

DOES EDUCATION COME IN PINK OR BLUE?
THE EFFECT OF SEX SEGREGATION ON EDUCATION

by

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ABSTRACT

This paper discusses the benefits and detriments of single sex education in terms of achievement, interest and self esteem for children in the United States education system and reviews the current research literature to determine whether students should be taught in a segregated environment. The paper examines the history of single sex education in the United States and the movement from inequitable beginnings to the primarily coeducational public school system of today. The body of research explores single sex and coeducational schooling in search of the effect of differentiated instruction and whether it might provide each gender with the different tools needed to enrich their learning and understanding. The research both supports and opposes single sex education creating inconclusive findings and indicating that additional factors impact the outcome of education regardless of gender. Gender bias, small class size, funding, family support and dedicated teachers seem to influence the research results and demonstrate the need for additional studies to isolate these factors and determine the impact solely of single sex education on achievement, motivation and self esteem.

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CHAPTER ONE: INTRODUCTION

Introduction

Today, perhaps more than ever, the United States public schools are under attack for failing to deliver academic rigor, excellence and equity to its students. The No Child Left Behind Act (NCLB) is the most recent of the reforms designed to spur change within a seemingly failing education system. Multiple reform acts have emerged in response to the call for improvement and equity. National and local movements aim to increase standards and accountability with more and more reliance on academic testing as proof of achievement (Spelling, 2008). Efforts to create change have fallen into the free market system as private enterprise attempts to run schools for profit as a way to increase student achievement, monetarily reward teachers for performance and challenge current schooling systems (Symonds, W.; Palmer, A; Lindorff, D; McCann, J., 2000). Additional choice of schools including magnet schools, charter schools, and voucher programs provide additional opportunities for aspired change (Viadero, 2008).

Along with these system reforms, growing concerns regarding gender equity mount. Over the last twenty five years, researchers produced a surplus of studies documenting and highlighting gender bias against girls in the coeducational school environment (AAUW, 1992; AAUW, 1998). Historically girls have received less attention, have different expectation of them, have lower enrollment in advanced level math and science programs, and face greater risk of sexual harassment and ridicule than do their male counterparts (AAUW, 1992;

AAUW, 1998), however, in recent years, new studies uncovered a concern of shifting tides. Studies show that boys are falling behind girls in language skills, reading comprehension, earn lower test scores and our schools fail to meet their specific needs (Gurian, 2001; Scott, 2003).

Gender equity has attracted the interest of American feminist and psychologist, Carol Gilligan, who supports study to aid both sexes. She remains concerned about the demands and rules of society and fears that boys will internalize their feelings and not allow them to voice their own concerns (Gilligan, C., Attanucci, J., 1988). She suggests reinforcement of societal utterances demean boys with terms of “Mamas boy” or “you’re gay” or “baby talk.” This creates a system of oppression which upholds a structure of men as patriarch and women as subordinate, shown in the very language to oppress boys (Gilligan, C., Attanucci, J., 1988). Under Gilligan’s influence, Jane Fonda donated 12.5 million dollars to Harvard Graduate School of Education to study gender equity under Project ASSERT and launch the Harvard Center on Gender and Education (Gewertz, 2002).

Debate over gender equity continues. Society perpetuates the gender gap as illustrated by inequitable pay scales, occupations, media, literature, and athletics. Predefined roles within society depict appropriate behavior and acceptable limits (Rogoff, 2003). When a child is born, the first words we hear are, “It’s a boy!” or “It’s a girl!” From these few words, the child’s role in society has already taken on meaning and whether male or female, gender defines the individual’s life from beginning to end (Weiss, 2001). Acceptable roles are

defined by society and instilled in the individual from their first breath based on the culture in which they live.

Schools and districts in a number of states have attempted to respond to these gender equity issues by experimenting with smaller class sizes, anti bullying policies and single sex classrooms (Whitmore, 2005). South Carolina's state Superintendent of Education, Jim Rex, made single sex education a top priority in the public school system by implementing single sex education in ninety seven schools (McNeil, 2008). Urban areas throughout the country including New York City and Chicago experiment with single sex education and use it as a strategy to raise achievement in children of minority status. California governor, Pete Wilson, supported experimental implementation of single sex programs in San Francisco schools, results included later in this paper (Hubbard & Datnow, 2005; Herr, 2004).

Questions regarding gender equity in education have encouraged research to determine whether boys and girls learn differently and if such differences would be better accommodated in single sex settings. Researchers from two main perspectives studied how gender shapes the way we learn. Current brain researchers consider differences in the biological and cognitive processes between the genders. Another perspective comes from sociologists, psychologists, educators and feminists who argue that culturally programmed gender identity is responsible for what and how we learn (Weiss, 2001). One question remains, does education and learning come in pink or blue? Which leads to the question:

What are the effects of gender segregated schools and/or classrooms on student achievement, participation, and self-esteem?

This paper will examine and critically review research that considers the benefits and detriments to single sex classrooms and schools. This paper will demonstrate the effects of single gender education in elementary, middle and high schools on student achievement, interest and involvement, as well as, self-esteem.

Rationale

Thirty six years after the passing of Title IX, which prevented discrimination on the basis of sex by removing federal funding for any unequal educational programs, inequity continues between boys and girls in the classroom (McGee Bailey, 1996). Data on persistence and achievement in science and math, review of texts and curricular data, research on student – teacher interaction, and student –student interaction all show the continuance of inequity and present significant barriers in education, specifically for girls (McGee Bailey, 1996). More recently, Title IX has been used in legal decisions to force single gender public institutions to close or become co-ed (Hayes, 1992). Ironically since restrictions to the public sector against sex segregation, it is in the years following the Title IX decision that we have seen a renewed interest in single gender education (Hayes, 1992).

Since the 1980's much debate continues regarding the issue of the gender gap in education. It has been reported and studied in countries throughout the

world including the UK, the US, Japan, Canada, the Netherlands, France, Jamaica, Germany, New Zealand and Australia. Single sex classrooms were once considered discriminatory, but in recent years they have resurfaced as a possible solution to closing the gender gap (Sax, 2005). One reason for hope is the belief that girls and boys learn differently (Gurian, 2001; Younger and Warrington, 2001) and that single sex education can isolate teaching methods designed specifically for a gender. This is especially true of recent belief that single sex education would be used as an effective strategy to boost progress of underachieving boys (Gurian, 2001).

In recent years, a widening gender gap created much debate. Research confirms the existence and perpetuation of a gap in language, math and science, especially in middle school years. Despite the many efforts on the part of education systems to encourage women in math and science, males continue to dominate these fields (Sax, 2005). The University of Washington identified the need to address women independently of men in the field of chemistry and offered Women's' Only Chemistry classes to reach out to women and encourage them in scientific exploration. The department seemed to hope to appeal to females who might feel insecure in a co-educational environment or would simply feel less inhibited in a women's only classroom (University of Washington, 1995). The Department of Education and Skills for the United Kingdom published a compilation of international research studies and reviewed findings which demonstrated boys as significantly behind girls in language, arts, and humanities (Department of Education and Skills, 2007).

In 1992 the Wellesley College Center for Research on Women published a ground breaking report by the American Association of University Women (AAUW), "How Schools Shortchange Girls," which illuminated many differences in education for girls and boys. This study became the seminal research of the time on which many studies are based. The study found that girls enter school in kindergarten ahead of boys and emerge twelve years later behind them especially in the areas of math and self esteem. Traditional schooling ignores the contributions and strengths of girls and their educational needs (AAUW, 1992). The study reported that girls' self esteem suffers in adolescent years which may lead to low academic performance. In addition, the report mentioned additional blocks to learning which schools find difficult to address but at which girls-only programs have more success, include sexual harassment, substance abuse, pregnancy, violence and eating disorders (AAUW, 1992).

Most parents and educators agree that girls have lagged behind boys in mathematics, science and technology. Programs designed to meet the needs of girls including GirlTECH, programs through the National Science Foundation, Girls Incorporated, and the Sally Ride Science Club formed to support and encourage girls in technology related subject matter where schools have failed (Jobe, 2003).

For the past two decades the media has highlighted the concern of policy makers, educators, researchers and parents about the gap between boys and girls in achievement. Public opinion sways from how we are shortchanging our girls to fairness to boys in their battle for equity in education (Younger, 2002).

Concerned that boys are not getting what they need from traditional coeducational schooling methods and the widening achievement gap of the underachieving boy, author and researcher of child development, Gurian (2001), supports theories of differences among the brains of girls and boys and reports from the fields of neurobiology, anthropology, educational psychology and sociology, regarding how a child's brain works, how girls' and boys' brains work differently, how hormones affect these differences, and how acculturation influences the biology, and differences in processing emotion. His research provides solutions and applications including encouraging single gender education to provide the best learning opportunities for youth.

Strategies of adopting different teaching styles has been successful, supporting boys (and sometimes girls) through mentoring schemes, focusing on literacy issues for boys, developing merit systems and short-term target setting in an effort to improve motivation, implementing single-sex groupings in special subjects, all in recognition of gendered modes of learning (Parker & Rennie, 2002). Schools and researchers have been taking the issue seriously for several years, therefore, and in the process undertaking a number of interesting innovations.

Conflicting evidence exists regarding the benefits of single gender education for boys or girls. The popular view is that single sex schooling benefits girls in particular, by providing them with an environment in which they can participate with confidence, free from the distractions caused by the presence of boys in the classroom. In theory, this should lead to higher attainment, but until

now there has been little hard evidence to support this. Multiple researchers have performed multilevel analysis of pupil-level data in order to study the effects of single sex education, however, each of these studies reports that once prior attainment and social background have been controlled for there is no significant effect by single sex education (Young, 1994; Harker 2000).

Males and females coexist in society daily. The ability to deal with the opposite sex is a crucial skill, yet if educating males and females separately could benefit either sex in any way, single sex education is worth considering and evaluating. If there is a positive impact on student learning, there is value in determining the criteria in the environment which causes this impact. If the criteria could be identified, schools would adopt changes to benefit their students. The effects may far out reach academic benefits. Self esteem, student involvement and participation may be affected by narrowing classrooms to a single gender which has the opportunity to affect the student over their lifetime and not simply while they are in school. In addition, if benefits could be quantified, teachers could use those tools to have a greater impact on student learning and intrapersonal relationships.

Distractions from the opposite sex can cause students, particularly adolescents, to behave differently than in same gendered groupings. Both males and females spend a considerable amount of time attempting to impress the opposite sex; single sex classrooms would remove these distractions. Males and females may place less value on their physical beauty, pay less attention to their looks, and spend less time on male/female interpersonal relationship issues than

in single sex situations, thereby providing more time with greater focus on education (Sax, 2005). In addition, females are more apt to participate in physical education classes while they reserve their abilities in co-educational settings (Hannon & Ratliffe, 2007). With the rising adolescent obesity rate, high number of psychological disorders including anorexia, bulimia, and body dysphoria, physical education is an essential experience and one that can assist both males and females with lifelong healthy habits, as well as, boost self esteem, adrenaline and empowerment (Sax, 2005).

Inhibitions are not specific to females. Males participate more actively in the fine arts of drama, music and art in single sex settings. Without perceived judgment and suppression of creative talent, males are free to explore artistic expression without trying to impress the opposite sex. This allows for a more fully developed individual with a much richer experience and education (Sax, 2005).

Statement of Purpose

This paper examines the research literature concerning the single gender classrooms and schools in public education. This paper will examine the factors that affect the benefits and detriments to single sex classrooms and schools. This paper will demonstrate the effects of single gender education in elementary, middle and high schools on student achievement, interest and involvement, as well as, self-esteem.

Summary

This chapter highlighted discussions of gender bias against both females and males in the coeducational public education system. Stereotypical views regarding gender roles have prevented invitation of girls into higher level math and science courses (AAUW, 1992) and swayed boys from language arts classes (Taylor, 2003). Not surprisingly, girls have lagged behind boys in mathematics, science and technology which has instigated many programs designed to raise girls' interest in high-tech activities and spurred interest in research to determine if removing the stereotype by placing girls in all girls setting, would reduce apprehension and encourage girls to succeed in these male dominated areas (Jobe, 2003). Recent media suggests boys are falling behind girls in reading, writing and standardized tests and are more likely to be deemed learning disabled (Taylor, 2003). This paper will critically examine these issues through review of research to uncover the realities of both single gender and coeducational settings.

Chapter two will present a chronological review of education through history from ancient times to its current status in the United States. It will discuss the development of the educational system and explore differences in approaches towards males and females. This chapter will highlight discussions of inequity between the genders and discuss current applications designed to diminish such bias.

CHAPTER TWO: HISTORICAL BACKGROUND

Introduction

This chapter examines several historical trends as they relate to gender issues in American education and dilemmas which still persist. It also addresses the emergence of modern social classes, and historic emergences of conceptualizations of social/economic class. The development of American schools and discussion of class conflicts surrounding education and schools will also be reviewed. Throughout this chapter the educational research trend concerned primarily with inequitable schooling and social class will be traced, and tied when possible to the historic and social developments in society.

Ancient Cultures

Education was the primal response to survival of early civilizations. Male and female mentors trained youths with the skills and knowledge to perpetuate the community. As cultures evolved, the transmission of knowledge changed formats from apprentice and oral traditions to written language and thus began human dependence on the written word initiating formal education. Women's opportunities for education have had a long and turbulent path from barely recognizable roots in the early years of civilization to the rampant growth seen in the nineteenth and twentieth centuries (Sexton, 1976).

