riordan's studies showed poor and disadvantaged students were especially likely to benefit from single-sex education. When Riordan studied data on minorities attending Catholic schools, he found that Black and Latino students in single-gender schools academically outperformed their peers in coed Catholic schools. "The more

disadvantaged the student," Riordan reported, "the more likely these students are to gain an advantage from attending single-sex school" (Vail, 2002, p. 36).

Out of all Black male students who enter the public school system, only 2.5% will earn a college degree by the time they are 25 years old. This means that 97% of young African American males are left to pursue avenues to make a living that do not require a college degree (Fergus & Noguera, 2010). Single-sex schools also have a proud record of minority graduation rates and minorities tend to outpace non-minorities, even within the single-sex setting (Hughes, 2007).

It is well documented that students in poverty and minority students overall are not performing as well as other students in the public school system. Single-sex public education provides poorer families the chance to see their children excel in single-sex classrooms, an option once only available to families able to pay private school tuition. Heise (2004) reported that, "Other single-sex school supporters share a conviction that single-sex education–especially for girls and low-income families–is now essential as a remedy for unequal education" (p. 1226). Hughes (2007) believes that each public school district should act immediately to provide choice to families in order to improve student achievement among students in poverty and minorities. Boys of color also face the reality of interacting with people who have low or no expectation of them, or they might be in an environment where others do not want them to be. Boys of color are commonly seen as unable to perform in public schools and are not given opportunities to do the type of work that will make them competitive with other college-bound students their age (Fergus & Noguera, 2010).

Mathematics Anxiety and Stereotype Threat

Anxiety has been known to have an affect on the performance of mathematics among some individuals. Higher test anxiety is related to lower achievement (Crocker et al., 1988; Hembee, 1988; Smith et al., 1990). Findings from earlier studies (Crocker et al., 1988) suggest that test anxiety does not have a differential influence on test performance when comparing male and female or African American and White students. However, there is some evidence that the relationship between test anxiety and achievement does vary depending on context (Helmke, 1988). When examining anxiety as a factor influencing differences in the performance of male and female students in developmental mathematics, Jackson (1993), found mathematics anxiety decreases and mathematics performance increases upon repeated administrations of mathematics tests. Jackson found that female college students performed slightly better than the male college students identified in the same sample group, but not significantly. There was no significant relationship between anxiety and performance in influencing the performance of male and female students. The study confirmed the assumption that neither gender nor teaching methods was in any way effective variables (Jackson, 1993).

Research in the achievement goal literature, has studied the *worry* component of test anxiety rather than the *emotionality* component (Elliot & McGregor, 1999). Worry refers to cognitive reactions such as self-criticism and concern about the consequences of failure. Emotionality refers to physiological reactions such as nervousness or profuse sweating. The worry component undermines exam performance by introducing distracting thoughts that interfere with concentration on a test (Deffenbacher, 1980; Morris, Davis, & Hutchings, 1981; Sarason, 1972; Wine, 1971). Other studies support

this distinction (Meece, Eccles, & Wigfield, 1990; Smith et al., 1990). There is some evidence that suggests students are experiencing more anxiety when taking tests these days. Thirty-five percent of teachers in high-stakes testing states and 20% of those in low-stakes testing states reported that students are anxious about taking their states' assessments (Abrams, Pedulla, & Madaus, 2003). The teachers (80% from the high-stakes testing states) described students as under intense pressure to perform well (Ryan, et al., 2007). Research indicates, that student beliefs about if they want to do well on a test (goals, value), whether they can do well on a test (i.e., self-concept, self-efficacy), and how they feel during a test (worry or emotionality) are factors influencing math test performance.

Low performance in mathematics of some female students has been linked to stereotype threat. Stereotype threat is a situational pressure that is created and depresses performance when negative stereotypes about particular groups (i.e., female and African American students do not do well at math) are made salient for individuals who belong to those groups (Spencer, Steele, & Quinn, 1999; Steele & Aronson, 1995). Research has documented that stereotype threat exists and impairs performance in a variety of performance contexts (gender, ethnicity, socioeconomic status, and age; Ambady, Shih, Kim, & Pittinsky, 2001; Croizet & Claire, 1998; Inzlict & Ben-Zeev, 2003). In Quinn and Spencer's (2001) study examining stereotype threat and cognitive processing, college women in the high-stereotype condition (typical standardized math test instructions) were unable to formulate strategies for more of the problems (14% of the time vs. 4%) compared with women in the low-threat condition (in which women were told that the items were gender fair). Furthermore, women in the high stereotype threat condition

could not generate any strategy 14% of the time, in comparison with 2% of the time for men.

Brain Based Learning and Physical Differences in Genders

The most striking difference in how the brain differs amongst genders is what Gurian (2001) and others (Sousa, 2001; Walsh, 2004) suggest is the system of nerves, the corpus callosum that connects the right and left hemispheres of the brain. In females this structure is, on average, 20% larger than it is in males (Gurian, 2001; Sousa, 2001; Walsh, 2004). This could be why females seem to be able to use both sides of the brain in processing information and are able to multitask more efficiently than males. Studies on boys and girls also point out some interesting differences in both hearing and seeing (Sax, 2005). Studies reported by Sax indicate that girls hear at different levels–in effect, better than boys do. Other studies show that girls are able to read facial expressions more astutely than boys are, and this difference is related to a different chemistry in the eye and corresponding receptor in the brain (Sax, 2005). Boys are better at spatial tasks, which give them an advantage in areas such as mathematics, graphs, and maps. Girls seem to use both sides of the brain and tend to be better at literacy-related activities (Gurian & Stevens, 2004; Sax, 2005).

Boys' brains tend to have more cortical areas, mainly in the right hemisphere, wired for spatial/mechanical processing than do girls' brains; girls' brains generally have greater cortical emphasis on verbal processing (Halpern et al., 2007). A girl's prefrontal cortex is generally more active than is a boy's of the same age, and her frontal lobe generally develops earlier. These are the decision-making areas of the brain, as well as the reading/writing/word production areas (Brizendine, 2010; Halpern et al., 2007).

Boys' brains tend to go into a more notable rest state than girls' brains do. Because the brain's first priority is survival, it scans its environment for information that would alert it to any threat, challenge, or information crucial to its survival. If the classroom is not providing any stimuli that the brain perceives as important, the male brain tends to slip more quickly into a rest state (which manifests itself as boredom or "zoning out"). In the classroom, boys often try to avoid these natural male rest states by engaging in activities like tapping their pencils or poking at classmates (de Munck et al., 2008).

Many educators in the BLMSIS study (Fergus & Noguera, 2010) implied that in public schools the boys were being taught using methods more conducive to the ways girls learn. Boys require more hands-on projects to address their "various learning styles," and a "differentiated instruction" in which all can benefit (Fergus & Noguera, 2010, p. 23). Physical activity, such as running and jumping, keeps male brains developing in healthy ways that promote learning. To encourage a boy's natural learning style, provide opportunities for him to use his energy to learn. Letting boys explore, touch, and manipulate will help them develop the skills they will need to be successful in school (Stevens, 2011).

Social Behavior of Adolescences

Theorists have encouraged the proposition that children's personality, and adult character development, has formed from long-lasting influences from parents during home socialization. Consequently, a teacher's negative perception of parental influence commonly produces a self-fulfilling prophecy in which the teacher holds little hope of changing the child's behavior; a negative attitude frequently conveyed to children (Rosenthal & Jacobson, 1968; Wills, 2007). When both genders are present in a

coeducational classroom, each gender tends to coalesce more tightly within itself when each recognizes a set of group norms that encourage conformity (Johnson & Johnson, 1991). The resultant in-group favoritism and out-group hostility inclines to produce group contrast effects, and these effects will widen differences between groups or create differences where none previously existed in single-sex settings (Callan, Gallois, Noller, & Kashima, 1991).

Once children have assimilated as members of a group, they will tend to conform, more and more closely, to the group norms. Furthermore, children from atypical homes do not necessarily transfer their atypical home behaviors to the peer group (Harris, 1998). Instead, children will transfer behavior learned at home to the peer group only if it is shared and approved by the majority of the peer group. Consequently, children's peer groups create their own culture by selecting and rejecting various aspects of adult culture and by making their own cultural innovations (Harris, 1998). Thus, in single-gendered settings, in-groups will attach to the high-status, dominant but supportive adult, regardless of teacher gender (Wills, 2007).

Single-Sex Classrooms

According to some teachers, there are tensions between boys and girls, and it is largely based on that realization and of concerns students shared about each other. When the single-sex classroom was introduced, teachers noticed how boys were more active in class and willing to share and interact with the other boys. Teachers also noticed how some of the attention of boys went from girls to being more like the guy whom they felt was cool (Wills, 2004).

