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Single-Gender Education at an Urban Middle School

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COLLEGE OF EDUCATION

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Calvin Hooks

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2016

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MEd, National Louis University, 2006

BBA, Howard University, 2000

Doctoral Study Submitted in Partial Fulfillment

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Abstract

Several recent studies have critiqued the cognitive science behind single gender education, and social cognitive theory has demonstrated that gender inequality in the classroom may inhibit students' academic achievement. This study examined a single-gender education program for both middle school boys and girls established to remedy academic achievement deficiencies at a public charter school, to be identified as Urban Charter School (UCS), located in an urban area. The key research questions examined the trend in mathematics and reading student outcomes over a 6-year period, the relationship between gender and outcomes in mathematics and reading, and the comparison of outcomes between the single gender program at UCS and coeducational programs in the district. This ex post facto quantitative research design used historical state level reading and mathematics assessment data from archival state assessments of 110-135 middle school students annually, in Grades 6-8. Chi–square tests were conducted to examine the differences in mathematics and reading score outcomes by gender and school type. The results demonstrated no trend in UCS student achievement scores, UCS female students exceeded state assessment proficiency expectations, and the average proficiency levels in reading and mathematics of UCS students were higher than were district averages. This study provides educators and the community at large with additional research on the relationships between single-gender education programs and student achievement.

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Dedication

I dedicate my doctoral study to all of the boys and young men who have ever been told you cannot, you will not or you shall never. Do not allow the limitations and narrow mindsets of others to dictate your destiny. You are a conqueror and your potential is limitless. Stand firm in faith and all things will be possible. The magnitude of grace and mercy is immeasurable.

Acknowledgments

I would like to thank the Walden University faculty, my family and my friends who have helped me reach this milestone in my academic career. The number is too great to begin listing names. So, I thank you all.

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Section 1: The Problem

Introduction

Single-gender schools were predominant in public education through the early 19th century and continued to exist into the 20th century. Equal rights legislation led to the popularity of coeducational schools to avoid inequality in educational opportunities (Tyack & Hansot, 1992). In 1972, Title IX of the Education Amendments of 1972 was passed in an attempt to remove restrictions on "democratic education" imposed by sex discrimination (Buek & Orleans, 1973). Initiatives proposed after Title IX led to the widespread adoption of coeducational schooling to remove bias in single-gender schooling (Buek & Orleans, 1973; Orleans, 1996). However, Sadker and Sadker (1994) indicated that gender bias in public schools resulted in an unfair educational environment for female students. Analyzing elementary school through higher education experiences, including textbooks, teacher interaction, parental expectations, and student interactions revealed a "powerful hidden curriculum" which failed to fairly further girls' educational opportunities (Sadker & Sadker, 1994, p. 9). Sadker and Sadker found instances of teacher bias toward boys such as increased speaking time, teacher valuation of input, and encouragement to handle problems by themselves. Sadker and Sadker argued that systematic male dominance fundamentally affected the capability of girls to succeed in the public education system in multiple avenues.

Since the publication of Sadker and Sadker's (1994) research, the field of education has attempted to develop education initiatives in an attempt to address this inequity. Examples of such initiatives include encouraging boys and girls into underrepresented fields, adopting policies to address stereotyping in education (Buek & Orleans, 1973; Orleans, 1996), and enhancing the quality of education and efficient management of resources (U.S. Organization for Economic Cooperation and Development, 2011). One suggestion for practical improvement in achieving these outcomes is single-gender education. Researchers have suggested that boys in single-gender environments have more academic success in classrooms and extracurricular activities, although girls feel more likely to participate in a classroom environment because of decreased self-consciousness that female students have been demonstrated to feel when male students are present in the room (Ferrara, 2009; Gurian et al., 2009; NEA, 2006; Noguera, 2012). Based on initiatives like single-gender education, Mead (2006) conducted research for an independent education think tank, and found that girls had lessened the inequity in education in the interim, progressing more quickly than boys in some areas of assessment (e.g. reading comprehension). However, she reported that this progression only leveled the capability of girls to succeed in a less gender-biased environment, although remaining gaps could be addressed by lessening race and class inequalities. This focus on race and class, instead of gender, has become a common trend in research; for example, the National Center for Education Statistics (2013) found average test scores for students in rural and suburban schools were greater than students in urban schools. However, this changing focus fails to consider that much initial research showed favorable results stemming from single-gender instruction (Gurian, Stevens, & Daniels, 2009).

However, researchers have recently challenged the validity of single-gender education as an educational approach. Eliot (2011), Halpern et al. (2011), and Barnett and Rivers (2011) asserted that research on gendered learning differences overestimates the biological differences between boys and girls. Researchers have suggested that single-gender education only exacerbates these gaps, when educators should focus on building the overlapping abilities of boys and girls. Not only is single-gender education founded on a problematic scientific basis, but the nature of it furthers stereotypes and institutionalizes sexism (Halpern et al., 2011). More detailed discussion of the relevant literature will be addressed in Section 2 of this Doctoral Study.