Ancient Greek education provided women the opportunity for study in music and oratory, but much of the culture focused on athleticism and military practices which dominated educational institutions. Women were excluded from these male centered events and viewed as incapable even of teaching their own

children (Sexton, 1976). Though early Greeks rejected women in education, Roman civilization with its traditions of family and the women's role as "guardian and teacher of the young" (Sexton, 1976) and women were seen as early educators without having had any education themselves.

Medieval Europe and the Age of Enlightenment

During the Dark ages, European women were on a more level playing field with men and as Christianity persevered, women were looked upon more favorably as purveyors of faith (Riordan, 1990). Women provided a vital domestic role during this era and within the home developed more formalized educational practices resulting in a higher literacy rate among women over men (Sexton, 1976). Opportunities for women continued but mainly within the confines of the church as Parish schools educated young nuns in reading and writing, but excluded them from any high offices within the church (Sexton, 1976). Education of women during the Renaissance and Reformation eras were once again restricted to boys, but as the Age of Enlightenment occurred, so did changes in women's education. Still restricted to the wealthy, women began educational pursuits in segregated formats as young men attended grammar and private schools under primarily Protestant influences and young women attended in the home.

Early American Schooling

The history of American schools clearly illustrates that the education system in New England was designed to protect existing Protestant authority by providing a class system of education. Originally education was restricted to only

those families who could afford private instruction; males from wealthy families received private education through tutors or small private schools. While the elite enjoyed a rich education of literature, foreign languages, arts and humanities, poorer children remained illiterate and apprenticed to their future positions. The introduction of reading and writing to the masses only became important “so that they could obey the laws of God and the state” (Spring, 2008, p11). An early attempt at social control is exemplified by the first colonial law regarding education, the Massachusetts Law of 1642, which required the first compulsory education. It reinforced the class system by giving low income children a poor education that focused on obedience rather than on analytical thought. A few years later, additional religious focus continued with the Old Deluder Satan Law which reinforced the conformity and required public financial support for school and thus laid the groundwork for public education today (Spring, 2008).

From the American Revolution to the Civil War, advocates of education saw women as equal to men in terms of morality and responsibility, but not their job prospects. Women’s destinies were to become mothers and wives; education was developed to help them become better themselves in this arena. Mount Holyoke Seminary addressed the needs of private education for females and opened in the early 1800’s to offer an equivalent education to what males would receive in a Latin grammar school. Curricula stressed both intellectual achievement and development of high moral character (Shmurak, 1998).

As Public Schools spread across the United States, so did the need for teachers. Women were educated out of necessity since the growth of public

schools created a need for more teachers. A justification for the education of women came with this need for more teachers. Seen as an extension of motherhood, teaching offered an acceptable profession for young women until they married (Shmurak, 1998).

Arguments from the 19th century about co-education for males and females centered on equality of education and separateness between the two groups (Shmurak, 1998) and arguments for and against co-education blossomed. In larger communities single sex education was a norm, but smaller rural communities, facing financial dilemmas, offered only co-educational facilities. Middle and upper class parents wanted to protect their daughters from the lower class sons of the poor. Single sex schools became common in cities in the Northeast including Boston and New York (Shmurak, 1998).

Believers in coeducation were in the majority and claimed that boys were better behaved and girls more self-reliant when schooled with the opposite gender. By the end of the 1800's most school administrators believed in coeducational schooling in both theory and practice. Early feminists were proponents of segregated schooling thinking that coeducational schooling would never truly be equal. Coeducation remained the norm throughout the remaining of the twentieth century (Shmurak, 1998) despite concerns that public school shortchanged boys since girls performed better academically and fears that female teachers would feminize boys.

Changing Tides: Impact of Feminism

From the 1930s to 1960s, educators did not acknowledge a gender bias in schools. By the 1970s, the women's movement raised issues of textbooks diminishing women achievements, sports funding for boys far outweighing that of girls, counselors giving sex stereotyped advice to girls that led to decreasing numbers of female mathematicians and scientists, teachers interacting with boys differently than girls and giving the major share of attention to boys (Shmurak, 1998). As males dominated the administrator roles, students perceived that men were in charge and women were subordinates (Riordan, 1990).

Title IX became the instrument feminists used to fight for coeducational schooling where Federal funding would be restricted if institutions discriminated against individuals based on their sex. Schools that had been previously restricted to males were forced to open their doors to females. These schools included vocational institutions and academically demanding schools. Trends to co-mingle students continued; in 1974 Women's Colleges in America totaled 228, by 1992 this number decreased to 94. Secondary schools followed suit (Shmurak, 1998).

Title IX legislation of the Education Amendments of 1972 changed the landscape of single-gendered education. Prior to this time, single sex schools were common in the United States. By prohibiting educational institutions from receiving federal funds for schools which discriminate on the basis of sex, many schools were unable to remain open. Title IX states: 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 educational program or activity receiving Federal financial assistance (Ferrara, 2005).

Ironically, just as single sex education was diminishing, research demonstrated its positive effects for females. Tidball (1976) found that women's colleges were more likely to produce graduates of achievement especially in the fields of science and mathematics as demonstrated by the number of doctorate degrees obtained in biology and the physical sciences from women's colleges as compared with coeducational institutions.

Recent Research: The Debate Continues

In 1980 the National Center for Education Statistics sponsored a longitudinal study, *High School and Beyond* (Riordan, 1985) which compared girls attending coeducational Catholic schools with single sex Catholic schools. It found that the girls from the single sex environment were more positive about their academics, were more interested in mathematics, showed higher aptitude in the sciences, and displayed higher educational aspirations than their peers in coeducational schools. In addition, girls at single sex Catholic schools had less stereotypical views of women in society and the workplace which suggested potentially nontraditional roles for their futures. Using data from the study, Riordan (1985) surmised that females in single sex Catholic schools performed better than Catholic girls in coeducational schools.

Debate continues over the effectiveness and efficacy of single sex classrooms. In the early 1990s, The American Association of University Women (1992) published a study on gender bias which created a stir in popular media of

the time. Many books were subsequently written on the subject investigating their findings including *Same, Different, Equal: Rethinking Single-Sex Schooling* by Rosemary C. Salomone, *Second Sex* by Simone de Beauvoir, and *Why Gender Matters: What Parents and Teachers Need to Know about the Emerging Science of Sex Differences* by Leonard Sax, among others. Findings included coeducation as reproducing gender stratification of society as a whole and single sex schooling was revisited as a means to provide a better educational opportunity for females. All girls' schools celebrated females in leadership roles, females did not have to compete for teacher attention, and females were the focus of study rather than secondary supporters. Some schools and communities supported single sex classrooms within coeducational institutions seeing the benefit to females (AAUW, 1998). Opponents argued that single sex education would never address the attitudes of males towards females in society and would not offer opportunity for males and females to work together as equals (Jobe, 2003). In addition, some feminists feared that returning to single sex schooling would equate women with helpless and vulnerable in need of protection from males.

Newer research examines the differences between behaviors and learning styles between the sexes finding that schools which place a high degree of importance on rule following, orderly conduct with little time for large muscle movement create a difficult environment for boys and cause them to be less successful (Gurian, 2005). Researchers suggest the while the emphasis on girls in education is pertinent, boys are being over looked and since they are more

likely to be diagnosed with a learning disability, lag a full year behind girls in reading and writing skills (Taylor, 2003), are the main discipline problems in school and are more likely than girls to drop out of school (Gray & Wilson, 2006). New methods and strategies of teaching aimed at supporting needs specific to boys' are making their way to both co-education and single sex schooling, however, many studies show boys receive more attention than girls in coeducational classrooms and therefore as a whole perform higher in those settings (Hannon & Ratliffe, 2007).

Summary

Chapter two, organized chronologically, presented a brief history and identified the roots of education within the United States while providing an overview leading up to the current debate of the benefits of single sex education. The chapter described the historically inequitable paths of educational opportunities for the sexes and provided insight into these injustices resulting in legislation designed to rectify them. In doing so, it highlighted the current educational dilemmas regarding best practices in meeting the specific and different needs of students and discusses the return to single sex schools.

Chapter three will provide a critical analysis of the research regarding single sex education with arguments both in favor of and against it. It will discuss the possibility of learning differences between the sexes and how single sex schooling might support differentiated instruction. Finally, chapter three will examine issues surrounding gender bias and its impact on students. Throughout the chapter, the review of research will examine smaller class size, democracy in

education, and increased funding in an effort to uncover reasons for successful schooling separate from single sex classes and discover opportunities for classroom application and implementation.

CHAPTER THREE: CRITICAL REVIEW OF THE LITERATURE

Introduction

Chapter one introduced the idea of classroom organization as a way to offer the best possible instruction for students. Differentiated instruction geared toward a specific gender might provide each gender with the tools they need to enrich their learning and understanding. A gender gap exists between the genders and many suggest that single gender education would benefit all students and offer a more level playing field. Chapter two reported the history of education in the United States and the development of schooling from single sex roots to primarily coeducational instruction. It examined the inequitable beginning of education placing the needs of males in primary importance and later recognizing females in equal standing. With equitable education as the goal, many researchers studied education and classroom orientation to determine the benefits and detriments of single sex education. Chapter three will review the current literature regarding single sex education. This chapter organizes the research into four sections: support for single gender education, opposition to single gender education, learning differences between genders, and gender bias in education. It summarizes and analyses the research to determine the impact of single gender education on achievement, motivation and self esteem.

Support of Single Gender Education

Researchers found that single sex education provided many benefits to students of both genders. Single sex education focused more on academics and created a culture of support for student learning. Single gender schools promoted

a subculture that allowed girls to feel more comfortable participating in class, more confident and celebrated their strengths. The research indicated that single gender schools provided a greater sensitivity to gender differences, differences in female and male maturation and provided safety from sexual harassment and allowed fewer distractions from the opposite sex. The following studies found that single sex education provided positive effects for students in higher achievement, motivation and self esteem.

Younger and Warrington (2002) completed a twelve year longitudinal quantitative case study in England analyzing the long term effectiveness of single gender education on achievement, and a qualitative study of the classroom interaction, participation and engagement of both males and females in single sex settings. In the quantitative work, the researchers analyzed student performance on a national achievement test, the General Certificate of Secondary Education (GCSE) examination, administered to students over 16 years of age. The students in the study attended a private school in England where single sex classrooms were the norm. Researchers analyzed test scores from males and females from 1988-1999 and compared the outcome to students results throughout the school, county and within England. Students were taught within their gender for all core subjects from grades 7-9 and in some mixed group settings for years 10-11 when grouping by ability for foundational subject matter was necessary. Despite English education authorities' views of single sex education as outdated, the school chose to continue their tradition of separate classes with support from within the school and the community. The school,

located within a mixed socio economic community, shared similar demographics with the other like schools in the town, but described as a “favored suburban catchment area” potentially indicating families with higher economic means.

Younger and Warrington (2002) found that for several years both national and school statistics demonstrated that girls outperformed boys in all categories on the GCSE, but over time both genders’ scores improved. For both genders the study compared the percentage of students who achieved at least five grades of A-C on the GCSE. They found that within the school over a three year period (1997-99) scores for boys raised from 34.7% to 59% yielding a proportional increase of 70% within the school compared with the national average of a 38.3% increase. Girl’s scores increased from 39.9% to 68% yielding a proportional increase of 70.4% in school scores as compared with the national average of 43.9%. The study acknowledged that the rate of improvement for both males and females might be misconstrued and depict a widening in the achievement gap since girl’s scores remained higher than boys, but researchers confirmed that improvement rates for both genders demonstrated equitable growth (70% for boys, 70.4% for girls) over the twelve years surveyed. The achievement gap was much more noticeable in data analysis of the country, showing girls as higher achievers, but fluctuated greatly within the school acknowledging girls outperformed boys by up to 21% in some years and boys outperformed by 5% in others.

To compare classroom interaction, student engagement and participation, Younger and Warrington (2002) quantitatively analyzed systematic observations

and qualitatively analyzed student ethnographic note-taking, to determine the depth and type of questions asked by students, frequency of student desire for help, classroom management differences including reprimands and praise, and the work patterns and behavior within the classrooms.

Two male teachers, familiar with classroom practices, observed both 9th and 10th grade math and geography classes. They compared single sex girls and boys in 9th grade classes and single sex and mixed classes in 10th grade classes. Thirteen teachers were observed throughout the 36 mathematics classes and 35 geography classes observed. From their findings the researchers concluded that teachers of single sex classes tended to question boys more than girls and those questions were content related rather than focused on classroom management.

The researchers concluded that similar preferential questioning was apparent in the mixed sex geography classes, however, classroom management demanded more time in these classes. In the mixed geography class, girls asked twice that number of questions than boys. The number of students who requested help from the teacher in single sex classrooms was about the same, but in mixed sex classes, girls asked twice as often for help, however, overall students in mixed classes asked for far less help in contrast. For both grades and both classroom organizations, girls participated more and took on a more active role than boys. Teachers intervened 25% more of the time in boy's single sex math classes to offer help and guide students than in girl's classes. Very few reprimands or praise was given to any of the classes, however, observations showed boys receiving more reprimands than praise and girls receiving more

praise than reprimands. In mixed classes, more praise than reprimands occurred for both genders.