Teacher quality has been found to make a difference in achievement. However, the teachers believed that the single-gendered organization of the classrooms had a particular influence because it allowed teachers to focus on content that was specifically relevant to the needs and interests of the children. As June, a teacher in a boys' class, commented:

> When I was teaching in a mixed class, I really didn't cater much for boys. I thought the things we did were interesting for me and that meant that they were probably more interesting for the girls than the boys. The poor boys just tagged along I suppose … The single-gendered nature of the class lets us go off into tangents that they [the boys] want to explore. Sometimes they take me into areas that I wouldn't normally go. (Wills, 2007, p.134)

Two teachers in the all-girls class maintained that their task was made easier because of the gender homogeneity and the generally quieter, work-focused, cooperative, and studious inclination of the girls (Wills, 2007).

Coeducational Classrooms

Opponents also reason that single-sex schools or single-sex classes have a detrimental impact on the social growth of each sex. The American Civil Liberties Union and NOW each argue that coeducation is better for boys and girls because it allows them to develop interpersonal skills so they can interact with each other. Mendez (2004) worried that, "Without the collegial relationships boys and girls form in school, they will not develop into men and women who understand and respect one another" (p. 1). As stated by Vail (2002), "Boys and girls must learn to get along together in the world, opponents of the single-sex approach say, and separating them will take away that opportunity" (p. 38).

The assumption here is that the only opportunity young people have to learn to get along together in the world is through their experiences in public schools. Hughes (2007)

questioned whether the main goal of schools is to develop students socially. Hughes asserts that the assumption is false; other, and arguably better, opportunities are available for students to develop real world experiences with individuals of the opposite sex through family, neighborhood, church, or volunteer organizations (Hughes, 2007).

Indeed, there are distinct advantages to educating boys and girls together appropriately (Kommer, 2006). In doing so, each gender will begin to see how the other thinks, feels, responds, and reacts. Such understanding is in itself a major goal for gender-friendly classrooms. Creating a gender-friendly classroom does not mean that gender-specific activities should be created, the classroom should be divided, or single-sex classes must exist. Remembering that everyone lives in a bi-gendered world makes it necessary to teach students ways to be successful in that world (Kommer, 2006). Students should have opportunities to work in a gender-matched activity, while at other times they should learn to function in a more typical gender-mismatched one. This allows students to experience instructional times that are more comfortable for students when the activities are matched to their nature. However, they also learn to function outside that comfort area when they are in a mismatched situation, and thus strengthen weaker areas. The quest is not to create classrooms that focus on one or the other gender. Instead, it is to purposefully structure classrooms so that some activities favor one gender's learning style and some favor the other's learning style. Specifically, it is critical that teachers know the differences and structure the learning environment so that the students' work sometimes reinforces individuals' stronger areas, and sometimes strengthens a weaker one (Kommer, 2006).

Successful Implementation Strategies

Rice and Dolgin (2002) reported that, "Peers may play a particularly important role in the development of children's gender identities" (p. 195). Boys and girls create very distinct cultures; when they are in same-gender groups, they act and play very differently. Girls are talkative and cooperative, boys are competitive and physical (Rice & Dolgin, 2002). Teachers need to understand these differences and be purposeful in the treatment of each to send the healthiest messages to adolescents (Kommer, 2006).

School districts as well as teachers have adopted strategies that have proven to be successful. Most of these strategies involve using movement during instruction, building on the visual aspect of the lesson or task, and incorporating student interest and choice (King et al., 2010). Strategies proven to be successful in the classroom and address the needs of all students include (a) social/emotional programming (e.g., advisory sessions, community meetings, mentoring); (b) cultural events (e.g., speakers, cultural awareness programs, Fatherhood and Motherhood appreciation); (c) community service; (d) high school and college preparation; (e) afterschool academic programs required for struggling students; (f) a rigorous curriculum (e.g., AP and honors classes); (g) discipline/uniforms; (h) culturally responsive or relevant instruction; (i) positive role modeling and/or mentoring programs; and (j) professional development (with emphasis on teaching the urban child and understanding of research on boy's learning and development).

Perceptions and Behaviors

Learner and Kruger (1997) studied attachment according to a developmental perspective and noted interesting facts about adolescence. They found that representations of the self and of others were significantly related to the quality of

attachment developed with teachers and parents. These researchers refer to studies that have demonstrated a positive relationship between teachers' support and a more positive self-concept in relation to school and academic tasks. They concluded, as Eccles Wigfield, Midgley, MacIver, and Feldlaufer (1993) did, that the quality of the teacher-student relationship is closely related to students' motivation and attitudes. Studies from Vallerand and his colleagues (Vallerand, Fortier, & Guay 1997; Vallerand & Reid, 1990; Vallerand & Thill, 1993) also revealed that the teachers' behavior has an indirect influence, either positive or negative, on students' motivation. Thus, the perception of the support teachers provide acts upon students' competence beliefs, indirectly affecting their engagement in academic tasks. Some findings in mathematics achievement motivation also indicate that teacher support is as important as parental support (Chouinard & Karsenti, 2005). The same conclusion was reached in Stolz's (2002) review of studies conducted in several countries.

Other researchers have highlighted the role of social agents, such as parents and teachers, in the development of students' self-perceptions and the value they attribute to academic tasks. Several authors reported that adolescents' academic motivation level is greatly influenced by their perceptions of the level of support and encouragement provided by parents and teachers (Grolnick, Gurland, Jacob, & Decourcey, 2002; Grolnick & Ryan, 1989; Wigfield & Eccles, 1992). These researchers also noted that these perceptions might have a greater impact than achievement in explaining effort and academic and career choices. The attitudes of parents and teachers toward mathematics and toward viewing their children as learners of mathematics affect the children's own perceptions of their competence and the value they ascribe to the domain (Singh,

Granville, & Dika, 2002). Additionally, Frenzel, Pekrun, Goetz, and von Hofe (2005) argued that achievement in mathematics is mediated by the expectations of teachers and parents.

Most teachers realize that the preparation they received in graduate school and teacher certification programs to teach *all students* was in fact training for verbal and sedentary learning. This presents a large elephant in the room for teachers and schools. Given the structures, expectations, and teaching styles in today's classrooms, teachers generally have more difficulty teaching boys than girls (Gurian & Stevens, 2004; Whitmire, 2010). In a classroom of 25 students, five to seven boys may be having difficulties, whether these are overt issues or a tendency to check out of the learning process. They need a kind of instruction teachers have not been trained to provide, and the lack of such teaching profoundly affects the overall grades, test scores, and behavior of the class, as well as teachers' sense of whether they are teaching effectively (King et al., 2010).

Professional Development

For teachers the imperative is to learn about the differences in gender. Teachers should accept that learning occurs differently for each gender, and to measure out activities and experiences that favor one some of the time, and the other some of the time. Keep in mind that although some girls may be more linguistically advanced than boys are, some boys are just as advanced. Although some boys manipulate objects well and see patterns better than girls do, some girls are headed toward engineering schools. Therefore, to teach only one way for each gender would be a disservice to the boys and girls who do not fit the stereotype (Gurian & Stevens, 2004).

When teachers plan learning experiences that favor one gender, they are also doing a great thing for the other. For as boys see girls appropriately modeling relationship behaviors, the boys learn how to be more sensitive and open. Likewise, when girls see the appropriate use of assertiveness that boys learn early, the girls see that this can be used to their advantage as well (Kommer, 2006).

Relevant instruction emerged as another key salient academic need of Black and Latino boys (Fergus & Noguera, 2010). Relevant instruction, defined as instruction that connects to students' cultures or current lives, was conceptualized as a remedy for the deficits in Black and Latino males' education, which administrators stated were caused in large part by the boys' disinterest or their inabilities to see themselves in curricula in traditional public schools. There is a need to center teaching and the curriculum around the educational needs of their students, with careful attention given to the social, emotional, and academic challenges urban students face (Fergus & Noguera, 2010).

Single-sex school administrators overwhelmingly report that the curriculum needs to extend beyond the walls of the classroom in order to not only prepare the urban student for academic success in these schools, but throughout the rest of their academic careers (Fergus & Noguera, 2010). The role that teachers play in their students' development has been the source of several recent studies. Gordon, Iwamoto, Ward, Potts, and Boyd (2009) suggest that not only do students need teachers who are highly skilled, but they also need culturally sensitive and responsive teachers. Teachers are seen as a vital element to the success of the single-sex schools. The need for on-going professional development is crucial for both the success of teachers and the Black and Latino male students they serve (Fergus & Noguera, 2010).