Local Background for the Study

During the time of this study, the focus public charter school served grades prekindergarten-8^{th} grade and averaged 550-600 students. There were 2 prekindergarten classes for 3 year-olds, 2 prekindergarten classes for 4 year-olds, 3 kindergarteners, three 1^{st} grade, three 2^{nd} grade, two 3^{rd} grade, two 4^{th} grade, two 5^{th} grade, two 6^{th} grade, two 7^{th} grade, and two 8^{th} grade classes. Each prekindergarten-6^{th} grade class averaged 25 students. Each 7^{th} grade-8^{th} grade class averaged 15-20 students. The 6^{th}-8^{th} grade classes were single-gender classrooms. The prekindergarten-5^{th} grade classes were heterogeneous.

All individuals on the instructional staff were considered highly qualified, as defined by the No Child Left Behind Standards. Sixty-five percent of the students were identified as African American. Thirty-four percent of the students were identified as Hispanic/Latino. One percent of the students were identified as other. The school averaged a 24% rate of English Language Learners. Ninety-six percent of the students were identified as low income. Thirteen percent were identified as receiving special education services.

For the purposes of this study, the school will be referred to as Urban Charter School. According to the District of Columbia Kids Count Action Center (2012), the urban area where Urban Charter School is located has one of the largest achievement gaps of all urban school systems in the United States. Even within the district, students who attend out of boundary public schools (i.e. those outside of city limits) score better in reading and mathematics than those who attend in boundary schools (i.e. those inside of city limits). Moreover, populations that live in neighborhoods with lower economic status (i.e., where the census data shows household income lower than $40,000) are more likely to be transient, with 66% of students living in these areas attending schools for which their homes are not zoned due to school choice practices, such as special assignment, which allow parents to decide where a student will attend. All of these factors significantly affect the capability for a student to perform and leads to disadvantages, which perpetuate class-based academic inequality (Schneider & DeVeaux, 2010).

At Urban Charter School, academic deficiencies, based upon low standardized assessment scores in reading and mathematics, led to proposals for change using paradigms, which had shown pedagogical promise in scholarship current in 2006. The change selected for this school was in gender-based instruction, and a single-gender education program became a viable option because of its relatively low initiation costs and support by scholarship conducted around that time (Connell & Gunzelmann, 2006;

Charles & Bradley, 2002). In 2006, students were separated by gender in certain classrooms, whereas other students remained in gender-heterogeneous classrooms. The current study intends to assess the outcomes of this pedagogical experiment, which ran from 2009-2014. A more detailed discussion of the study's parameters will be presented in Section 2: Methodology.

Problem Statement

Identification of the Problem

Economic- and place-based inequalities exist for youth living in urban environments, leading to necessary intervention on the part of the educational system (NAEP, 2012). Spellings (2009) argued that the achievement gap between Whites and minority students has continued to expand, and thus called for the implementation of programs intended to address these inequities. However, funds are limited. Educational budgets are already significantly lower than those appropriated in 2008, and are estimated to be reduced by 7-12% by 2022 (Oliff, Mai, & Leachman, 2012). When funds are appropriated for these purposes, it is imperative that they are appropriated towards research-based programs and that the validity of this appropriation is assessed. Single-gender schooling is currently contentious among researchers in the field and requires special validation. Therefore, the study will determine whether the single-gender initiative was useful for Urban Charter, and help to determine a plan of action for the schools' future allocation of resources.

Location of Population Affected by the Problem

In this study, I examined Grade 6-8 students enrolled in a single-gender education program at an urban school, which implemented single-gender schooling in 2006. During the time of this study, the focus public charter school served grades prekindergarten to eighth grade and averaged 550-600 students. There were two prekindergarten classes for 3 year-olds, two prekindergarten classes for 4 year-olds, three kindergarten classes, three first grade classes, three second grade classes, two third grade classes, two fourth grade classes, two fifth grade classes, two sixth grade classes, two seventh grade classes, and two eighth grade classes. Class sizes for prekindergarten to sixth grade averaged 25 students. For seventh and eighth grades, classes averaged 15-20 students. The sixth, seventh, and eighth grade classes were single-gender classrooms. Prekindergarten through fifth grade classes were heterogeneous.

One-hundred percent of the instructional staff were considered highly qualified, as defined by the No Child Left Behind Standards. Sixty-five percent of the students were identified as African American. Thirty-four percent of the students were identified as Hispanic/Latino. One percent of the students were identified as other. The school averaged a 24% rate of English Language Learners. Ninety-six percent of the students were identified as low income. Thirty percent were identified as receiving special education services.