Younger and Warrington (2002) found that educators catered their teaching style to the gender and the needs of the class and these styles were noticeably different between the single sex classes. The girls tended to work more collaboratively, sustained self motivated and worked well in group settings, successfully managing independent work. Teachers offered the boys a more structured class with many short lessons and noticed the boys tended to need more teacher interaction for praise, support and direction.

Younger and Warrington (2002) , through observations of classroom interactions, interviews with students and teachers and analysis of test scores, surmised that single sex classes strongly contributes to the high achievement of both boys and girls and sustain their learning. They acknowledged that teachers play a large role in student success in their ability to determine the different needs of the students and create teaching strategies of differentiated instruction to meet the needs of the particular students. They found that single sex instruction within the school they observed was beneficial for both boys and girls and found no increase the gender gap. Based on reported scoring of the GCSE and compared with national standards, both genders showed continual improvement and benefited from their classroom orientation both in standardized tests scores and demonstrated high levels of self confidence.

This case study offered a solid review of test score data and adequately compared test scores of male and female student in single sex classes as

compared with national statistics, however, it was weak in several areas. This study is not reproducible as the qualitative questions were not included with the findings. Neither questions of students and teachers nor their answers were included in any format other than broad statements of support of this type of classroom. The number of subjects was not clearly reported nor was detailed demographic information provided. Results may be unique and not transferable due to the small sample size. The students attended a private rural school in England, however, demographics of urban public schools may not offer equivalent comparison. Researchers did not consider the experience and expertise of the teachers and the support of the family and community which may drastically affect student achievement and test outcome. Although findings concluded that the single sex make-up of the classroom was responsible for high achievement levels, the study does not go into depth in determining why this is the case or demonstrate that these students would not have otherwise continued to receive strong marks no matter the gender of their classmates.

This study supports the claim that single sex education may benefit all students regardless of gender. Both the length of the study and the fact that the researchers tracked the same group of students lends credibility by accounting for prior student knowledge. Students in this study made continual gains on achievement tests with scores far above the national norm for both male and female students. Although girls test scores remained higher in most areas, both males and females showed consistent achievement which the author suggested may be due to the gender make-up of the classroom.

Spielhofer, Benton and Schagen (2004) utilized the same GCSE testing in an effort to determine the impact of school size and gender composition on student achievement. The researchers quantitatively examined student scores on a national achievement test and correlated this data with school type and organization. The authors viewed previous studies as inconclusive and faulted them for not accounting for student's prior knowledge or abilities which impacted the study outcome. Spielhofer et al. applied stringent applications and used multi-level modeling among other statistical methods to determine that girls performed best in single gender schools and achieved better results than their peers in mixed schools for all the outcomes measured. The measured difference was particularly striking for average GCSE science score, for which girls in single gender schools could be expected to achieve over a third of a grade better than similar pupils in mixed schools. The analysis also suggested that single gender schooling would particularly benefit girls at the lower end of the ability range. In addition, the analysis of the impact of single sex education on pupil performance found no overall differences between the performance of boys in single sex and mixed schools.

The authors analyzed data compiled by the National Foundation of Educational Research (NFER) of 2954 English schools based on student (n = 36,341) scores on a national standardized test, GCSE, taken after the students 11th year in school. Researchers applied National Value Added Data sets to account for differences in students based on prior achievement and combined with data from NFER to determine school type and organization.

Researchers grouped students according to the size of their school and by organization of mixed school or single sex categories, as well as grammar or comprehensive school. School size ranged from 25- 405 students with most schools ranging from 100-249 students and the sample included a majority of mixed comprehensive schools with few single sex schools. Results showed from 23 common GCSE subjects, students from schools of middle sized range (180-200 pupils) performed better than larger and smaller cohorts.

Researchers analyzed the large and complete data source which allowed for multilevel analysis and researchers accounted for past test scores to help correlate school size and gender with test score, but ignored factors outside the experiment. The study did not consider or account for parental support, economic backgrounds, racial differences, teacher-pupil interaction and quality of education all of which impact student performance. Further research may complete these unsubstantiated claims. Studies analyzing school size and its impact on performance need also consider the differences in student background and the private or public nature of the school. Specific reasons for these findings are not upheld.

Speilhofer et al.'s research strengthens the case for single sex schooling. The study incorporated multiple research methods to analyze the impact of single sex education on student achievement. The analysis found girls particularly benefited from single sex schools, especially those with lower ability levels. The study found increased performance for girls who attended gender specific math

and science classes since the girls' schools attached no stigma to traditionally considered gender specific subject area.

Multiple researchers utilized data from the GCSE achievement tests; Daly and Defty (2004) analyzed test scores and data from the GCSE achievement test to analyze student attitudes and performance in mathematics. The researchers quantitatively examined the GCSE to correlate attitudinal and performance difference between students attending single sex or coeducational schools. Researchers found that girls from single sex schools scored higher on tests than girls in coeducational schools, conversely boys in coeducational schools scored higher than their counterparts in single sex schools.

Researchers reevaluated data compiled by Durham University's Curriculum, Evaluation and Management (CEM) Center on students aged 15-16 ($n = 42,000$) in Welsh and English state funded secondary schools. GCSE scores, CEM scores and Likert styled questionnaire along with a multilevel modeling design, to account for regressions, supported findings of girls from single sex schools edging ahead of girls from mixed schools ($p < 0.05$). Males had a small net advantage over girls (1.5% of a standard deviation, statistically, $p < 0.05$) in terms of regression coefficient in math achievement, however, the strongest predictor of math achievement at age 16 for either gender was math achievement at age 14, estimated at 0.969 units of standard deviation.

The authors acknowledged the lack of random sample as a detriment to the study and suggested that the sample size offset concerns for randomness, but the sample compared to national averages confirmed a similar pattern. The

study would be stronger with more information regarding the participants, their backgrounds, and particularly test scores prior to the GSCE to account for intake differences. Due to the large sample size, the results tended to be statistically significant. Though researchers found a statistical significance in the slight improvement for girls, they conceded that the increases in girls' performance appeared so slight that they questioned the cost effectiveness of single sex education.

Daly and Defty (2004) offered qualified support for the conclusions reached by Speilhofer et al. (2002) on the impact of single sex schooling on student performance. Daly and Defty found improvement in girls' attitudes towards mathematics in single sex schools, but found no improvement in boys' attitudes to mathematics at boys' schools. The research, therefore, suggested only limited benefits from single sex schooling as only girls seemed to profit.

In a two year qualitative case study examining risk taking behavior among girls in an exploratory single gender middle school math class, Streitmatter (1997) followed 24 girls and documented their behavior and attitudes. The study showed that girls may benefit from single sex classes as demonstrated by their confidence in their math ability and achievement. Compared to their earlier coeducational years, the girls felt more comfortable speaking out and took greater risks while supported by students of the same gender.

The school principal chose a teacher and twenty four girls, identified as top students by teacher recommendation, grades and highest test scores, to participate in a trial classroom of female only students to explore the benefits of a

single sex math class. The students' backgrounds included African American, Latina, and Asian which made up roughly half the class and the other half of the class descended from Europe. Researchers conducted student interviews focused on reflection of former coeducational classes and their achievement in this class compared with former classes, aspirations and background information. The study documented classroom interactions and instructional method, as well as, interviewed the teacher for her perceptions and experiences. Findings concluded that girls felt more comfortable speculating and felt less concerned with having the wrong answer. Girls took repeated academic risks, reported more outgoing behavior, and sense of freedom. When compared to a mixed class taught by the same teacher, the teacher reported difficulty in comparing classes as they contained different students which impacted achievement and motivation, especially considering these girls were handpicked for the class, but the teacher noted the more aggressive behavior of the boys' and how it impacted the class. The teacher surmised that she had an easier time engaging female students who seemed eager to work and she did not have to work as hard to involve and maintain student attention as she did in the mixed class.

Though this study demonstrated significant advantages to girls' only math classes, the study lacks credibility. The researcher did not clearly describe the questions asked of students and teachers regarding their beliefs nor did the research describe any data analysis, procedures or coding to account for the study outcomes. The principal handpicked the students who participated which

created bias of this voluntary and non random sample. To make this study stronger and more viable both a control group and a random sample would enable the researcher to compare and note differences, as well as, a larger sample and groupings of both genders and mixed classes. Multiple teachers should be included to allow for teacher differences and note their impact.

Streitmatter's study seems to lend support to the case for single sex schooling. The girls in the study preferred gender specific math classes and said that this setting encouraged them to see themselves as mathematicians and enhanced their mathematic experience and ability. All the girls reported preference of girls' only classes to a coeducational environment.

In a qualitative action study, Sherman (2003) applied brain based theory of gender difference and its effects on learning to determine if differentiated instruction impacts student achievement, attitude and behavior and found that both genders benefited from specialized instruction dedicated to the specific needs of the class. The case study exemplified the different needs of the genders taking into consideration motor development, verbal ability, impulse control, hormonal differences, risk taking ability while analyzing how the teacher attempted to meet those needs and the student's impression of the trial separation.

In a teacher's effort to put brain based research and knowledge of gender separation to the test, Sherman (2003) a middle school teacher, divided her eighth grade English classes by gender for a one year study. Sherman began the first quarter of school with coeducational classes and switched to single sex

classes (n = 20, males and n = 16, females) for the remainder of the year. The teacher collected weekly journaling, written observations, student work, assessments and student surveys. The study examined the different needs and habits of the two classes and compared the different challenges. The teacher found that females adapted quickly, felt comfortable and willing to share, and participated evenly and respectfully while completing good work ahead of schedule while male students struggled with homework, needed motivation to complete work, participated eagerly in class discussions, and needed more structure in class and on assignments. The study found that although the teacher initially approached the classes in the same manner, she adapted and developed different classroom practices in both content and approach to appropriately meet the needs of the students and found that differentiated instruction benefited all students as seen by positive attitudes, test achievement (from 70.35 to 80.65% for boys and from 87.94% to 92.94% for girls), and increased skills.

This case study offered no demographic information about the participants or the teacher making transferability difficult. In the summary of findings, the researcher suggested increased test scores as a result of gender separation and differentiation in education, however, improved test results may be due simply to maturation or increased student choice options in single sex classrooms. One strength of the study included the researcher's disclosure and clear description her theoretical positioning and interest in supporting claims which allowed the reader to fully understand her view, but this may have biased the outcome of the study. Benefits may be due to small class size enabling class specific instruction

rather than to gender separation. Additional similar studies would help support the claims made regarding benefit of gender differentiated instruction.

In light of the increase in student learning, achievement and participation, this study supported single sex classes for all students. Research found that tailored instruction met the diverse needs of students and positively impacted their learning, skills and experience. This research concluded that differentiated instruction through a single sex classroom benefited both males and females.

Hannon and Ratliffe (2007) investigated the interaction between students and teachers in an effort to determine if high school females have a greater opportunity to participate in single sex versus coeducational Physical Education classes. The study tracked the actual time girls played the sport and touched the ball or Frisbee in both single and mixed settings. Additionally through observation, researchers noted whether girls received more verbal or physical interaction with their teacher in the single sex groups or mixed groupings which may have resulted in higher participation from girls. The study qualitatively suggested that separating the groups allowed for a more equal distribution of participation, while in mixed settings males dominated game play and equipment.

The researchers studied one urban High School in the southeastern United States with a diversity distribution of 47.84% Caucasian, 46.74% African American, 2.99% Hispanic, 1.24% Asian, 1.10% Multicultural; and 0.14% American Indian students. Participants included 67 students (32 male, 35 female) enrolled in two intact coeducational physical education classes. For the study, one class remained coed while the other separated by gender during game play.

Students played the team sports of flag football, ultimate Frisbee and soccer and researchers counted the number of times students touched the ball or Frisbee indicating game participation. Results showed females on all girl teams tended to touch the ball or participate more than any other grouping: flag football, ultimate Frisbee, and soccer. Verbal interactions followed the same trend and data suggest that both male and female students in single sex settings received greater verbal interaction. In mixed group setting, no gender bias was noted.

Researchers conducted statistical analysis using Statistical Package of Social Science (SPSS) software version 12.0. Checked and confirmed data ensured reliability of results. Descriptive statistics determined the verbal interactions with the students in each game and one way ANOVAs tested for difference in opportunities to participate between coeducational and single gender subjects. All statistical tests utilized Alpha level of 0.05. Researchers carefully described their method which allowed for confirmability and avoided scoring confusion as interactions were tightly defined. Though the author also conceded the small sample size and the need for additional research on individuals as opposed to teams, other weaknesses included the subjectivity of the observer, the physical ability of the student may affect the number of touches received and may have skewed results and one educator instructing both single gender and mixed classes would have created a more equitable study. Though research presented weaknesses, the outcome remained that both genders benefited from single sex physical education which suggested that single sex education benefited students.

Debate continues over the benefits to students, particularly to girls of gender separated math and science classes. To determine the effect of differentiated instructional strategies and their benefit to boys and girls and to determine circumstances and conditions where gender inclusive education benefits students, Parker and Rennie (2002) investigated ten high schools in Western Australia as part of a Single Sex Education Pilot Project (SSEPP) and gathered quantitative and qualitative data from teachers, students and through classroom observation. The study found that single sex classes provided an environment where teachers could present gender inclusive science instruction more readily than in mixed classrooms. In addition, female students felt a greater freedom to express themselves without judgment or persecution from male classmates, however, the teachers' success and ability to provide gender inclusive classrooms depended greatly on extraneous factors of support from the community and parents against the status quo and in favor of gender specific classes.