Performance goals can have some positive functions. Three important types of achievement goals are (a) mastery goals, (b) performance-approach goals, and (c) performance-avoidance goals (Bouffard, Denoncourt, Goulet, & Couture et al., 2005; Harackiewicz, Barron, Pintrich, Elliot, & Trash, 2002; Midgley, Kaplan, & Middleton, 2001). A mastery goal orientation reflects an emphasis on learning and understanding, whereas a performance orientation focuses on demonstrating competence in relation to others (Ames, 1992; Linnenbrink & Pintrich, 2002). Students pursuing performance-approach goals seek social recognition and success over others, while those pursuing performance-avoidance goals seek to minimize the negative impact of failure on self-esteem and to avoid looking incompetent according to comparative standards (Covington, 2000; Linnenbrink & Pintrich, 2002). It is important for teachers to have a clear understanding of these goals and how to use this information to inform instruction.

Parental Support

Parents who are considering a single-sex school should be encouraged to visit the school their child will attend before they start. Talk to the administrators and teachers to find out if they are aware of the current research on how boys learn best or teaching urban school students. At home, continue to involve your child in activities that are consistent with his interests and make learning fun. Pay attention to what motivates your child and provide incentives (not rewards) to encourage ongoing learning. For example, if your son likes sports, show him how math and science are involved. Help your child connect the dots from what he is expected to learn in school and how it will help him succeed in his chosen interest or activity. For boys, listen as your son learns what interests and excites him. Then find ways to let him meet men who are interesting and

willing to share their stories, perhaps even provide some mentoring or an apprenticeship. Motivation is something we want our children to internalize. Helping your son learn to harness his physical energy to set and achieve his own goals will help him become a life-long learner (Stevens, 2011).

Wills concluded in her study of single-sex classes for girls, that some classroom teachers and some parents could see the benefits of a single-sex setting. Some teachers commented that the single-sex classes are particularly useful in upper primary classes. Parents have been so supportive. Quite a few parents have said how much more their daughters have achieved this year; more than they have done in previous classes. Parents noticed how much more confident the girls are. They have commented on the fact that the girls are getting a better deal, being better catered for (Wills, 2004).

Summary

The review of the literature identified the basis of single-sex instruction. Thanks to NCLB, school districts are now afforded the opportunity to offer parents a choice in their child's education. NCLB guarantees schools the right to offer same-sex instruction in either coeducational schools or single-sex schools, as long as comparable services are being provided for both genders. Proponents of single-sex classes support the premise that if single-sex instruction is in the best interest of the child, then school districts should offer this type of instruction as a means to increase student achievement. Proponents also state that by allowing students to be homogenously grouped provides opportunities for both the student and teacher. Teachers are able to tailor their instruction based on gender. Single-sex classes create conducive environments for student achievement. A positive result of single-sex environments is the decrease in student behavioral issues.

Despite the legal aspects of Title IX and NCLB, opposing views report that there is little evidence showing that single-sex instruction improves academic achievement. Opponents also feel that there is a delay in how students socialize with the opposite sex when attending same-sex schools. Opponents believe that the government is creating a gray area under the *separate but equal* clause. Opponents such as NOW and AAUW question how separating students by gender is different from separating individuals by race. Opponents feel that the laws are being misinterpreted. These views of the *separate but equal clause* are countered by stating that individuals who were being discriminated against were not given a choice, but in fact were being segregated as a means to keep those individuals from advancing; whereas, single-sex education offers choice and a means to excel academically.

Single-sex education has proven to be effective in low socioeconomic areas because it affords parents the opportunity to send their child to a single-sex school. Opportunities like this were only awarded to those who could afford private schooling. NCLB has leveled the playing field by providing parents with a choice as well as a voice in their child's education. The urban child is faced with many social barriers and teachers must be the catalyst for students to achieve. Teachers must learn how to match a student's learning style and behavior with instruction. The urban male child is faced with many stereotypes that place him far behind others in the race to achieve–even before the race begins. Single-sex environments have been shown to increase competence and confidence in students. Students learn best by interacting with other students, especially in an environment where students are no longer intimidated, embarrassed, or overlooked by the opposite sex. The literature also identifies some advantages of coeducational

instruction. Coeducational instruction allows for one sex to see how the other sex thinks, feels, and reacts. Environments should allow for student interaction as well as for instructional activities that cater to both sexes.

Student achievement in mathematics and any other subject is strongly dependent on proper training for teachers, and support for both students and parents. These are essential. If schools and classrooms are implementing a purposeful curriculum that addresses the needs of all of its students then the question is, "Is there a need for separate schools that only cater to one sex?" The review of literature supports the idea that implementing more single-sex schools would be a costly and inefficient way to act on students' achievement, motivation, and academic trajectories. Other means, such as the improvement of the pedagogical practices in classrooms and the provision of academic opportunity and options, would appear to be better ways to support the motivation of students of both genders.

CHAPTER III

METHODOLOGY

In today's economy, budget constraints are forcing school districts to cut back in all areas of education - from the central office to the classroom. Strategically, districts and schools are carefully examining ways to cut back on expenses without sacrificing their ability to provide a quality education to their students. As a possible solution to address the nature of the urban middle school student and to improve academic performance, some districts have created single-sex schools. Within those same districts, coeducational schools have also adopted the single-sex classroom model to address middle school performance issues. If single-sex classrooms within coeducational schools prove to show similar gains in academics as in single-sex schools, then the possible elimination of current and/or future single-sex schools could serve as a means to strategically cut back on the funding of buildings, certain professional developments, transportation, resources, administration, and staff for single-sex schools. Mathematics is an area in which students must master in order to successfully compete in a global market. Therefore, the purpose of this study was to determine if differences in academic performance in mathematics exist among urban middle school students who attend coeducational classes, single-sex classes within a coeducational school, or a single-sex school.

Research Question

This research study was guided by the following overarching question. What differences in academic performances in mathematics exist between students in coeducational urban middle schools who attend single-sex and coeducational classes, and

students who attend an urban single-sex middle school? In addition, the following supporting questions will be addressed.

1. In which academic setting (coeducational, single-sex in coeducational school, or single-sex school) do males perform best?
2. In which academic setting (coeducational, single-sex in coeducational school, or single-sex school) do females perform best?

Research Design

This study used an ex post facto causal-comparative research design. Student GCRCT achievement data were used to compare how the instructional setting influences student achievement in mathematics. The instructional settings observed in this study were single-sex schools, single-sex instruction, and coeducation instruction. Two middle single-sex schools, one school for boys and one for girls, were used in this study. For the purposes of this study, coeducational single-sex instruction occurs within a coeducational middle school. Students attend a coeducational school; however, all of their courses are homogeneously grouped by sex. The final instructional setting examined was of students who attended a coeducational middle school and coeducational classes. This instructional setting may be referred to as a traditional middle school setting.

This study made inferences based on the findings of students' mathematics achievement data on the GCRCT in Grades 6–8. Inferential statistics were used as an effective tool of measure in comparing student achievement in the three different instructional settings observed. According to Gall et al. (2007), statistical inference is a set of mathematical procedures for using probabilities and information about a sample to draw conclusions about the population from which the sample was drawn. This study is

an attempt to examine if there is a significant difference in student achievement amongst urban middle school students in different instructional settings; therefore, inferential statistics was used for this examination.

The independent variables were the instructional setting, gender, and grade level in which the instruction took place. The dependent variable was performance on the mathematics section of the GCRCT. The researcher selected the subjects based on the courses at the three schools between the school years 2007–2008 and 2009–2010. The researcher for the study did not manipulate any of the variables. The results reflected whether a relationship in mathematic GCRCT achievement existed between gender, grade level, and the instructional setting in four urban middle schools.

Population

The population for this study was middle school students within an urban school district in Georgia during the 2007–2010 school years. Four middle schools were included in this study. The researcher included students from an all male urban middle school and students from an all female urban middle school. Students from two coeducational urban middle schools were also included in this study. The schools were within the same school district, but were located in different areas of the district. One coeducational middle school used single-sex instruction and the other coeducational middle school maintained coeducational instruction for all students.

All of the schools in this study were Title I schools. A school qualifies to be classified as a Title I school when at least 35% of the children in the school (more than one third) are from low-income families. This is determined by the number of children who are eligible to receive free and reduced-price lunch at the school. All of the schools

in this study are in the 90% or higher percentile for free and reduced-price lunch. Over half of all schools in Georgia are designated as Title I (Georgia PIRC, 2010).

The two single-sex schools began in the school year 2007–2008. A sixth grade class was enrolled at each school at that time. The seventh grade was added to each of the same-sex schools in the following year (school year 2008–2009). The eighth grade was added in 2009–2010.

Table 1 presents the demographics of the schools where the four types of instructional strategies were taught. The male single-sex school now has an average enrollment of about 300 students in Grades 6–8. The majority of the students who attended this school were African American, and less than 1% was Hispanic or multiracial. Approximately 17% of the students are enrolled in special education programs, all African American. Less than 1% (.23%) has limited English proficiency. The male single-sex school has approximately 1.6% of its students absent 10 or more days from school.