The goal of the project was to increase participation and achievement levels for girls in math and science classes and to increase teachers' awareness of gender bias in instruction through training and use of classroom strategies. The two year study followed ten public coeducation high schools with high diversity rates in terms of size, location and socioeconomic background as each school individually developed single sex classes to suit their specific needs. The students (173 male, 236 female) in the study responded to a survey after having

participated in both mixed and single sex classrooms. Teachers and students both responded with believed success of the program.

Teachers answered that they preferred girls inclusive classrooms to either mixed or boys exclusive classrooms and reported that the atmosphere in girls exclusive classrooms proved more supportive and helpful. Girls in single sex classes participated more and appeared more extraverted than those in mixed classrooms. Student to student harassment diminished greatly. The study found that the learning environment in all boy classrooms provided more authentic student teacher relationships and peer to peer camaraderie. The study concluded that success was due in part to easier classroom management which created more time for gender inclusive opportunities including problem solving and collaborative work. Researchers surmised that although many studies focused on benefits to girls, evidence clearly showed that boys benefited equally in terms of development of communication skills, as well as, academically.

Although the study touted itself as both qualitative and quantitative, the study furnished no quantitative data to clarify or confirm findings. Researchers provided few details regarding the participating schools, demographics, test scores, or any quantifiable data. The study provided little qualitative data, as well, and information was limited to a few quotes from faculty and students, however, survey questions were not published. Though this study is not reproducible, findings clearly demonstrate benefits to gender exclusive instruction. Additional studies with more detailed information would substantiate these findings and lend credibility.

This study seemed to support gender inclusive classrooms and depicted the benefits as widespread from academic to social, according to both teachers and students. Single sex classrooms allowed teachers to differentiate education and concentrate on areas of educational weakness, poor oral and writing skills for boys and limited problem solving and hand-on activities for girls. Reduced time and energy spent on classroom management increased instruction time for girls' classes which allowed time for collaborative problem solving focused on projects and risk taking. Successful all boys' classes incorporated more effective classroom management strategies which dealt directly with issues so that on task behavior resulted. Researchers seemed to suggest that though much of the world educates in coeducational environments, certain conditions warrant single sex classes.

In a qualitative case study, Martin (1996) also studied differentiated classrooms and specifically looked into gender bias by exploring the effects of a teacher's sensitivity and influence to gender bias in a female only high school physics class located in the Midwest of the United States. Through reflective journaling, Martin challenged traditional teaching strategies and personal biases to recognize and accommodate the specific needs of girls in science and develop curriculum and strategies to meet those needs. Student's work, interviews, observations, student journals and pre and post class surveys provided additional data sources to support the findings that teacher knowledge and training is both beneficial and necessary in creating a gender sensitive classroom.

Not easily confirmable or reproducible, the author of this study provided no analyzable data, surveys or results of surveys, nor did the researcher provide descriptors or qualifiers of how she made the classroom gender sensitive. Since the study used the teacher/researcher's journaling as the primary determinant for a gender sensitive classroom, both journal analysis and specific findings proved essential to gain full understanding of results. The research neglected to indicate the exact sample size but alluded to approximately 20 participants; additional studies including a larger sample size would have given more credibility to this study. Due to the lack of evidence, little information demonstrated that the teacher's gender sensitivity training and awareness accounted for student improvement and relationship building, other factors may have caused this result. However, the small class size itself may have offered opportunity for authentic relationship building and therefore opportunity to provide specific instruction designed for this class. Although this study could be strengthened by additional research in the field, it upholds the benefits of differentiated instruction and single sex classes as an opportunity to support students specifically and purposely.

Researchers found higher levels of stress in students in unsuitable schooling situations. To determine whether differences in levels of stress occurred among early adolescents within single gender or coeducation schooling environments, Brutsaert and VanHoutte (2004) conducted a quantitative study of 68 secondary schools in Belgium and found that single sex schools produced students with lower stress levels and higher achievement. Researchers investigated students aged 14 and 15 in 21 girls schools (n = 2228), 22 boys

schools (n = 1972), and 25 coeducational schools (1142 girls, 1085 boys) and administered an in-class, proctored anonymous questionnaire which utilized the Likert scale for its findings. All schools consisted of private Catholic schools in urban areas and researchers applied three test models for multilevel analysis (HLM) to assess for difference. The first model focused on reports of socioeconomic status, parental occupational status, previous academic performance, parental support and curriculum variations, the second model analyzed student well being and sense of belonging at school and the third evaluated the teacher pupil interaction. Before applying multivariate analysis, adolescent girls in coeducational environments reported the highest stress levels above girls in single gender settings and boys in any school setting ($p < 0.01$). Once school type and factors influencing outcomes were equated, stress levels from girls in single sex and coeducational environments were compared and confirmed that girls from single gender schools report less stress than their counterparts ($p = 0.02$).

The researchers attempted to discover variables accounting for increased stress levels and determined that girls in single sex settings feel a higher sense of belonging and community (reliability coefficient, $\alpha = 0.73$) in their schools. The socioeconomic status of individual families did not impact stress levels, but the status of the general school population made a difference in girls stress levels ($p < 0.001$) but made no difference to boys' perceived stress. Higher achieving females had lower levels of anxiety ($p = 0.03$) and researchers proposed that lower achieving girls might have lower levels of self confidence

and feel less socially connected both of which may account for their increased stress levels. Boys were not affected by either their GPA, feelings of belonging within the school or the organization of the school and researchers surmise that boys attribute academic failure to external causes. The research seemed to imply that adolescent girls showed lower stress levels when they felt socially comfortable and accepted in their schooling environment and asserted that single gender schools provided girls with a more safe and nurturing environment therefore lowering their perceived level of stress.

Although peer reviewed and included findings consistent with like research, this investigation contained many inherent flaws. The mortality rate for school participation neared 70% for this study. Researchers did not use a random sample and studied only private Catholic schools thus biasing the sample. Due to anonymous nature of the study, academic performance was self reported and no fact checking occurred. Although authors presented some questions from the study in the findings, the majority appeared unlisted rendering the study unconfirmable. In addition statistical data regarding the main finding of girls from single gender schools having lower stress levels than girls from mixed schools only carried a 0.73 coefficient, thus placing reliability into question.

Although it is easy to jump to the conclusion that single sex education benefits girls, it is difficult to prove this case. The research reviewed above indicate that there are many areas where girls benefit from support of their peers, but whether their stress levels and academic performance can be linked to the organization of the school has yet to be determined.

These studies supported single sex schooling and identified key causes for their success. The research demonstrated that gender inclusive schools focused on education and academics, they supported the individual strengths and needs of students and offered differentiated instruction to provide the best possible education for all students. Studies found that stress levels diminished in gender inclusive settings and gender bias was reduced. Not all studies had these findings.

Opposition to Single Gender Education

Many studies opposed single sex education or found that single sex education provided no real benefit to students. Some researchers surmised that single gender education reduced opportunity for practice with life skills in dealing with the opposite gender. Others suggested that single sex male classes perpetuated more peer harassment and failed to socialize or discipline unruly male students. Studies also found that single sex settings reinforced stereotypes and sexism by protecting the girls from boys, supporting theories of girls as weak and in need of special treatment.

Van der gaer, Pustjens, Van Damme and De Munter (2004) studied single sex and co educational classroom in Belgium to examine the progress of students in terms of language and math achievement. This quantitative study also investigated the effectiveness of single sex classes within coeducation versus single sex schools and whether the gender composition of the school had more of an impact than the classroom composition alone. The study analyzed data from the Longitudinal Onderzoek Secundair Onderwijs (LOSO) project

which was a longitudinal research study of secondary education within Belgium. Questionnaires gathered data from teachers, principals, students and parents regarding the achievement, perceived intelligence, motivation and attitudes of students, social and cultural backgrounds and classroom setting. For the purpose of this investigation, researchers extracted math and language data and used multilevel analysis on a sample of approximately 4000 students and found that boys and girls benefit differently from classroom composition. For boys the gender composition of the class was more important than the gender composition of the school and boys made more progress in language in mixed classes. For girls, the composition of the school was most important and girls made more progress in mixed math classes but not in single sex language classes.

The LOSO project studied over 6000 students from 1990 over their academic years from age 12-18. From this project the study analyzed data on language from 106 boy's classes, 92 girl's classes and 129 mixed classes. The Mathematics data set included 95 boy's classes, 89 girls' classes, and 145 co-educational classes. The researchers defined single sex girl's classes as having greater than 80% girl to boy ratio, mixed classes contained between 20% and 80% girls and single sex boys' classes included greater than 80% boys. Researcher hypothesized that both genders would make more progress in single sex setting than in mixed classes. Two testing trial examined progress of both boys and girls in single versus mixed setting and found that class organization did not impact girls performance in language ($\chi^2 = 1.078$, $p = 0.299$ and

$x^2 = 0.907$, $p = 0.341$) or mathematics ($x^2 = 0.002$, $p = 0.964$ and $x^2 = 0.853$, $p = 0.173$), but trials for boys were less conclusive. Boys showed no difference in achievement in math classes, but in one trial boys were positively affected by mixed gender language classes ($x^2 = 11.293$, $p < 0.001$) yet the second trial showed no difference ($x^2 = 1.111$, $p = 0.292$) between mixed or single sex classrooms. The author claims that the use of multivariate analysis allows study of both the effect of single sex versus mixed classes and schools. The Cronbach rating of 0.90 confirmed reliability.

From this data the authors concluded that results seemed unclear as to whether single sex classrooms or schools are viable options in an attempt to increase student academic performance. They generalized that boys benefited more from class organization, specifically mixed setting in language classes, and less from the gender composition of the school. Conversely the authors found that the gender composition of the school of greater impact to girls than the organization of the classroom, showing girls made more progress in single sex math classes than in a mixed setting, though results proved inconsistent. Their overall results seemed to indicate little to no benefit to boys from single sex education and no consistent evidence of difference in academic improvement between single sex and coeducational schooling for boys or girls in math or language subjects.

This study contained many strengths including review of this research by peers, the sample size evaluated, and length of analysis and concession of controlled covariates. The researchers accounted for the difference in girl's

performance scores for single gender versus coeducational math classes with evidence that half of the girl's only schools were vocational schools. Once analysis took school type into account, scores from single gender girl's math classes showed more improvement than girls in mixed classes, but researchers did not show what measure they used to account for this manipulation. Another weakness revealed that all single sex schools were private schools which could skew outcomes considerably. This research could have been more reliable if the researchers would have compiled their own data rather than relying on that of the LOSO study which may have had inherent flaws. Researchers provided no data regarding when or how the testing was administered; student maturation between schools may account for differences. Since data appeared inconclusive, additional studies would be necessary to determine whether single sex education benefits either gender. Given the inconclusive nature of this study, Van der gaer et al. (2004) does not appear to support single sex education and additional studies help support this conclusion.

In an effort to determine differences between boys and girls on academic achievement, between girls from single sex schools compared with girls from mixed schools and how much the social background of the student impacts their achievement, Harker (2000) evaluated New Zealand's' Progress of School report, and found that no difference existed for girls attending single gender or coeducational school, however, found that social and ethnic mix and ability create differences.

The study examined the Progress at School report, a longitudinal study of 37 schools (n = 5300 students) in New Zealand, and a national-level report from the Ministry of Education regarding supporting data for those same students. Researchers applied hierarchical linear modeling (HLM) to examine enrollment and achievement patterns of between boys and girls and school type and to account for differences in socioeconomic levels, prior achievement, and ethnicity and school type. To determine achievement differences between boys and girls, Harker (2000) compared both test results and student grades and found girls substantially ahead of boys in English (t-test = -3.15, p < 0.01) and girls slightly behind boys in mathematics (t-test = 2.54, p < 0.01) and summed that girls outperformed boys in all subjects in terms of proportion high grades. Researchers oversampled boys in this study as they experienced fewer drop outs for the two elite boys' schools and this tended to bias the study. The Progress at School also demonstrated trends which indicate that girls matched boys in rates of entry into higher level science and math classes in New Zealand.

To evaluate achievement differences between girls from single sex and mixed classes, the study accounted for previous achievement since students from single sex schools demonstrated higher achievement in every area. With application of these measures, findings proved statistically insignificant between girls in coeducation (68.75, SD = 4.6) versus single gender (70.81, SD = 4.1) environments, however, evidence of ethnic differences in terms of achievement is substantial. Adjusted achievement rates accounting for background variables showed Pacific Islander girls and Maori girls significantly behind in every subject.

Though the belief that girls do better in single sex schools is not reported here, highlights of ethnic differences indicate socioeconomics may impact achievement more than the type of school.

The large sample size and completeness of academic data lends credibility and since their findings concur with other like studies, dependability appears high, however, specific demographic data and information regarding the number of boys and girls at each type of institution remained undisclosed. Though researchers provided tables of analyzed data, the questions asked of the study were not explicitly divulged leaving this study irreproducible. Although the author notes use of the HLM application, he does not disclose how the sample is manipulated. The author confirmed that this study was an evaluation of academics only and additional studies would be needed to evaluate self confidence, dropout rate, social maturity, etc as they may affect the outcome on single sex versus coeducation for girls.

Harker (2000) found that girls in both mixed and single sex classrooms outperformed boys in test scores and grades, but detected no significant difference between mixed and single sex schools for males or females. This indicated that although the girls outperformed the boys, the class or school organization may not hold responsibility for the increase. The author proposed that social and ethnic diversity may have created greater variance in test scores and grades and therefore the study seems not to support single sex schools.

Another study looked at minority status as it related to single sex education. In a quantitative and quasi-experimental research study focused on

the effects of co-education versus single gender education on inner-city African American students of lower socioeconomic backgrounds (n = 90), Singh, Vaught and Mitchell (1998) found no significant achievement advantage between single gender or coeducational classes nor differences between the genders.

Historically research centered on white participants and found a null effect of single gender setting for males; this study specifically targeted minority students as participants to examine potential differences and effect on racial or ethnic minority students.

Four fifth grade classes from inner city public schools in the mid-Atlantic state region of the United States participated including two coeducational classes (n = 20, n = 18) and two single sex classes (n = 25 males, n = 27 females). The authors compared end of the year achievement test scores from the Iowa Test of Basic Skills (ITBS) in reading, mathematics, science, and social studies. They used fourth grade ITBS scores as covariate measures to control for differences in prior achievement. Student grades from their fourth and fifth grade years provided a second source of data to determine achievement. Researchers compared daily attendance of all students to determine if significantly higher rates of absences correlated with class arrangements. To offset affects of the non random sample of participants and intact classes utilized, the authors utilized Analysis of Covariance (ANCOVA) due to the similarities between in the groups in terms of school demographics and prior achievement. The study analyzed achievement variables and attendance separately using class arrangement and gender as independent variables.

The authors reported the evidence as insufficient to support or deny benefits of one type of class structure over another and suggested further study to determine benefits particularly to urban African American males. Attendance for males in the single sex class was positively affected as males in mixed gender class missed class significantly more often than males in single gender classes or females in either classroom structure ($p < 0.05$). Since year end grades confirmed improvement, the study concluded that boys may not be hurt by same sex schooling, but additional research may help to fully explore the educational, motivation, engagement, and social benefits.

Although the researchers applied rigorous analytical methods and successfully represented local demographics in their sample, several key weaknesses prevailed. Figures in tables failed to confirm author's conclusions; the study neglected to mention evidence of coeducational class' ITBS scores well above that of single sex classes ($p < 0.05$) instead the analysts used grades to balance differences creating a potentially inequitable comparison. ANCOVA analysis accounted for these differences, yet details remained undisclosed. Given the small sample size, teacher differences and their effects on students, and the reliance solely on testing, further analysis seemed required. A larger sample size of minority students including more classes and multiple grades would also enhance these findings.

Most of the results in this study lacked statistical significance. The results for female mathematics students and end of year grades for students in single gender classrooms tended to strengthen the argument in favor of single sex

classrooms, however, the author pointed out that standardized test scores demonstrated higher achievement for co-educated students while students in single sex classes received higher grades. The author suggested test scores as more stable indicators reflecting cumulative learning while grades may reflect classroom effects of classroom organization and environment. Given these concessions, this research remained inconclusive regarding the effectiveness of single sex education indicating no clear benefits demonstrated by one classroom organization over another.

In a two year qualitative and ethnographic study, Hubbard and Datnow (2005) investigated the effects of the introduction of single sex schooling on low income and minority students in a 1997 pilot program in California of publicly funded single sex schools. Researchers conducted a two year longitudinal case study of six single sex public academies from 1998-2000. Academies recruited students with recommendations from teachers, administrators, law enforcement officials or social service providers. The program chose students predominantly affected by poverty, limited English proficiency, and faced academic disadvantages which showed them well below the national average. The study determined that separating students by gender alone may not help them improve; researchers reported several factors assisted and enhanced student performance. Single sex classrooms offered fewer social distractions to the students as compared to co-educational programs, smaller class size, access to curriculum and academically and socially enriching experiences, and additional

funding contributed to students comfort level and willingness to engage personally with their teachers.

Researchers investigated six publically funded single sex school's (3 all male and 3 all female schools) and limited this study to findings for the three all boys schools. Authors chose to focus on the boys schools only to address the specific needs of the "at risk" population and they note that their evidence for the larger study found no differences which affected their analysis. Two middle schools (n = 60 and n = 140) in northern California and one high school (n = 90) in southern California participated and researchers gathered data from over 300 interviews conducted individually and in focus groups of two to four students and with principals, teachers, academy directors, parents and district officials. More than half of the students who attended the schools participated in the interviews. All three schools contained different demographics and researchers used ethnographic examination of the student's lives to gain better perspective of the specific circumstance affecting their education and lifestyle; commonalities include impoverished geographic areas, high unemployment rates, mobility, crime, and language barriers. Classroom observations and field notes focused on peer to peer interaction, student to teacher interaction and made note of teaching strategies utilized. Researchers utilized transcribed interviews as the primary data source. Case reports of each school included coded transcripts and notes to allow for cross case correlations.

Data from this study remained inconclusive. The study examined the importance of authentic relationships between teacher and student but did not

conclusively determine the positive or negative effects of single sex education. Researchers purported that the single gender nature of the school allowed for fewer distractions, however, no specific evidence supported this claim. The study recognized the possibilities of philosophical and structural differences within the schools as great, yet analysis avoided these issues and did not examine their effects. The influence of state money and the opportunities it allowed may have had a greater impact on the students than the organization of the school. More data and further study is needed to account for these variables.

Three important interrelated conditions contributed to the positive experiences of low-income and minority students: single sex setting, financial support from the state, and the presence of caring, proactive teachers. School administrators supported this nontraditional curriculum, found resources that would benefit the nontraditional student body, and allowed more open in-class discussions about the personal and practical as well as academic. The organization of the schools and resources aided the students while caring teachers provided integral components to students' success, however, the question of the benefit of single sex education remained unanswered. Research remained inconclusive, but despite lack of evidence, the author appeared to want to support single gender education.

In 1999, Herr (2004) performed additional research on the California study to address educational inequity among disadvantaged schools and raise test scores. This study examined the program implemented by Governor Pete Wilson to introduce six academies with single gender inclusive classrooms and studied

teacher and student interaction in single sex classrooms. This qualitative case study also examined gender equity and how the teacher's attitudes on gender affect the classroom and instruction. The author determined that the research was inconclusive. Students received better test scores, but it may have been due to the educational practices rather than the gender make-up of the classroom.

The study took place in an urban middle school with a diverse population of Latino (44%), African American (28%), Asian American (22%) and white (6%) students. Students were predominantly of lower class backgrounds evidenced by the 80% free and reduced lunch rate. The researchers regularly interviewed students (n = 1100 girls and boys) and teachers (n = 18) in a semi structured manner and confirmed with observations to identify themes and patterns.

Teacher's interviews made up the majority of the study and focused on questions comparing single gender classrooms with previous mixed class experiences.

Researchers employed the grounded theory approach which required that the data reveal relevant findings and after coding, determined that under extreme pressure to succeed, a focus on achievement eclipsed gender equity as high test scores would impact the continuance of the program. Observations and

interviews revealed the inequities between the single sex classrooms. Boys' classes appeared hyper controlled and dreaded by teachers as boys presented more energetic challenges; conversely girls seemed preferred, more compliant and therefore easier to teach. The study found that teachers were so focused on testing and discipline that their teaching practices, creativity and authenticity suffered.

This study faced many difficulties and pointed out the multifaceted aspect of education. With one focus in mind the researcher failed to unpack gender equity issues without being impacted by the pressures of testing. Peers reviewed this study, therefore lending credibility, and transferability to other like institutions seeking single sex implementation, however, this study cannot be reproduced. The report provided no information regarding research questions, data surveyed or analysis making confirmability a problem. Although evidence could not conclusively determine the benefits of single sex education, the authors found one detriment which could not be overlooked. Several interviews concurred that teachers preferred all girls classes to all boys classes, in fact, researchers reported that teachers dreaded all boys' classes which indicated boys an undesired in the single gender classroom. As single sex classes seemed to undervalue boys, the researchers could not find support for single sex classrooms.

Researchers found that small class size affected achievement and that the organization of the classroom impacted students greatly at different ages. In a quantitative randomized experiment to explore the effects of smaller class sizes on gender, and student achievement among girls and boys (n = 11,600) in poor and middle class backgrounds, Whitmore (2005) found that both males and females benefit equally from smaller class size, however, classroom composition impacts classroom dynamics differently among genders. The study concluded that in earlier grades, kindergarten through second, boys benefit from classroom interaction with girls, whereas in older grades, boys' behavior deteriorates in

classrooms with a high percentage of girls indicating that boys benefit from single sex classrooms as they age.

The researcher used data from the Tennessee Project STAR, a randomized experiment in which 79 schools participated totaling 11,600 students. Students and teachers were randomly assigned to small (13-17 students) and regular (22-25 students) sized kindergarten through third grade classrooms and all returned to regular sized classes in fourth grade and beyond. Program outcomes showed that students from smaller classes achieved higher scores and continued to receive higher scores through high school graduation. Researchers questioned whether males and females respond differently to smaller class size and if class size should vary with classroom composition meaning whether the behavior of students could determine optimal class size. They reasoned that since girls are reported to behave better than boys, larger class size may not impact girls learning as compared with boys.

The impact of the ratio of males to females in the classroom differed greatly between the grades. In the kindergarten classrooms, children who were in predominantly female classes scored 2.3 percent higher than children in male dominated classrooms. Researchers noted that statistics showed both genders benefited equally from the classroom with higher number of females. Results were not consistent between grades as seen in the first grade class results which showed no significant statistical difference between classes based on gender variance. Entry of children who did not participate in kindergarten may have impacted the finding for this grade and skewed test results downward.

Statistically significant findings returned in the second grade classrooms and showed that students in classrooms with a majority of females scored two percent higher than their counterparts. These results were even higher in inner city schools which showed a significant impact in classes with a higher percentage of females. By the third grade, the influence of girls on classrooms diminished, showing that boys and girls perform similarly regardless of class composition. Researchers cited developmental changes and lack of ability to work independently as rationale to boys' scores dropping below that of girls by about 0.2 standard deviation.

Whitmore (2005) hypothesizes that smaller class size may offer a greater opportunity for access and influence from more capable peers who may positively impact test scores and encourage improvement among classmates. Students who benefit may in turn impact their future classmates who may not have had the benefit of smaller class size. This study showed that in years K-3, students benefited equally while they are in smaller classes, however, gains persisted at different rates in later grades. The greatest impact was seen on African American girls; those who were from reduced sized classes were more likely to take college placement tests which show interest in higher education. The author accounted for this variance and found that the impact of the more capable peer on testing improves scores by 0.6 points while the predominantly females class impacts testing by a 1.3 point increase which demonstrated that females did have an impact regardless of their academic prowess.

Since the researchers used preexisting research in their findings they acknowledged uncertainty regarding the randomization of their sample so they controlled for variances by applying a chi-square test on recordable characteristics. These characteristics included student gender and race, free lunch standing, prior test scores, and accounted for new students to the school. In addition, the researchers controlled for limited statistical data to reflect nonrandom patterns by omitting schools which failed to pass the twenty-two tests administered to check for randomization. Though this study stated statistical significance due to its large population, it gave little information regarding either the Tennessee STAR Project or the testing measures used which makes this study neither reproducible nor confirmable. Researchers claimed statistics as significant, but little data presented demonstrated findings or confidence levels. In addition, this study may have been stronger with a comparison between coeducational classes and single sex classes. Research failed to follow single sex classrooms which would have highlighted the benefits of mixed or single class composition.

Given Whitmore's (2005) findings of the positive influence of both class size and female dominated classrooms in early grades, schools may benefit from this model to improve test scores. This study did not confirm nor deny the benefits of single sex schooling, but indicated small class size rather than gender organization predicted success.

Single gender schools are often recognized as supporting the needs of their female students by placing a low importance on body image and reinforcing

the high value of academics while downplaying physical image. Typically single sex schools were thought to provide girls with accepting and supportive environments. The following two studies explored whether girls from different school organizations showed differences in their self esteem and views of body image and acceptance.

To study differences in self esteem between girls from single sex and mixed high schools, Granleese (1993) surveyed students (n = 24, age 13) from Protestant schools in Northern Ireland regarding academic competence, social acceptance, behavior, athleticism, physical appearance, and self worth. The correlational study showed that girls from single sex schools were less happy with their physical appearance and valued their behavior conduct ($p < 0.01$) as a measure of their self worth, while girls from mixed school scored themselves higher on social acceptance, physical appearance ($p < 0.025$) and athleticism. Girls from both schools valued themselves equally on global self worth, each recognizing different aspects of themselves as more valuable.

The author reported self perception of physical beauty as the single best predictor for self worth for girls in coeducational settings. Girls from single sex settings focused on behavioral conduct as indicative of their self worth. Granleese (1993) asserted that girls from single sex schools may be less affected by gender stereotypes and therefore more open to roles seen as gender specific thereby leaning towards support of single gender education for girls.