Table 1

Demographics of Middle Schools Where the Four Instructional Strategies Were Taught

Instructional strategy	Average enrollment	% of students in special education		% of student with limited English proficiency	% of students absent 10^{+} days
		Male	Female		
Male single-sex	300	17	0	0.2	1.6
Female single-sex	400	0	6	0.2	0.0
Coeducational single-sex	400	24	5	0.7	1.8
Coeducational	600	20	6	3.0	1.0

The all female single-sex middle school has an average enrollment of about 400 students in Grades 6–8. The majority of the students who attend this school are African American and less than 1% are Hispanic or multiracial. Approximately 6% of the students are enrolled in special education programs. Less than 1% of the students have limited English proficiency. None of the students enrolled at the female single-sex middle school were absent 10 or more days from school.

The middle school in which math was taught in coeducational single-sex classes has an average enrollment of about 400 students in Grades 6–8. The majority of the students who attend this school are African American, with less than 1% Hispanic or multiracial. Approximately 24% of males and 5% of females are enrolled in special education programs. Less than 1% has limited English proficiency. Less than 2% of the students at the middle school were absent 10 or more days from school.

The traditional middle school has an average enrollment of about 600 students in Grades 6–8. The majority of the students who attend this school are African American and less than 1% are Hispanic or multiracial. Approximately 20% of males and 6% of females are enrolled in special education programs. Three percent of the student population has limited English proficiency. Approximately 1% of the students at the traditional middle school were absent 10 or more days from school.

Participants

The number of participants used to analyze the research questions was based on the number of middle school students taking the mathematics portion of the GCRCT in the four middle schools in spring 2008, spring 2009, and spring 2010. The data were obtained from the school district's database. These participants are a convenience

sample, used specifically for this study. A convenience sample is created when the researcher selects a sample that suits the purposes of the study. The sample can be convenient based on the researcher's accessibility to the sample or some of the data that the researcher needs already have been collected (Gall et al., 2007). When determining a sample size for a quantitative research study, Gall et al. suggest using the largest sample size possible and to follow a general rule for determining the minimum number of participants needed for different research methods. In correlational research, a minimum of 30 participants is desirable. In causal-comparative and experimental research, there should be at least 15 participants in each group to be compared (Gall et al., 2007).

GCRCT mathematics scores for 4,450 students were collected across the four middle schools, three grades, and 3 years. Table 2 contains information about the number of students in each type of class in each grade and in each school year. The 4,450 scores are not from 4,450 unique students. Scores across the grades and years may be for students as they passed from each grade in the same school. For example, the 107 scores collected in Grade 7 in school year 2008–2009 at the male single-sex middle school are for students who may also have scores reported among the 133 in Grade 6 in school year 2007–2008.

Table 2

Number of Students in Each Middle School by Instructional Group, Grade, and Gender

	Grade							
	6		7		8		Total	
Instructional group	M	F	M	F	M	F	M	F
Male single-sex								
2007–2008	133		*		*		133	
2008-2009	83		107		*		190	
2009-2010	112		83		92		287	
Total	328		190		92		610	
Female single-sex								
2007–2008		184		*		*		184
2008-2009		132		151		*		283
2009-2010		134		128		144		406
Total		450		279		144		873
Coed single-sex								
2007–2008	73	73	69	70	74	74	216	217
2008-2009	72	68	71	75	60	70	203	213
2009-2010	72	70	60	62	69	79	201	211
Total by gender	217	211	200	207	203	223	620	641
Total	428		407		426		1261	
Traditional								
2007–2008	105	99	87	101	86	114	278	314
2008-2009	83	90	89	105	83	103	255	298
2009-2010	102	95	76	88	100	100	278	283
Total by gender	290	284	252	294	269	317	811	895
Total	574		546		586		1706	

Note: * grade was not phased in during this school year.

Instrumentation

Georgia law, as amended by the A+ Education Reform Act of 2000, requires that all students in Grades 1–8 take the GCRCT each spring in the content areas of reading, English/ language arts, and mathematics. The GCRCT only assesses the content standards outlined in the Georgia Performance Standards (Georgia Department of Education, 2010). The GCRCT is designed to measure how well students acquire the

skills and knowledge described in the GPS. The assessments yield information on academic achievement at the student, class, school, system, and state levels. This information is used to diagnose individual student strengths and weaknesses as related to the instruction of the GPS, and to gauge the quality of education throughout Georgia (Georgia Department of Education, 2010). Therefore, the GCRCT served as a reliable instrument for data collected for this study.

To provide reliable measures as well as structure to the assessment program, the curricular standards provided in the Georgia Performance Standards are grouped into content domains. Each domain is comprised of standards with similar content characteristics. The domains for middle school mathematics are number and operations, measurement (Grade 6 only), geometry, algebra, and data analysis and probability. Each domain area varies in terms of percentage weight counted toward the overall score. The scale scores for the GCRCT include a range of scores from 650 to 900 (Georgia Department of Education, 2010). Performance levels for the GCRCT include (a) does not meet the standard (below 800), (b) meets the standard (800–849), and (c) exceeds the standard (above 849).

Data Collection

Data were collected from the district's research and accountability department. Scores were collected for those students who were instructed in each of the four instructional strategies at the four middle schools. The mathematics GCRCT scores from school years 2007–2008, 2008–2009, and 2009–2010 were collected. After the GCRCT scores were acquired for each school, the researcher worked closely with the schools to identify single-sex mathematics classes. The data were grouped and disaggregated by

instructional setting (single-sex instruction within a coeducational school, regular coeducational class, and single-sex class within a single-sex school), gender, grade, and school year.

Data Analysis

The purpose of this study was to determine if differences in academic performance in mathematics exist among urban middle school students who attend coeducational classes, single-sex classes within a coeducational school, or a single-sex school. The data were analyzed by the Statistical Package for the Social Sciences (SPSS) to test for significance. To investigate the research question for this study, the proportion of students who passed and failed the GCRCT in each of the instructional settings was compared by gender and grade. Student names were not used in this study, only student scaled scores. The researcher collected GCRCT data for years 2007 through 2010. The data was analyzed using an inferential statistic. This comparison was made using an independent samples chi-square test. The statistical test was evaluated at an alpha level of $p < .05$ (Gall et al., 2007). Table 3 provides a graphical illustration of the way the data were categorized for the analysis. Table 4 contains an analysis of the variables and the research justifying the use of each of them in the analysis.

Table 3

Independent and Dependent Variables Used to Analyze Research Questions

	CRCT results		
Instructional method	Exceeds standards	Meets standards	Does not meet standards
Single-sex school	Gender Grade School year	Gender Grade School year	Gender Grade School year
Single-sex instruction	Gender Grade School year	Gender Grade School year	Gender Grade School year
Coeducation	Gender Grade School year	Gender Grade School year	Gender Grade School year

Table 4

Quantitative Item Analysis

Item	Research	Research Question
Instructional Setting	Georgia Department of Education, 2010; Gall et al. (2007); Cable & Spradlin (2008); Gurian (2001); Sax (2005, 2007); Fergus & Noguera (2010)	Main, overarching question
Gender	Georgia Department of Education, 2010; Gall et al. (2007); Cable & Spradlin (2008); Gurian (2001); Sax (2005, 2007); Fergus & Noguera (2010)	1, 2
Grade	Georgia Department of Education, 2010; Gall et al. (2007); Cable & Spradlin (2008); Gurian (2001); Sax (2005, 2007); Fergus & Noguera (2010)	1, 2

Summary

This quantitative study involved an ex post facto causal-comparative research design. Three years of data from the Georgia Criterion-Referenced Competency Test (GCRCT) for mathematics were collected to determine if mathematics achievement differences existed among urban middle school students who attend coeducational classes, single-sex classes within a coeducational school, or a single-sex school. The independent variables were the instructional setting, gender, and grade level in which the instruction took place. The dependent variable was performance on the mathematics section of the GCRCT. The researcher selected the subjects based on the courses at the three schools between the school years 2007–2008 and 2009–2010. Student achievement data on the GCRCT from years 2007 to 2010 is used to compare how the instructional setting influences student achievement in mathematics in urban middle schools. Students in grades sixth through eighth defined the middle school group of this study. The majorities of students in this study are African-American and attend a Title I school. The researcher used convenience sampling since the State of Georgia Department of Education already compiled the GCRCT results and was accessible. The inferential statistic used to determine significance amongst these instructional settings was Chi-Square. Instructional setting, GCRCT achievement, gender, grade, and school year disaggregated the data, and were displayed in tables along with appropriate text to support the findings. The results of the analysis are presented in Chapter IV.

CHAPTER IV

RESULTS

The purpose of this study was to determine if differences in academic performance in mathematics exist among urban middle school students who attend coeducational classes, single-sex classes within a coeducational school, or a single-sex school. Data from 4,450 students enrolled for 3 years in four middle schools were collected to answer the research questions. This chapter contains the results of the analyses.