Researchers chose a small non-random sample of students from a rural area of Northern Ireland; results of this study may not be transferable to other

samples. In addition the number of students from all girls' schools outnumbered girls from the mixed school by nearly 6:1 which potentially skewed the results. The author generalized the data and failed to acknowledge that priding oneself on behavior may be indicative of promotion of permissive qualities and without survey questions to analyze for nuisance, data proved inconclusive. Girls from mixed gendered schools may not value physical beauty more; they may feel more comfortable with themselves as they rated themselves high in this category. The author conceded that additional research specifically clarifying the data would strengthen findings by defining role rigidity and of the views of traditional gender specific roles between groups. Additional studies of longer proportion and those which followed students over time would lend credibility and strengthen these findings.

In light of these findings, the research seemed to support single sex schooling for girls. Adolescent girls unconfined by traditional stereotypical gender roles could participate in a wider spectrum of activities and subject matter. According to findings, girls from coeducational environments maintained and adhered to more strict gender roles and were less likely deviate. The author suggested that single sex schools may be more advantageous to adolescent girls.

The Granleese (1993) study found increased importance on body image for girls in mixed school settings; conversely, Dyer and Tiggerman (1996) reported coeducational schools may have a positive impact on healthy body image. In a quantitative study, Dyer and Tiggerman (1996) investigated the

differences in concerns of body image between female adolescents in single gender and coeducational schools and found girls from single gender school had more body dysphoria and body image issues than girls from coeducation school settings.

Dyer and Tiggerman (1996) investigated potential differences between different school environments on body figure preferences, eating disorder symptomology, and role concerns in 142 Australian Caucasian adolescent girls from medium to high socioeconomic households. The researchers administered a multipart Likert scaled questionnaire which required the girls to evaluate their body figures and choose ideal, measured role concerns and importance of slimness, physical attributes, intelligence, professional success and popularity on personal achievement and satisfaction and took an Eating Disorder Inventory (EDI) to measure psychological factors. The study found that girls perceived themselves as significantly larger than their ideal. Girls from the coeducational school maintained a significantly larger body mass index than the girls from the single gender school ($p > 0.05$) and the single gender educated girls chose a much thinner ideal figure ($p > 0.05$) and focused more on their weight than girls from the coed school ($p > 0.05$).

Despite actually weighing less, the study found girls from the private single gender school as more dissatisfied with their appearance, upheld a thinner ideal and displayed more eating disorder patterns than their counterparts at a private coeducational school. Researchers proposed that since girls from the single gender school value less curvaceous female figures, the girls may be afraid to

grow up, be attracted to the opposite sex and fear changes in their bodies. The study concluded that what motivates the wish for thinness differed between the students in each school.

The study was limited to a small sample size and would gain more credibility from a similar study with a larger sample and scale. In addition a wider demographic may produce different outcomes; however, this peer reviewed study highlights an unpredicted result and deserves further review. The fact that girls from coeducational school had a higher body mass index and had a better view of self than their slimmer counterparts makes this study worthy of replication. Additional questioning to determine reasons for differing body type preferences between the two groups of girls would strengthen this study. In addition, new research examining the different reinforcement received from same sex peers compared with opposite sex peers may add new information to the potential benefits of mixed school settings. Examining whether girls in mixed school settings maintain a better body image due to positive reinforcement from boys as compared with competition between girls for desired appearance in single sex schools requires further review.

Dyer and Tiggerman (1996) addressed reliability and calculated a Chronbach alpha of 0.73 to 0.92. The authors banished perceptions that school organization may protect or shield students from societal influences, instead they may offer opportunity to perpetuate them. This study tends to support mixed sex education as it seems to support healthier self perceptions and may offer positive advantages and reinforcement from peers.

This section highlighted research which did not demonstrate clear, substantiated benefits of single sex classrooms. Harker (2000) and Singh (1998) found small class size and the ethnic mix of students important predictors of student success. Hubbard & Datnow (2005) and Herr (2004) reviewed a California pilot program which targeted minority and at risk students and found improved test scores, but the influx of funding to the program including specialized teachers and small class size, complicated these findings. Whitmore (2005) showed successful classroom management in smaller classes as an indication of increased achievement. All studies failed to find a direct correlation between single sex classes and higher achievement.

Learning differences between Genders

One perpetuated theory continued to circulate regarding the belief that differences exist between genders and account for differentiated learning practices. To address concerns of reported disparity between males and females in math achievement and ability based on differences in spatial skills, Lachance and Mazzocco (2005) completed a longitudinal study of primary school aged children assessing math ability, achievement, decoding tasks, visual motor and perceptions tests and reading skills. The study found no advantage of one gender over another in spatial skills, math ability, or achievement indicating no difference of future performance.

Seven schools participated in this four year longitudinal quantitative study following kindergarten students (129 girls, 120 boys) through third grade from a

large predominantly white suburban school district in Baltimore. Yearly tests measured IQ, mathematics ability, mathematics achievement, spatial skills and reading ability for participants utilizing a variety of standardized testing measures including the Wechsler Abbreviated Scale of Intelligence (WASI) for cognitive ability, Woodcock Johnson for reading and decoding, Rapid Automated Reading (RAN) for reading fluency, and several others. La Chance and Mazzocco (2006) examined the mean, standard deviation, and effect sizes of each test, and applied measured analysis of variance (ANOVA) to the research and found through *t*-tests that IQ scores did not vary between genders ($p = 0.18$). These findings proved indicative of all testing which concluded that no consistent patterns of spatial difference appeared between genders and no support for claims of superiority of one gender's math aptitude over another.

Extensive testing substantiated the authors' findings of the correlational data. Researchers revealed ample comparisons and highlighted descriptions to include median, standard deviation and *t*-test outcomes and *p* values for every test. Authors went to extensive measures with testing and instrumentation and findings seemed dependable as they coincided with other research. The findings may not be generalized to a larger diverse population since the sample was fairly homogeneous and additional studies of larger and more diverse populations may support these conclusions.

This study found no basis for spatial difference indicating difference in ability between males and females; therefore, its findings do not support differentiated instruction or single sex classrooms.

Spatial relations may not be the only way males and females are thought of as different, sex differences in approach to school, self and studies may impact performance. In a quantitative study to determine gender difference in approaches to studying and schooling, Rogers and Hallam (2006) compared questionnaire responses from male and female secondary school students from two high achieving single sex schools in England. The research explored differences in test approach and preparation between genders. Overall the study found differences in approaches to examinations between girls and boys with boys scoring higher in their self reported approach to studying for tests. High achieving boys reported maintaining high grades while completing less homework while high achieving girls reported lengthy study sessions and homework time indicating that boys have better study habits than girls. Girls also revealed higher levels of anxiety about testing, studying and schooling which may also result in higher stress levels.

The sample consisted of 310 tenth ($n = 144$) and eleventh ($n = 166$) grade students from two similarly academic focused schools; the students selected (143 females, 166 males) had similar history with high achievement on GCSE examinations which minimized the confounding effects of teacher-pupil interaction, student self-esteem, stereotypical subject choices, and preferred classroom environments. Students answered Likert scaled questionnaires compiling data on their study habits, coursework, examination, homework, and ability to compile and synthesize information.

Researchers analyzed data using multivariate analysis of the student responses which ranged broadly and found that boys scored themselves higher in study strategies and they maintained a positive outlook towards schooling and testing to allow for a balance between school and social life. Boys reported a wider use of effective strategies in studying and testing. Overall views regarding studying revealed significant gender differences with a mean for boys of 133.74 (SD = 14.13) and girls of 130.38 (SD = 11.48) ($p = 0.027$). Girls rated themselves as more industrious and had sufficiently more anxiety than boys in regards to examinations and coursework. Self perceptions regarding homework differed greatly as boys reported spending a mean of 10.41 hours of homework per week contrasted with girls who reported a mean of 13.62 hours weekly which resulted in a significant difference ($F = 37.78$, $df = 1$, $p < 0.001$).

While the study only took into account the student reactions to the GCSC test via personal responses on the questionnaires and not the test scores themselves, self esteem and feelings of inadequacy may have played a part in the results. Girls may be more self critical which would render analysis inconclusive. Since the study focused on high achieving students from private single sex schools, study results may not be generalized to the general population, however, findings concurred that even high achieving students lacked sufficient study skills. Further analysis proved necessary to determine if class orientation reduces perceived stress in girls or if instruction of effective study habits might be more appropriate. Although the study reported differences in

approaches to work between males and females, findings do not conclude whether single sex classrooms would impact achievement or performance.

Ferrara (2005) provided another research study which examined the differences in learning between the sexes in middle school students in northeastern United States. The three year case study qualitatively evaluated student and teacher reports on how each group responded to the instructional strategies and curriculum designed for single sex classrooms. The study found many differences between the groupings. Girls' classes moved at a faster pace and maintained a higher class standing than the boys' classes. The teachers preferred girls classes to boys and reported girls were easier to teach. Girls also took on leadership roles comfortably within the classroom. Teachers supported the learning styles of the students by preparing specified curriculum to meet their needs. Boys in the study preferred a variety of shorter activities while girls found longer more involved activities preferable. The study found that overall both boys and girls participated more and were more self confident in single gender classrooms.

The research studied three middle schools which participated in gender inclusive programs. The teachers (n = 21) in the study responded to survey questions based on teaching methodology, student assessment, and changes made to their teaching to better serve the student population. Teachers shared successes with one another and tips on reaching the students and found that girls and boys approached learning differently and successful teachers geared their curriculum towards the needs of the class.

This study would be difficult to duplicate. The researcher did not provide adequate information regarding survey questions, differences in behaviors between gender groups and whether classroom management practices changed between the two student groupings. The researcher suggested additional studies including brain based research to verify and support findings. Although additional studies are needed to support these findings, the research supported single sex classrooms and found success for both genders through differentiated instruction. In addition, the researchers applied triangulation by randomly selecting teacher to fulfill survey requirements.

Many research studies determined that girls lose interest in mathematics during high school years and suggested that single sex classes may allow girls to feel more comfortable and encourage their return to math and the sciences, however, motivation for math achievement may not be gender dependent.

Chouinard (2008), interested in the research indicating a decrease in high school student motivation in mathematics, elaborated on the findings in a three year quantitative study to further examine differences between genders in regards to self competence, believed value of math, achievement and interest in mathematics. The study concluded that both males and females showed a reduced interest in mathematics over their high school years with particularly low motivation at year end and student patterns of disinterest illustrated gender similarities rather than differences.

The researchers followed students in two cohorts (first cohort: 277 males and 427 females; second cohort: 259 males and 366 females) over three years

who completed a semiannual questionnaires which utilized Likert scales to determine the students motivation, self competence and achievement in mathematics. The student subjects (n = 1130), grades 7-11, participated from 18 public and private schools in Quebec, Canada. Questionnaire analysis used a hierarchical linear modeling (HLM) which the author pointed out as a dynamic model which allowed for growth and change. This model limited regression and accounted for gender, cohort variance and change over time. Authors alluded to previous studies which indicated boys would have higher competence levels, conversely this study found virtually no difference between the genders in their reported level of competence indicating belief in mathematics ability remained high while interest diminished. Findings also included advice that teachers should avoid competition among students and emphasize mastery instead of gender segregation.

This study provided for gender proportion between cohorts, but offered no demographic details for the students studied for comparison. In addition the study did not elaborate on inclusion of single gender schools or specifically state limit of participants to coeducational schools. Neither survey questions nor definitive outcomes were presented with findings for comparison and correlation which would have been beneficial to examine difference since study was self reported by students, however, the large sample, longitudinal data and ample statistical data offers validity to the decline of student motivation. Additional research may offer insight as to when student interest declines and whether this decline is subject specific. This study highlighted the similarities between

genders in their self competence and motivation towards mathematics over time and offers no support for differentiated instruction.

Burkham, Lee and Smerdon (1997) attempted to determine reasons for consistent findings of boys outperforming girls on standardized tests and whether achievement was differentiated by subject matter, ability level or learning environment. Researchers analyzed quantifiable data from the National Education Longitudinal Study and collected data from parent surveys, student surveys, school achievement tests, and data from teacher and principals. The study found that of the 8th-10th grade students studied (n = 25,000) from 1035 American Middle Schools, males were advantaged in learning physical science , especially in students of average and above average ability ($p < 0.01$). Researchers determined that gender differences were differentiated by science subject matter, which was illustrated by the under representation of female students in higher level science classes from which future scientists would be drawn. Though differences in the numbers were small, they were statistically significant due to the large sample size. By the time students reached tenth grade, the study concluded that for all ability levels, males outperformed females in physical and life sciences, and thus depicted a widening gender gap.

Studies suggested that lack of encouragement from home, lack of science experience, and opportunity to learn, contributed to the differences and proposed increased hand-on science instruction, collaborative rather than competitive work environment with practical problems offering opportunity for creative problem solving. The study found girls learning less science than boys; the report insisted

that schools have actively increased gender stratification rather than simply reflecting cultural influences related to gender. The researchers called for instructional changes in the classroom with more hands on science experimentation to actively involve students of both genders and promote gender equity, however offered no suggestions for teacher implementation nor directly suggested single gender classes would be beneficial, in fact, language supported instructional adaptation into mixed gender settings.

Colley and Comber (2003) examined concerns of gender differences in education and addressed research that found that boys preferred and scored higher in science and physical education while girls ranked higher in English and language arts. The study looked at changing interests of curricular material between boys and girls over different aged groups. The results showed shifting preferences over that last decade, however, evidence demonstrated that gender differences continue and researchers attributed this influence to belief systems of gender roles perpetuated by society.