The students in the four middle schools were divided into six groups according to the type of instruction they received. Specifically, these groups were studied: all male single-sex middle school (MSS), all female single-sex middle school (FSS), coeducational single-sex instruction within a middle school (CSSI), and a traditional coeducational middle school (COED). Across the sixth, seventh, and eighth grades and 3 years, data were collected on the GCRTC mathematics performance of 4,450 students. This group of students was identified as the *sample*. These students are not unique. Some of them attended one of the schools for only a year, while others attended the middle school for 2 or 3 years. A small group of students (n = 289) attended the same school and were instructed in mathematics in the same way for their entire middle school careers. This group was identified as the *cohort*. The remainder of the chapter presents data analyzed on both the sample and the cohort.

Description of the Sample

Tables 5 and 6 contain a description of the ethnicity of the students in the sample and the cohort. The majority of the students were African American. A smaller number of the students was Hispanic, Asian, or multiracial.

Table 5

Ethnicity of Students in Cohort

	Race				
Group	African American	White	Hispanic	Asian	Multiracial
Male single-sex	49				
Female single-sex	71				1
Male coed single-sex	32				1
Female coed single-sex	37				
Male coed	35		13	2	
Female coed	38		10		
Total	262	0	23	2	2

Table 6

Ethnicity of Students in Sample

	School year														
	2007–2008					2008–2009					2009–2010				
Grade/Race	AA	W	H	A	MR	AA	W	H	A	MR	AA	W	H	A	MR
6th grade															
Male single-sex	133					83					110		1		1
Female single-sex	182		1		1	131				1	131		1		2
Male coed single-sex	72				1	71			1		71				1
Female coed single-sex	72				1	66		1		1	70				
Male coed	87		16	2		73		9		1	89	3	7	1	2
Female coed	83		16			84		5		1	83	1	11		
Total	629	0	33	2	3	508	0	15	1	4	554	4	20	1	6
7th grade															
Male single-sex						107					82				1
Female single-sex						148		2		1	128				
Male coed single-sex	69					70				1	60				
Female coed single-sex	70					74				1	60				2
Male coed	81		5		1	69		17	2	1	65		9	1	1
Female coed	90		11			88		16		1	82		5		1
Total	310		16	0	1	556	0	35	2	5	477	0	14	1	5
8th grade															
Male single-sex											92				
Female single-sex											141		2		1
Male coed single-sex	71		3			60					68				1
Female coed single-sex	73		1			69				1	77				2
Male coed	74		12			75		7		1	82		15	2	1
Female coed	103	1	8	1	1	93		10			84	1	14		1
Total	321	1	24	1	1	297	0	17	0	2	544	1	31	2	6

Equivalency of Students Entering Sixth Grade

To determine if the mathematics performance of sixth graders in 2007–2008 was equivalent among the six groups, the 2006 fifth-grade GCRCT scores were matched with students enrolled in the sixth grade in 2007–2008. Average scale scores in the sample ranged from a mean of 321.57 for male students who became members of the male single-sex instructional group to a mean of 331.76 for female students who became members of the female coed single-sex instructional group (see Table 7).

Table 7

Means and Standard Deviations of Fifth-Grade GCRCT Scale Score of Sixth Graders in 2007-2008 in Sample and Cohort

Group	*n*	*M*	*SD*
Sample			
Male single sex	115	321.57	30.02
Female single sex	158	327.39	28.00
Male coed single sex	65	324.46	22.74
Female coed single sex	66	331.76	22.79
Male coed	90	325.13	25.43
Female coed	83	325.63	24.37
Cohort			
Male single sex	49	325.73	34.65
Female single sex	72	328.90	29.07
Male coed single sex	33	324.58	18.87
Female coed single sex	37	333.81	22.03
Male coed	50	327.34	25.98
Female coed	48	325.85	21.87

Average scale scores in the cohort ranged from a mean of 324.58 for male students in the male coed single-sex instructional group to a mean of 333.81 for female students in the female coed single-sex instructional group. Table 8 contains the results of the analyses of variance (ANOVAs) conducted to determine if differences existed in fifth-grade GCRCT scale scores between students before they became members of the six instructional groups in the sixth grade. There were no significant differences among the instructional groups. Figure 1 illustrates the scale scores for the sample and the cohort.

Table 8

Results of Analyses of Variance to Establish Equivalency Among Sixth Graders in Sample and Cohort

Source	*SS*	*df*	*MS*	*F*	*p*
Sample					
Between groups	4964.43	5	992.89	1.42	.22
Within groups	398942.03	571	698.67		
Cohort					
Between groups	2167.05	5	433.41	.61	.70
Within groups	202038.81	283	713.92		

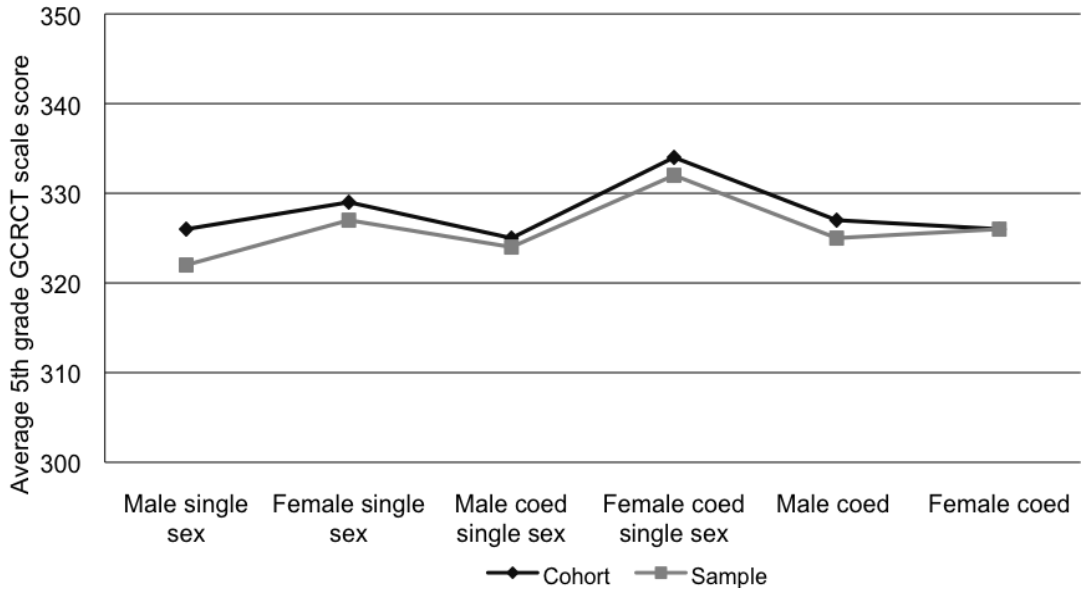

Figure 1. Fifth grade GCRCT scale scores by cohort and sample.

Analysis of the Research Questions

Research questions were developed to determine if differences in academic performance in mathematics exist among urban middle school students who attend coeducational classes, single-sex classes within a coeducational school, or a single-sex school.

1. In which academic setting (coeducational, single-sex in coeducational school, or single-sex school) do males perform best?
2. In which academic setting (coeducational, single-sex in coeducational school, or single-sex school) do females perform best?

Performance at Each Grade of the Sample and Cohort

In order to answer the first two research questions, independent samples chi-square analyses were conducted to determine if significant differences existed among the instructional groups in each grade by gender. The percentages of students in the sample

who met or exceeded standards on the GCRCT are presented by grade and group in Table 9. The results are not disaggregated by year. Therefore, the sample size for each analysis is large. The tests were not significant at each grade for each gender.

Table 9

Chi-Square Analysis of Students in Sample Meeting or Exceeding Standards on GCRCT From 2007–2010 by Grade, Group, and Gender

	Grade											
	Sixth				Seventh				Eighth			
Instructional group	*n**	*%*	χ^2	*p*	*n**	*%*	χ^2	*p*	*n**	*%*	χ^2	*p*
Male single-sex	328	47			190	65			92	54		
Male coed single-sex	216	61			200	55			203	59		
Male coed	291	44	14.94	<.01	252	57	4.24	.12	269	55	.87	.65
Female single-sex	450	54			252	80			144	65		
Female coed single-sex	211	55			297	71			223	70		
Female coed	284	49	2.78	.25	294	66	14.95	<.01	317	64	2.12	.35

**n* = number of students in group

In the sixth grade, a larger percentage of students in the male coed single-sex group (61%) were more likely to have passed the mathematics portion of the GCRCT than did their male peers (44% - 47%). There were no significant differences in the pass rates for females (49% - 55%) in the sixth grade. In the seventh grade, females enrolled in the single-sex school and females instructed in the coed single-sex classes (71% -

80%) were more likely to have passed the test than did their peers in the female coed classes (66%). There were no significant differences in the pass rates for males (55% - 65%) in the seventh grade. There were no significant differences in the pass rates of either the males (54% - 59%) or the females (64% - 70%) in the different instructional settings in the eighth grade. The disaggregated data by grade of the sample indicates that female students always performed better in single-sex settings, as compared to female students in a coeducational setting.