The qualitative study surveyed students of multiple aged groups (n = 518 male, n = 413 female) from single gender and mixed gender schools and collected data ranking student curricular preferences in order of interest including academic and practical coursework. The researcher compared data compiled from the different age groups to establish trends. The author divided school subjects based on the findings and associated them with either boys or girls indicating preference and found that Art, Drama, English and Geography remained feminine subjects while males preferred Math, Physical Education, and

Sciences. The author elaborated that interest in science and technology may have been influenced by gender stereotyping on the part of the school.

This study had several weaknesses. The data included little information regarding the students studied, their backgrounds, achievement levels or information illuminating differences in coursework offered by the schools. The schools themselves may offer unique programs which may have skewed results. A longitudinal study examining the same students over time could identify trends within students or between schools. The findings of this study may support learning and interest differences between genders and reinforce differentiated education provided by single gender schools, however, the authors clearly indicated the belief that society perpetuates gender roles and great change may not occur until society embraces and adopts different broadening views.

Gender Bias in Education

Stereotyping and gender bias are cultural culprits that unknowingly undermined student achievement and goal setting. Teachers are role models and students look to these authority figures for guidance and take cues from their behavior. As individuals are subject to cultural and societal prejudices, teachers impact the classroom greatly as they set the tone for the classroom. Teachers affect student achievement, self confidence, and can honor or devalue students thus assigning student status in the classroom.

Gray and Wilson (2006) explored the performance of students in single sex classrooms in a coeducational school from the teacher's perspective. The study focused on the teachers' impact on the introduction of singled gendered

classrooms in a coeducational school, the impact of single sex classrooms on the educator's enjoyment of teaching, and the teacher's perceptions of student achievement and behavior as a result of the single sex classroom.

The study took place in a medium sized secondary school in Northern Ireland with an enrollment of 600-700 students. Quantifiable data collection instituted two methods of compilation. A questionnaire gathered information regarding teacher's training in a single sex classroom, their opinion of its introduction and the outcome of the class based on student behavior and achievement. Thirty one educators (31 females, and 12 males) responded to the 22 question Likert scaled survey and researchers noted that 65% of respondents were employed at the school prior to its introduction of single sex education. A stratified sample of teachers (n = 15), based on their gender, subject taught, years of teaching and position at the school, elaborated on the original questionnaire in interviews and small group sessions. Qualitative analysis of the data helped to deepen the results of the survey.

The school instituted single sex classrooms to reduce behavioral issues and increase boys' academic performance. The teachers' preconceptions of single sex education was that it would benefit girls as well since the teachers' time was previously monopolized by behavior issues with males, however, overall the teachers' attitudes towards this segregation was unfavorable and this negativity progressed along with the study.

The study concluded that a majority of teachers (77%) believed boys do not benefit from single sex classrooms; 61% of teachers claimed the boys'

academic performance did not increase and there was an increase in competition and bullying both within and outside of the classroom. In contrast, the teachers were less certain about the impact on girls' academic performance with 39% agreeing that their performance increased, 29% noting no increased performance and 32% unsure as to whether any change was apparent. Despite ambivalence of the teachers as to the benefit to girls, 61% of the teachers were against continuing with single sex education. They voiced cost concerns and 45% of them believed that education standards went unmet. Although the majority of the teachers felt they would benefit from training in single sex classrooms, the teachers voiced concerns of receiving boy's only classes and 71% preferred mixed gendered classes or girl's only classrooms.

The study included tables with the outcomes of some of the questions asked of teachers, however, provided few details leaving little opportunity to reproduce this study. In addition, the researchers failed to acknowledge how the teacher's preconceptions and biases could have impacted the study; this research would have been stronger with data of academic achievement to support their findings.

This qualitative case study contains merit in data analysis. The researchers utilized peer review to check their findings and used triangulation. As this is a current and pertinent topic for schools systems throughout the world, this research is transferable and relevant.

This research demonstrated the teacher's perspective regarding single sex education. Teachers did not support single sex education for either gender.

The teachers polled concurred that boys demanded a disproportionate amount of teacher attention for behavioral issues and their performance showed no increase. Teachers did not advocate for single sex education for girls either, though they did not have as strong of a resistance towards girls only classrooms. They responded with ambivalence to its success. Due to increased behavioral concerns by boys and the dislike for teaching boys only classes, research showed that teachers did not support continuance of single sex classes.

Teachers treat students differently and set the tone in the classroom. When Myhill and Jones (2006) qualitatively investigated the treatment of girls and boys in fifteen schools in England, they found that teachers treat boys less favorably than girls and have lower expectations of males. The semi structured interviews of teachers (n = 40) and students (n = 144) examined the same topics of behavior, achievement and perceptions of learning between the genders. The researchers interviewed student together in mixed gender grouping to allow for consultation to reduce opportunity for pressure of gender stereotyping. Among all questions asked, the researchers collected data from only one question: "Do you think boys and girls are treated the same?" and concluded that 62% felt boys were treated less favorably than girls.

The schools investigated offered both rural and urban environments containing primarily middle and lower class populations of Caucasian decent. Students from each of the classrooms were grouped by pairs of an overachieving and underachieving girl and boy, totaling four per group. The underachieving girl was least likely to note girls as being favored over boys and a small number of

girls felt that boys received more favorable treatment. The perception that boys are treated unfairly increased with age which researchers believed to be related to awareness of gender identity among older students.

Although the researchers recognize the critical paradigm as guiding their research with the intent to incur change from the results of the study and acknowledge potential sources which may confound the research including the interview process, many weaknesses thrive. The gender of the teachers goes both undisclosed and unexplored. Researchers attempted to account for biased stereotypical responses in mixed gendered questioning but did nothing to account or measure these biases. The researchers did not disclose the evaluation process used to identify low achieving and high achieving students or compare gender difference of this achievement.

The authors questioned whether education amplified societal stereotypes rather than challenging them to create gender equity in the classroom. The study raised valuable concerns that focused on the underachievement of boys that may be resulting in the marginalization of girls and called for action to address these inequities.

Gill (1994) examined the attitudes of Australian students in their final years of elementary school as compared with high school experiences to determine differences in the attitudes between boys and girls and between girls in mixed versus single sex settings. Gill (1994) found that although girl's interest in school peaked in middle school, it receded in upper grades while boys maintained a steady outlook on school. Girls', from both mixed and single sex schools, interest

in math and science followed their attitudinal levels, increasing in the middle years before decreasing overall. The author claimed societal influence caused these behaviors and suggested disrupting the process to create change.

Over the course of a year, in this qualitative ethnography study, researchers observed and interviewed teachers and seventh grade middle school students (n = 112) in an effort to determine their attitudes towards math, science, teachers and school in general. The authors followed the same students to eighth grade where they separated into different high schools including the public coeducational high school (n = 52), a private all girls school (n = 12) and compared their findings with interviews of 10th grade students from the same two local high. Analysis of the changing views with age showed that interest in school peaked at the end of elementary school for girls and showed marked decline, especially in attitudes concerning math, but contrasting experiences with girls of mixed and single gender schools showed no significant difference in their attitudes toward school or subject matter, meaning that girls attending mixed and single sexed schools had similar trends, a downward spiral of interest in school as they aged. Boy's attitudes toward school maintained a low interest throughout the years and no statistically significant difference was present.

Based on student interviews of boys and girls the author noted many differences between their views of both genders. The researcher summarized the discrepancies between roles the students' associated with each gender. The majority of primary school students expressed equality among the genders but later blatantly stated that females should not be in leadership positions. Both

genders agreed that boys enjoyed a higher status in high school and were better in math and science. Gender stereotypes solidified with a common view that boys have more intelligence, but girls try harder. The author indicated that as girls' age, their perception of school roles change and they feel less secure in their roles, while boys gain momentum and gain confidence as independent learners.

Gill (1994) did not define their sample with demographics, previous achievement data, geographic information or any background data, nor were details exposed regarding how students were chosen participate or how many actually participated. Interview questions were not described well enough rendering this study irreproducible. Had the longitudinal data followed the same students throughout their elementary and high school experiences to determine if their attitudes changed, this study would have been stronger.

The author raises valid points regarding the impact of gender bias on student achievement and how they impact the genders differently. The researcher links growing student attitudes to those prevalent in society and type of schools may be inconsequential to student achievement, but rather the larger views of society may recreate a bigger impact on student achievement and not simply the gender make up of the class.

Watt (2004) studied math achievement and motivation in a longitudinal sequential cohort study of middle and high school Australian students (n = 1323) and found that self confidence levels for math and interest declined during the teen years while perceptions of difficulty increased. Gender differences depicted

boys favored math while girls favored English. Researchers explained that social constructs, stereotyping, cultural practices and gender bias modeled this behavior and perpetuated it.

The study cited the Gender Intensification Theory which suggested that gender role identification became more important over adolescence as the participants tried to conform to the norms of society. Reduction in belief of one's math ability occurred for both males and females, however, single sex education did not cause a reversal of stereotypical views. The study revealed that student's chose math classes to attend and overwhelmingly accepted a lower math classes than their male counterparts. Although this study does not yield evidence that single sexed classrooms would change the findings, it does demonstrate the trends towards disenchantment with math affected both genders thereby suggesting that gender bias and stereotyping are bigger factors in determining math ability and achievement than classroom orientation.

Jackson and Bisset (2005) identified important factors parents use when choosing a school for their children demonstrated that parents are not exempt from stereotyping or gender bias. In a quantitative and qualitative study, the researchers identified the important factors for parents in choosing an independent single sexed or co-education school for their children. Through questionnaires and interviews of 225 completed responses, the researchers limited their interviews to 15 families and found that the school's reputation and student performance were the most important factors for parent's decision

making, however, parents of female students are more likely to take gender into account in determining their child's education.

Three independent schools (one all girls school, one all boys school and one coeducational school) in the United Kingdom participated in this research. All three schools had competitive academic prowess as determined by student standardized test scores and were all highly sought after. Schools are all of comparable size and support the same grade levels. The coeducation school also offered boarding; the single sex schools were day schools only. Families involved in the study were chosen based specific criteria including representation from all three schools, two parent households of male and female parents, parents of multiple children and parents for which single sex education was and parents for which single sex education was not a factor. For a majority of parents (55%), single sexed school was unimportant; however, of the parents who chose single sexed schools for their children, 45% stated single sex was the reason for their choice of schools. Parents of girls favored single sexed schools by 54% and parents of boys at 37%. The single sexed schools ability to meet the particular needs of girls was deemed one of the most important factors to parents in their choice of schools. Single sexed schools were seen to have particular advantages for girls.

Strengths of this study included analysis of comparable schools from areas of similar socioeconomic background and clear reproducible research methods, however, the limitations of those surveyed presented a problem. Since single parents were not interviewed in this study and the sample was not

representative of minority ethnic groups, this study cannot be generalized to a larger and more diverse population.

Overall school reputation and academic record were key factors for parents choice in school selection, and whether the school is single sexed was less important , however, long standing views that single sexed education has its advantages for girls is still a strong belief according to parents surveyed. Although parents have many options to weigh when selecting schools, this study determined that parents take their child's gender into consideration and weigh factors differently depending on the child's gender.

Garrahy (2001) evaluated gender differentiated schooling experiences provided by three third grade teachers by comparing the teachers stated beliefs regarding gender and the actual occurrences in the classroom. Over a fifteen week period, researchers gathered qualitative data from classroom observations and found that teachers believed they did not take student gender into account when teaching, however, findings concur that teachers reacted to the needs of the dominant culture which prevailed and reflected the need and interest of the boys in the classrooms.

A small Midwest public elementary school with students of lower and middle class backgrounds participated in the case study. The researcher used multiple data collection methods to analyze the third grade classes including prolonged interviews and classroom observations and applied triangulation of data sources between the three teachers, peer debriefer, and negative case analysis to ensure trustworthiness of data. Garrahy (2001) chose this age group

to avoid prepubescent complications and minimize physiological changes that might impact the study. All three Caucasian female teachers upheld their belief in gender blindness to support the notion of fairness described by seeing the children as generic rather than as boys or girls, this, however was not the case. The study identified that all three teachers classified themselves as fair in how they reprimand, grade and interact with students. Though the teachers wanted to treat all students equally, two of the three teachers interacted with male students more favorably and taught in a manner which benefited the male gender. The teachers asked more questions of boys, called on boys more often and gave in to their demands. The teachers held different expectations for boys and girls and allowed only boys to speak out of turn or entertained their interests in discussion over that of the girls. Though educators did not believe gender was an issue in elementary school, due to the age of the students, discrimination against girls emerged in the classroom.

Although not specifically studied, the results of this research demonstrated advantages of single sex education for equitable treatment of all students. Teachers are role models to students and they set the tone for the classroom. If one gender is receiving unfair or inequitable attention, students see this injustice, expect it and reinforce it. Gender bias training and self reflection provide ongoing reminders to help both boys and girls receive the support and attention they deserve.

In a quantitative study to determine how methods classes for preservice teachers address gender bias and equity in mathematics, science and

technology (MST), Campbell and Sanders (1997) conducted a national survey of instructors teaching MST methods coursework. Through a stratified sample of both large and small institutions, the researchers surveyed 353 primarily white middle class teachers of equally mixed gender. The outcome of the survey focused on the current status of gender equity in education in MST fields, attitudes of respondents regarding gender bias and equity and suggestions to create better gender equity in educational institutions.