The data for this analysis are presented by instructional group in Figure 2. Progress through middle school can be assessed for each group. The percentage of male students in the single-sex school who passed the mathematics portion of the GCRCT increased from 47% in the sixth grade to 54% in the eighth grade (a 7% increase from Grade 6 to Grade 8). The largest gains were made by females in the coed single-sex class (15%) and females in the coed class (16%). The smallest gains were made by males in the coed single-sex classes (-2%). The sample data indicates that female students performed better than male students in all instructional settings when comparing overall percentage gains of passing the mathematics portion of the GCRCT. The data also indicates that student performance of the sample on the mathematics GCRCT showed tremendous gains in seventh grade for most instructional groups.

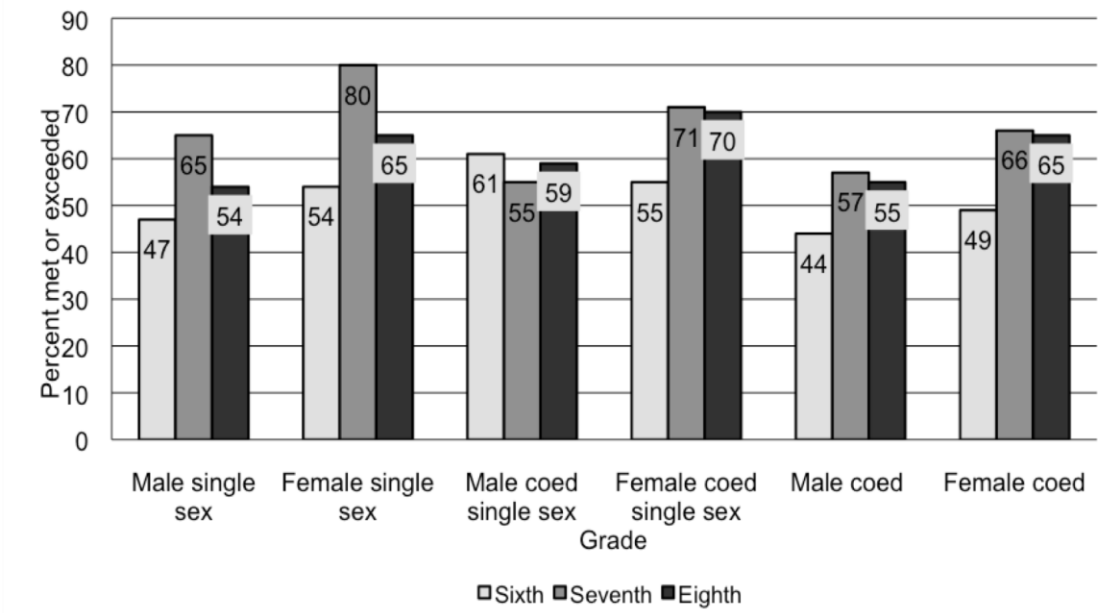

Figure 2. Percentage of students in the sample passing the mathematic portion of the GCRCT from 2007–2010 by grade and group.

Grade, group, and gender in Table 10 present the percentages of students in the cohort who met or exceeded standards on the GCRCT. The independent samples chi-square test was conducted to determine if significant differences existed among the instructional groups in each grade and by gender. The tests were not significant for the male instructional settings, nor were tests significant for the seventh grade female settings. However, the tests for the female instructional settings found significant differences at the sixth and eighth grades. Females in the sixth grade (78%) and eighth grade (84%) coed single-sex classes were more likely to have passed the mathematics portion of the GCRCT than did their female peers in the other instructional settings. The disaggregated data by grade of the cohort indicates that female students always performed better in single-sex settings, as compared to female students in a coeducational setting.

Table 10

Chi-Square Analysis of Students in Cohort Meeting or Exceeding Standards on GCRCT From 2007–2010 by Grade, Group, and Gender

	Grade											
	Sixth				Seventh				Eighth			
Instructional group	*n**	%	χ^2	*p*	*n**	%	χ^2	*p*	*n**	%	χ^2	*p*
Male single-sex	49	43			49	69			49	55		
Male coed single-sex	33	70			33	61			33	58		
Male coed	50	52	5.74	.06	50	66	.68	.71	50	60	.24	.89
Female single-sex	72	47			72	74			72	71		
Female coed single-sex	37	78			37	84			37	84		
Female coed	48	44	12.18	<.01	48	71	2.05	.36	48	50	11.54	<.01

**n* = number of students in group

The data for this analysis are presented by instructional group in Figure 3. The chart also includes the students' performance on the mathematics portion of the fifth-grade GCRCT. This group is an intact cohort; therefore, their performance can be tracked from the fifth grade through the eighth grade. The students' pass rate at the fifth grade level (as presented earlier in the results) was similar across all three groups (84% - 97%).

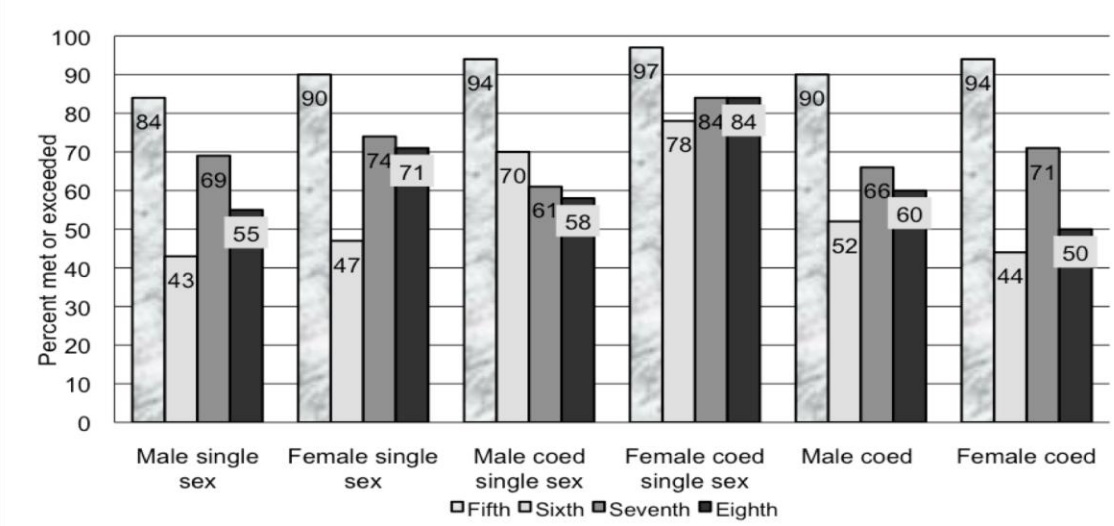

Figure 3. Percentage of students in the cohort passing the mathematic portion of the GCRCT from 2006–2010 by grade and group.

The percentage of male students in the single-sex school who passed the mathematics portion of the GCRCT increased from 43% in the sixth grade to 55% in the eighth grade (a 12% increase from Grade 6 to Grade 8). The largest gains were made by females in the single-sex school (24%). The smallest gains were made by males in the coed single-sex classes (-12%). Although the gains made by females in the coed single-sex classes were not large (6%), their performance was the best, starting at a 78% pass rate in the sixth grade and increasing to a pass rate of 84% in the eighth grade. The performance of the females in the coed single-sex classes showed positive gains and maintained more stability than the performance of females in the other instructional settings. No differences were found among the instructional settings of the males. The cohort data indicates that female students performed better than male students in single-sex and coeducational single-sex instructional settings when comparing overall percentage gains of passing the mathematics portion of the GCRCT. The data also

indicates that student performance of the cohort on the mathematics GCRCT showed tremendous gains in seventh grade for most instructional groups.

Summary

The purpose of this study was to determine if differences in academic performance in mathematics exist among urban middle school students who attend coeducational classes, single-sex classes, within a coeducational school, or a single-sex school. The study also seeks to identify which instructional setting do males or females perform best.

The results of this study provided specific information relating to the instructional groups observed. Between the school years 2007 – 2010, there were students who attended the schools in this study for one, two, or all three years. To gather specific information on the impact instructional practices may have on students, the researcher decided to divide the overall sample group into two groups. One group, identified as the *sample* represented students who only attended the schools in this study for one, two, or three years, or students who repeated a grade. The other group, identified as the *cohort* represents a subset of the sample group. This group of students remained in one of the schools of study and matriculated each year from grades sixth through eighth. The purpose for dividing the sample was to examine how a longitudinal study compared to a general study within the same population.

When examining the sample group data for the six instructional groups for grades sixth, seventh, and eighth, male coed single-sex sixth grade students were more likely to have passed the mathematics portion of the GCRTC than male students in coed and single-sex settings. While there were no significant differences in the pass rates for

males grade seven, males in the single-sex setting showed the greatest gains by at least 8% over males in coed single-sex and coed settings. There were no significant differences in the pass rates for males in grade eight. In the seventh grade, females enrolled in the single-sex school were more likely to pass the test than females in coed single-sex and coed settings. There were no significant differences in the pass rates for females in grades six and eight. The disaggregated data by grade of the sample indicates that female students always performed better in single-sex settings, as compared to female students in a coeducational setting.

The largest gains made by students in the sample group on the GCRT over three years for meeting or exceeding standards were made by females in a coed setting. Females in a coed single-sex setting had the second highest gains on the GCRCT as amongst the six instructional groups and were the only group to maintain a high pass rate. The largest gains made by students in the cohort group were made by female students in a single-sex setting, followed by male students in a single-sex setting. It is also important to note that female students of the cohort in a coed single-sex setting were the only group to maintain a high pass rate. The data from both the sample and cohort indicate that female students performed better than male students in most instructional settings when comparing overall percentage gains of passing the mathematics portion of the GCRCT. The data also indicates that student performance on the mathematics GCRCT showed tremendous gains in seventh grade for most instructional groups.

Over a three year period, grades six through eight, sixth grade male coed single-sex and female coed single-sex students in the cohort group were more likely to pass the GCRCT in mathematics than other sixth grade students in the instructional groups. There

were no significant differences in the pass rate of seventh and eighth grade male students. Eighth grade female students enrolled in a coed single-sex class were more like to pass the test than female students in the other instructional groups. While there were no significant differences of seventh grade female students, female students enrolled in a coed single-sex class were also more likely to pass the GCRCT based on percentage gains. Males enrolled in a coed single-sex class in either the sample or cohort groups were identified as having the lowest percentage of gains in meeting or exceeding standards on the GCRCT in mathematics over a three year period.

Additional information concerning the percentage of students failing to meet, meeting, and exceeding the standards in mathematics are provided in the appendix. Chi-square analyses by year, grade, and instructional setting are provided for both the sample and the cohort. The discussion of the results and conclusions that were drawn from the results are presented in Chapter V.

CHAPTER V

SUMMARY, CONCULSIONS AND RECOMMEDATIONS

This study was conducted to examine the influences, if any, of instructional settings within an urban school district, and its' exerts on middle school students' mathematical achievement as measured by the GCRCT. This study specifically examined single-sex schools, coeducational schools, and single-sex instruction within a coeducational school. This study was initiated based on school budget cuts and the need to fund programs that prove to be effective; thereby resulting in an examination of the effectiveness of single-sex schools and single-sex instruction on mathematic achievement.

Single-sex schools have existed before the 20th century, and were used initially to educate boys. Around the 19th century girls were integrated into public schools, and by the middle of the 19th century almost as many girls as boys were attending school (Steptoe & Arbor, 2004). By the 1890, coeducation was clearly the most common model for public schools. In 1972, nondiscrimination legislation was passed to protect students from discrimination in education on the basis of gender (GAO, 1996). Title IX became a significant educational amendment in 1972, because it prohibits school districts from discriminating against students on the basis of sex and sets legal limits to single-sex public education. Title IX does not govern admissions practices at the elementary and secondary school level except for vocational schools, it does require that school districts provide comparable facilities, courses, and services to boys and girls – separate, but equal (Sneed, 2009).

Now in the 21st century, former President George Bush paved the way for an aggressive approach to educational reform with the No Child Left Behind (NCLB) Legislation (Huges, 2007). Incentive grants were provided for single-sex schools under NCLB, and revisions to Title IX were making it easier for schools to adopt single-sex polices. In 2006, the Department of Education's single-sex regulations expanded authorization for schools to offer single-sex programs for their K-12 students. These programs could only be offered if the excluded gender receives "substantially" equal educational opportunities (National Coalition for Women and Girls in Education, 2008, p. 40). By 2006, there were 223 public single-sex schools (Fergus & Noguera, 2010). The number of single-sex public schools has steadily increased in recent years. As of April 2010, at least 540 schools offered single-sex programs. Most of these schools were coeducational and merely offered single-sex instruction, however, about 91 of the 540 schools were completely single-sex (Guarisco, 2010).

Many school districts welcomed single-sex schools and single-sex instruction as a means to improve student performance (Hughes, 2007). Riordan (1994), believed that single-sex schools would actually benefit boys from minority groups and boys from poor families who may need more direct guidance. Proponents to single-sex schools and single-sex instruction feel that boys and girls learn differently and should be educated in instructional settings that support gender differences (Brizendine, 2010; Gurian, 2001; Sax, 2007). Opponents, such as the National Organization for Women (NOW), believe that separate but equal policies rarely treat girls equally and often rely on outdated sex-stereotypes about girls' and boy's interest and abilities. NOW also believes that interactions between genders should not be eliminated in the classroom (Guarisco, 2010).

Analysis and Discussion of the Research Findings

This study examined the research questions using a quantitative research method. The quantitative approach is based upon the use of middle school mathematics CRCT testing data derived from the Georgia Department of Education for school years 2007 – 2010. These data reflect the mathematics achievement results of students who attend MSS Middle School, FSS Middle School, CSSI Middle School, and COED Middle School. Mathematics CRCT test data from school year 2006 – 2007 was also collected and analyzed to serve as baseline data prior to middle school testing. All data were collected, coded, and disaggregated by instructional setting, gender, grade, and CRCT result. CRCT results are coded as "Does Not Meet", "Meets", or "Exceeds" the standard along with the students' scaled score. During the 2006- 2007 school year, students were assessed in mathematics based upon the State of Georgia's Quality Core Curriculum. The scaled score ranged from does not meet standard – below 300; meets the standard – 300 to 349; and exceeds the standard – 350 and above. After school year 2007, students were assessed in mathematics based upon the State of Georgia's Performance Standards. The scaled score ranged from does not meet standard – below 800; meets the standard – 800 to 849; and exceeds the standard – 850 and above.

The study represents two groups of middle school mathematics students in one of the four instructional groups. The sample and the cohort represent these groups. Sample and cohort data were separately analyzed to identify how students of the cohort (students who attended the same middle school for grades sixth through eight) compared against the sample group (transient students). To determine if both groups of students were entering the sixth grade at an equivalent level in mathematics an analyses of variance

(ANOVA) was conducted. The results indicated that there were no significant differences among the instructional groups entering middle school.

Chi Square was used to compare the overall achievement data of students between school years 2007 - 2010. The results for the sample group revealed that sixth grade male coed single-sex students were more likely to have passed the mathematics portion of the GCRCT than did their male peers, and seventh grade females enrolled in the single-sex school and females instructed in the coed single-sex classes were more likely to have passed the test than did their peers in the female coed classes. The results for the cohort group revealed females in the sixth-grade and eighth-grade coed single-sex classes were more likely to have passed the mathematics portion of the GCRCT than did their female peers in the other instructional settings. When examining the incremental growth of the student groups from school years 2007 – 2010, the largest gains in the sample group were made by females in the coed single-sex class (15%) and females in the coed class (16%). The largest gains in the cohort group were made by females in the single-sex school (24%). Females in the coed single-sex classes in both groups proved to be more consistent in maintaining a large percentage of students to either meet or exceed standards in mathematics as compared to the other sample and cohort instructional settings. The data from both the sample and cohort indicate that female students performed better than male students in most instructional settings when comparing overall percentage gains of passing the mathematics portion of the GCRCT. The data also indicates that student performance on the mathematics GCRCT showed tremendous gains in seventh grade for most instructional groups.

Possible explanations for the various levels of student achievement in both sample and cohort groups for the three years examined are:

1. Schools have succeeded in creating a mathematics instructional environment that is conducive for female students. The decline enrollment of male students over the years may also be a factor for the increased performances of female students.
2. Sample group varied each year with the number of students who were new to the school. The adjustment to the environment as well as to instructors might have resulted in possible decreases in student achievement.
3. Teachers in both sample and cohort groups may possibly teach a new group of students each year, therefore the learning curve is greater in terms of teachers knowing their students learning style.
4. Single-sex instructional teachers within a coeducational school and coeducational teachers, may not have completed comprehensive professional development courses on how boys and girls learn.
5. Teachers may not have differentiated their instruction based on students' readiness level.
6. Cohort group has the advantage of familiarization with the school culture, norms, faculty, and some students; therefore the transitioning period is presumed to be minor.
7. Sample sizes varied greatly amongst the cohort and sample groups.