Researchers found that professors are primarily uninformed regarding gender equity, but are aware of the significance and strongly agree that gender equity issues should be taught in methods classes to increase knowledge and application. The study found that female teachers were more apt to address gender equity concerns in the classroom than their male counterparts and female educators had significantly more positive attitudes towards gender equity implementation. Campbell and Sanders (1997) warned that the lack of awareness and preparation with gender equity issues caused educators to unintentionally teach boys more effectively than girls. The authors found that teachers gave boys preferential treatment and suggested the immediate addition and application of gender equity education to teacher preparation coursework.

The study's strengths included the detailed educational background of teachers to present possible opportunities for bias, however, the study is not reproducible as the four page questionnaire was not included in the findings, thus also making analysis difficult. This study would be stronger with a broader subject base incorporating teachers, preservice teachers and their faculty

advisors. The study neither supported nor opposed single sex education, but rather explored the importance of gender equity education to benefit all students.

Summary

Chapter one revisited single sex classrooms as an opportunity to offer the best possible instruction for students. Differentiated instruction geared toward a specific gender might provide each gender with the tools they need to enrich their learning and understanding. Chapter two reported the history of education in the United States and the development of schooling from single sexed roots to primarily coeducational instruction. It examined the inequitable beginning of education placing the needs of males in primary importance and later recognizing females in equal standing. With equitable education as the goal, many researchers studied educational and classroom orientation to determine the benefits and detriments of single sex education. Chapter three reviewed the current literature regarding single sex education. The research both supported and opposed single gender education. In many studies the findings were inconclusive and could not offer significant results to promote single gender. Studies summarized and analyzed the research to determine the impact of single gender education on achievement, motivation and self esteem.

CHAPTER FOUR: CONCLUSION

Introduction

The purpose of this paper was to determine the benefits and detriments of single sex education in terms of achievement, interest and self esteem for children in the United States education system.

Chapter one introduced the purpose of this review and described the current debate. It discussed findings of gender bias within schools and the impact of perpetuated stereotyping on both genders. Reports suggested girls falling behind in math and science and faced sexual harassment and mockery from their male peers (AAUW, 1992; AAUW, 1998). Studies demonstrated that boys too faced academic challenges in reading comprehension and language arts. This chapter entertained suggestions of single sex education as a potential opportunity to design curriculum to meet the specific and differing needs of the sexes.

Chapter two, organized chronologically, presented a brief history of education leading up the current system within the United States. It discussed the inequitable beginnings and explored the different educational opportunities offered to males and females. It described current goals of educators to level the playing field and reported single sex education as a possible opportunity to develop gender specific curriculum aimed to address their particular weaknesses.

Chapter three presented a critical review of the current research on single sex education. The research was divided into four areas of thought each

analyzing the topic under a different lens to determine benefits of different instruction. The first nine papers discussed data supporting single sex education within schools. The research explored the possible benefits of increased self esteem, higher achievement, and motivation from a separated class environment. It evaluated participation levels, stress, and opportunity from dedicated curriculum designed to meet the specific needs of the grouping. The next eight reports compared single sex and mixed setting variables and considered multiple variables to account for perceived increased achievement sighting small class size, students' socio-economic background or minority status, dedicated teachers or more funding as possible factors. Five papers examined learning differences and preferences between the sexes. The research investigated cognitive differences, spatial differences, approach to learning, and motivation. The final seven papers examined gender bias in classrooms and explored the effect of stereotypes, the role of the teacher in class success, attitudes and perceptions regarding single sex schools from students, parents and teachers.

The final chapter will summarize the findings for the current research on single sex versus coeducational education presented in chapter three. The chapter will discuss implications from the research for classroom practice and will offer suggestions of areas in need of further research in the realm of gender separated education.

Summary of Findings

The first seventeen studies in chapter three examined research on gender organization and its impact on student achievement, motivation and self esteem. The latter thirteen studies explored potential learning differences between the sexes and the broadening effect of gender bias on education. Research proved inconclusive and appeared divided on the benefits of single sex education.

Several studies demonstrated a positive effect for students in single sex settings. Younger and Warrington (2002) examined results from the GCSE standardized examination offered annually to students in the UK and concluded single sex classrooms positively affected both males and females with self esteem and test scores compared with coeducational environments. The study reported proportional increases in test scores for both sexes and claimed teacher differentiated instruction as responsible. Additional research using the GCSE results demonstrated girls on the low end of the academic range of achievement particularly benefitted from single sex settings (Spielhofer, 2004). Daly & Defty (2004) seemed to agree with Spielhofer's analysis of test scores in their research and added results that girls in single sex science classes received higher grades than their coeducated peers.

Other studies found no consistent evidence of academic improvement from one type of school organization over another (Harker, 2000; Singh, 1998; Van der gaer et al., 2004). Van der gaer et al. (2004) compiled data from 6000 students over their middle and high school years and reported no substantial

academic benefits to students from single sex settings. The research examined reported gains and declared factors other than gender as responsible.

Socioeconomics, family support and quality of instruction all impacted student achievement. In studying advantages to school organization, Harker (2000) found social and ethnic mix essential to performance and denied gender make-up of the class as responsible.

Two studies examined the impact of a pilot program in California which targeted minority students and implemented single sex education in an attempt to improve performance. The study showed increased performance but could not demonstrate conclusive evidence that achievement resulted from the single sex nature of the class. The study sited smaller class size, more money, and dedicated teachers as potential reasons for increased grades and test scores (Herr, 2004; Hubbard & Datnow, 2005).

Even studies which seemed to support single sex schooling reported mixed findings indicating benefits to only one gender. Daly and Defty (2004) noted that females benefitted from same sex environments with improvement in test outcomes while boys experienced more academic success and a more well rounded education in coeducational settings. They questioned the cost effectiveness of the small gains for only one gender.

Studies did not agree regarding self confidence levels in girls of mixed and single gender settings. Dyer and Tiggerman (1996) reported that girls from single sex settings had more body dysphoria resulting in a higher percentage of girls with medical conditions including anorexia and bulimia. The study found girls

from single sex schools more apt to suffer from lack of self confidence regarding their body image and more apt to focus on their detriments. While another study found that girls from coeducation settings placed a higher value on external appearance than did their single sex schooled counterparts and were more bound by gender stereotypes (Granleese, 1993).

Still more research documented behaviors and attitudes of girls and found they participated more in classrooms of same sex peers, took greater risks, and felt more comfortable speaking out even if they didn't know the answer (Parker & Rennie, 2002; Streitmatter, 1997). Streitmatter (1997) examined risk taking behavior among girls in a single gender middle school math class. The study recognized that girls took repeated academic risks and reported more outgoing behavior and sense of freedom. Studies documented teachers' response to all girls classes and noted that students were easier to engage and sustain interest than those in mixed classes (Parker & Rennie, 2002; Streitmatter, 1997), however, faults lie in these same studies as gender bias of teaching professional cloud the issue. Gray and Wilson (2006) found teachers preferred all girls classes to all boys and found no support from the teachers in the study for single sex education for either sex sighting increased classroom management issues in all boys classes and no proven benefits for girls.

Conversely, Rennie and Parker (2002) investigated ten high schools which participated in the Single Sex Education Pilot Project and through classroom observation determined single sex classrooms provided greater freedom for students to express themselves without judgment or persecution

from the opposite sex. Student to student harassment greatly diminished in single sex classes and girls participate more and appeared more extraverted than those in mixed settings. The study showed that both boys and girls benefitted equally in terms of academics and development of verbal and written communication skills.

Taking into consideration difference in motor development, verbal ability and impulse control, Sherman (2002) separated students into single sex classes and adapted curriculum to meet the needs of the students. The study indicated the presence of different learning styles and noted student improvement through differentiated instruction. The study showed that females adapted quickly, participated evenly and respectfully in cooperative situations, completed good work ahead of schedule while boys struggled with homework, needed greater class structure and required additional motivation. As the teacher tailored instruction to meet the specific and different needs of the students, the study documented the positive impact to student learning, skills and experience.

Younger and Warrington (2002) found that educators catered their teaching style to the gender and the needs of the class and these styles were noticeably different between the single sex classes. The girls tended to work more collaboratively, sustained self motivation and worked well in group settings, successfully managing independent work. Teachers offered the boys a more structured class with many short lessons and noticed the boys tended to need more teacher interaction for praise, support and direction.

Research may be confounded. Benefits found from small class size may be misinterpreted as gender difference when in fact the school placed a higher value on academics than it does athletics. This fact alone may be one reason schools should strive for smaller schools and class sizes. Smaller class sizes offered opportunity for individualized instruction which led to differentiated instruction, proposed to assist single sex classrooms (Herr, 2004; Hubbard & Datnow, 2005).

Gender bias is an issue which impacts adults and student daily. Highlighted by the inequity in employment, athletics, media, and literature, Gender bias is also an issue which affects students via their teachers and research does indicate that gender bias education and training helps teachers to identify their own biases making them better able to change their behavior. Without such training bring bias out into the open, it is destined to continue. Research shows that teachers are interested in receiving more training to better help them deal with their students, evaluate curricular material and present a more equitable and balanced education (Campbell & Sanders, 1997; Gray & Wilson, 2006).

Classroom Implications

Gender bias is an issue in schools today. Predefined gender roles limit both male and female students from attaining their personal goals by imposing cultural standards on them. Some school districts offer teacher training and research shows that teachers are taking advantage of the training but desire more education with frequent intervals. Teachers need to challenge their own

assumptions as well as those of their students in order to offer an equitable education for all their students. This needs to take place regardless of whether the school offers single or mixed gender education. Some studies found that single sex male schools had the highest propensity towards stereotyping and gender bias than either mixed or all girls' schools (Gray & Wilson, 2006; Myhill & Jones, 2006). Teachers need to challenge one another and challenge their students to examine their own biases, thereby creating an environment for everyone to have a better chance to succeed (Campbell & Sanders, 1997; Gray & Wilson, 2006).

Textbooks and curricular materials are in need of a gender overhaul to allow for more equity both in tone and in content. Women need to be better represented and identified for their achievements. The powerful male dominated industries, history, math and science need to recognize the achievements of all citizens regardless of race or gender. By offering a wider view, girls will have a greater chance of finding female role models and more easily distinguish themselves in roles previously stereotyped for males.

If boys and girls do learn differently, teachers should make to allow for such differences. Teachers should create multiple opportunities for hands-on activities, integrated study with multiple perspectives to allow children multiple chances to absorb information, collaborative work to allow for opportunity for practice to strengthen the skills of working with others as well as to allow children of all ability levels opportunity to succeed (Burkham, Lee, Smerdon, 1997; Gurian, 2001). Girls have made significant progress with supportive programs

designed to encourage them in math and science subjects (Jobe, 2003); we may see boys benefits from additional programs designed to reach them in areas of struggle. In addition, opportunity for large muscle movement at every age may be helpful in maintaining attention levels by offering students the ability to make choices for their own bodies and give them responsibility rather than restriction.

Implications for Further Research

Researching gender and identifying that one element as the reason to create change is difficult indeed. Confounding factors of socioeconomics, religion, family expectations, and affect the outcome of studies and makes it difficult to identify gender as the sole factor responsible for achievement, motivation or whatever topic is studied.

Larger research studies spanning twenty years or more and following students through their lives would allow clearer picture of the struggles students face might help to gain more confidence in the research. Research which looks at a snapshot of children's lives may not give an accurate picture of the benefits of the type of schooling they are receiving. There may be hidden benefits which can only be uncovered in a longitudinal study.

Most of the single gender schools studied were private schools with some religious affiliation. Since families who are able to afford private school tuition may be of higher socioeconomic status, the results of these studies may not transfer to other demographics. In addition the religious nature of these families may impact the family dynamics and may again skew the research so that it is

not transferable to other populations. Studies which include students from multiple backgrounds would offer credibility and lend more transferability.

Family culture greatly impacts the success, expectation and achievement level of students and is largely determined by the expectations at home. Additional studies could take this influential point into consideration to separate and identify gender as a factor responsible for change.

Truly random samples would benefit this research as to offer a genuine sample. Though many studies have accounted for variation and difference through statistical measures, additional studies to determine if school practice, economics, SES, race and home expectations has more to do with equitable education than the gender of the student.

Both male and female role models are important for development. By studying students who have strong role models and/or families with successful mother figures to determine if their achievement and self esteem are higher than in families of girls whose mothers do not work. Is it the home culture that determines how the education for the female is made important?

Summary

The “jury is still out” on the impact of single sex schooling on educational attainment. Several international reviews and systematic reviews have failed to identify consistent or strong findings for single gender education. There is some evidence that girls’ and boys’ attitudes to subjects are influenced by whether a pupil attends a single gender school. Boys and girls attending single sex schools are less likely to hold gender stereotypical views about science subjects

compared to pupils attending co-educational schools, however mixed findings regarding achievement, self esteem and motivation provide inconclusive evidence as to the benefits of school organization on learning. Additional study and time may demonstrate change especially in light of the proponents of gender equity and social change emerging in the teaching profession. Research seems to support aligning teaching approaches with the needs of the students to better serve all students regardless of gender. Eliminating learning barriers and creating supportive, challenging environments independent of differences may be the only way to endure equity and success for all children.

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