Conclusions and Implications

Based upon analysis of the data, it can be concluded that in this particular study the single-sex academic setting is the environment in which both male and female students of the cohort showed the greatest academic gains on the CRCT in mathematics. Female students of the sample also showed the greatest academic gains on the CRCT in mathematics in single-sex settings. When examining the sample group data, males showed the largest percentage of growth in the coeducational academic setting. Female students in the sample group excelled in both coeducational single-sex and coeducational academic settings. The female coeducational single-sex academic setting maintained the highest level of student achievement in mathematics on the CRCT as compared to all other groups in this study. This study may suggest that students, who attend single-sex schools for a period of three years, tend to excel academically in mathematics, as well as transient female students enrolled in a single-sex setting. This study may also suggest that students, who are transient during their middle school years, tend to show increased gains in mathematics achievement in coeducational environments over three years; however, the data also indicates that coeducational settings showed lower performance levels of students by grade, group, and gender. These findings are unique to this study and do not suggest that similar empirical research should be discounted. This study contains many outside variables that may have been factors in the results.

Recommendations

This examination of urban middle school student performance in mathematics as measured by the GCRCT has illuminated certain issues which this researcher suggests warrant further inquiry.

To begin, more research should be conducted on other subjects/courses outside of mathematics. This proposed study should be replicated in similar school settings to confirm findings. This proposed study's design could be used in all schools in all settings at various grade levels within public education. The findings could yield to school districts specific information relating to instructional practices that impact student achievement. These findings may influence funding, and/or ways school districts can provide teachers with the necessary professional development to support the learning styles of boys and girls.

The results clearly indicate that females are performing better than the male students on the GCRCT in mathematics. More specifically, female students in coeducational settings perform well in both sample and cohort groups. The only gains made by male students were of those males belonging to the sample group at the sixth grade level in the coed single-sex instructional classes. Unfortunately, male students in the coed single-sex instructional classes were also the only group to have a decrease in achievement on the GCRCT over a three-year period. Recommendations are based on these findings.

One possible reason for this trend can be attributed to the number of female mathematics teachers who create environments that are nurturing to females. Research finds that the traditional classroom and methodologies are more conducive to how girls learn rather than boys (Gurian, 2001). The gains acquired by female students might be attributed to the number of female student who remained in school between sixth and eighth grade. From school years 2007 – 2010, male student enrollment per year declined

as compared to female students. Schools seem to be more appealing to female students than male students.

Schools must adopt new practices/strategies for teaching boys. Male students learn best by moving around and becoming involved in the learning process via "hands-on" opportunities. Both visual stimuli and topics of interest are the "hooks" that teachers need in order to "reel in" male students. When appealing to Black and Latino male students, schools must first address their social and emotional needs. These social and emotional needs stem form low self-esteem, identity crises, negative external pressures, lack of parent involvement or male role models, poor quality of prior educational environments, and negative views of education (Fergus & Noguera, 2010).

School districts must also provide adequate funding for single-sex instruction. Funding that will provide teachers with training and professional development opportunities to become proficient in understanding how to create conducive learning environments for both genders, and understanding how each gender learns. Sufficient funding should also be available for internal and external resources in support of single-sex instruction and instructional strategies for urban students. Funding may be the determining factor in hiring the highly qualified staff. It is important for teachers to change their pedagogy to accommodate the learning environment and not transfer "old" skills in new settings.

Careful planning and implementation are essential to principals who are considering single-sex instruction. Schools must have sufficient time to plan, gain support of their constituencies, recruit and train teachers. The school's mission should not solely lay a foundation for student achievement, but it should address the specific educational needs of boys and girls (Protheroe, 2009). Schools should embed within the curriculum courses that are of interest to urban students. Partnerships with the community and stakeholders are also

effective strategies in supporting student achievement. These partnerships can offer mentor support and supplemental services beyond school hours. The goal of reaching students can be achieve, if deliberate steps are taken to address these recommendations.

The results of this study will be disseminated via the World Wide Web. The researcher will present findings to local and district school administrators, teachers, parents, and stakeholders within the school district used in this study, as well as to present this study at conferences.

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APPENDIX A

IRB PERMISSION

Georgia Southern University
Office of Research Services & Sponsored Programs

Institutional Review Board (IRB)

Phone: 912-478-0843
Fax: 912-478-0719 IRB@GeorgiaSouthern.edu
Veazey Hall 2021
P.O. Box 8005
Statesboro, GA 30460

To: Craig Ogden
Linda Arthur
Department of Leadership, Technology on Human Development

cc: Charles E. Patterson
Vice President for Research and Dean of the Graduate College

From: Office of Research Services and Sponsored Programs
Administrative Support Office for Research Oversight Committees
(IACUC/IBC/IRB)

Date: February 7, 2011

Expiration Date: May 31, 2011

Subject: Status of Application for Approval to Utilize Human Subjects in Research

After a review of your proposed research project numbered **H11251** and titled **"A Comparison of Students Performance in Single-Sex Education and Coeducational Education Settings in Urban Middle School,"** it appears that your research involves activities that do not require full approval by the Institutional Review Board according to federal guidelines.

According to the Code of Federal Regulations Title 45 Part 46, your research protocol is determined to be exempt from full review under the following exemption category(s):

B4 Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

Therefore, as authorized in the Federal Policy for the Protection of Human Subjects, I am pleased to notify you that your research is exempt from IRB approval. **You may proceed with the proposed research.**

Please notify the IRB when you have completed the project by emailing irb@georgiasouthern.edu. Include the date of completion, the number of subjects (records) utilized and if there were any unexpected events related to the subjects during the project. (If none, state no unexpected or adverse events occurred during the conduct of the research.)

Sincerely,

Eleanor Haynes
Compliance Officer

APPPENDIX B

DETAILED CHI-SQUARE ANALYSIS OF STUDENT ACHIEVEMENT IN SAMPLE ON GCRCT IN MATHEMATICS BY GRADE, GROUP, AND GENDER

Detailed Chi-Square Analysis of Student Achievement in Sample on GCRCT in Mathematics by Grade, Group, and Gender

Grade	School year																	
	2007–2008						2008–2009						2009–2010					
	n	DNM	M	E	χ^2	*p*	*n*	DNM	M	E	χ^2	*p*	*n*	DNM	M	E	χ^2	*p*
6th grade																		
Male single sex	133	62	36	2			83	51	45	5			112	44	48	8		
Female single sex	184	54	44	2			132	41	56	3			134	39	55	7		
Male coed single sex	73	47	49	4			71	34	58	9			72	38	57	6		
Female coed single sex	73	33	64	3			68	54	43	3			70	49	47	4		
Male coed	105	59	40	1			84	54	41	6			102	55	41	4		
Female coed	99	64	34	2	24.10	<.01	90	39	53	8	15.77	.11	95	51	44	5	10.71	.38
7th grade																		
Male single sex							107	38	43	19			83	31	55	13		
Female single sex							151	24	66	10			128	15	70	16		
Male coed single sex	69	52	42	6			71	51	49	0			60	30	60	10		
Female coed single sex	71	40	53	7			75	24	71	5			62	23	55	23		
Male coed	87	55	37	8			89	29	57	14			76	45	47	8		
Female coed	101	33	63	4	15.78	.02	105	36	59	5	45.06	<.01	88	33	51	16	28.96	<.01
8th grade																		
Male single sex													92	46	40	14		
Female single sex													144	35	42	23		
Male coed single sex	74	45	51	4			60	23	65	12			69	52	42	6		
Female coed single sex	74	27	66	7			70	36	56	9			79	28	70	3		
Male coed	86	50	48	2			83	37	60	2			100	46	42	12		
Female coed	114	26	72	2	20.69	<.01	103	29	68	3	11.61	.07	100	54	44	2	55.21	<.01

APPENDIX C

DETAILED CHI-SQUARE ANALYSIS OF STUDENT ACHIEVEMENT IN COHORT ON GCRCT IN MATHEMATICS BY GRADE, GROUP, AND GENDER

Detailed Chi-Square Analysis of Student Achievement in Cohort on GCRCT in Mathematics by Grade, Group, and Gender

	School year																	
	2007–2008						2008–2009						2009–2010					
	6th grade						7th grade						8th grade					
Grade	*n*	DNM	M	E	χ^2	*p*	*n*	DNM	M	E	χ^2	*p*	*n*	DNM	M	E	χ^2	*p*
Male single sex	49	57	39	4			49	31	49	20			49	45	39	16		
Female single sex	72	53	44	3			72	26	65	8			72	29	53	18		
Male coed single sex	33	30	61	9			33	39	61	0			33	42	52	6		
Female coed single sex	37	22	73	5			37	16	76	8			37	16	78	5		
Male coed	50	48	50	2			50	34	50	16			50	40	44	16		
Female coed	48	56	40	4	17.92	<.01	48	29	65	6	5.57	.35	48	50	48	2	14.15	.02