Students were divided by gender into classrooms in accordance with studies of programs at other schools, which demonstrated the positive effects of single-gender schooling. The school chosen for this analysis publicly released its annual report in 2011 on academics and demographics, and described the student population as: 99% categorized as minority, 96.4% designated as low income (below $40,000 per household), 12.8% received special education services, and 24.3% received services as non-English speakers (Public Charter School Board, 2011).

Evidence of the problem

In 2006, according to publically released school test scores, only 27.36 % of the students attending this school scored a “Proficient” in reading and 18.91% scored “Proficient” in mathematics. The state’s AYP scores were 47.37% and 40.27%, respectively, and also missed the set standard. The school’s average attendance rate for the 2010-2011 school year was 97.2% and the rate of promotion was 93.5% (Office of the State Superintendent of Education [OSSE], 2011).

Upon retrieval of this data, administration determined a 5-year plan for the school, implementing goals for improving the achievement of the students. Those goals, as described on the No Child Left Behind (NCLB) District assessment data report, include reading and mathematics goals and subgroup achievement goals based on ethnicity, special education, English Language Learners (ELL) and economic status (OSSE, 2011). The failure to meet the achievement targets was an area of concern for the school administrators and influenced the school administrator’s decision to implement the single-gender education program that will serve as the focus for this ex post facto quantitative study. The administration noticed that when students were naturally separated for classes such as physical education, they noticed a difference in the level of focus in the students. That led to discussions around the possibilities that such behaviors would transfer in the core subject areas and eventually led to single-gender classes in Grades 6-8.

When the school was reassessed, its 2011 AYP report indicated the school did not meet any of its District assessment related achievement goals. According to reporting to the Office of the State Superintendent of Education (2011), Urban Charter did not meet its proficiency targets in 2011 for either reading or mathematics. The target reading proficiency rate was 73.7% and the school's actual reading proficiency rate was 52.47%. The target mathematics proficiency rate was 70.10%. The school's actual mathematics proficiency rate was 50.22%. However, these rates were higher than those of the District. The district had an actual reading proficiency rate of 45% and an actual mathematics proficiency rate of 47%. The data reflected testing of Grades 3-8 and not exclusively for grade levels with single gender programs in Grades 6-8. Table 1 demonstrates the comparative data for the school and the district.

Context of the Problem

Urban Charter is a public charter school, with elementary and middle school grades. The school averages 550 students with the majority of the students identified as economically disadvantaged and minority. The school is one of the oldest charter schools in the urban area in this study. The early childhood grades remained as heterogeneous classes. The single-gender program was implemented into Grades 6-8 during the 2005-2006 school year. The change took place under the leadership of a principal who was in place since 2000. As a charter school, the school was a school of choice. So, all students who enrolled chose to attend voluntarily and chose not to attend their designated neighborhood school. Because all Grade 6-8 classes were single-gender, parents could opt out of the program by not attending the school. This study only examines data from 2009-2014, because that time period represents the only public data available through the No Child Left Behind/Office of the State Superintendent of Education website.

In the district, only 56% of students who attend noncharter public schools meet 4-year graduation goals and average a 1220 out of 2400 on the Scholastic Assessment Test (SAT) compared to the national average of 1500/2400, findings which are consistent with research that suggested that race and poverty affected SAT scores (Dixon-Roman, Everson, & McArdle, 2013; Perazzo, 2013). At the urban school in that district, academic deficiencies, based upon low standardized assessment scores in reading and mathematics, alerted the educational community to a need for change.

Nature of the Proposed Study

In this study, I analyzed the annual academic achievement trends in reading and mathematics for 110-135 male and female middle school students within the single-gender education program, Grades 6 through 8, and encompassing a 6-year period from 2009-2014. Ex post facto quantitative design broadly encompasses nonrandomized intervention studies and applies when randomized controlled trials are either logistically impossible or unethical (Harris et al., 2006). This study is an ex post facto quantitative design, because it focuses on two grouping variables (gender and classroom type) without random assignment, and relies on archival quantified data (Creswell, 2005).

In the area of the target school, there is a schedule for periodically distributed assessments and one for annually distributed assessments to gauge student progress. The end-of-year examination scores were analyzed between single-gender classrooms and gender-heterogeneous classrooms to determine academic achievement over the 6-year time period of the study and to assess the pedagogical experiment.

Data from single-gender and heterogeneous classrooms within this research design may be threatened by various factors such as socioeconomic status of participants, classroom attendance, and student attrition rates; therefore, results may be skewed. Further research into potential threats to the design, specifically those related to the social make-up of classrooms, is necessary.

To assess mathematics and reading outcomes and their differences by gender and classroom types, chi–square tests were conducted. Because data for mathematics and reading outcomes are only available as an ordinal variable (i.e., below basic, basic, proficient, advanced), these outcomes will be considered ordinal variables. I selected this statistical analysis because the data available will be gathered solely from ordinal variables. A chi–square test is the suitable examination when the researcher is interested in the association amongst two ordinal variables (Pallant, 2010). Specifically, I conducted a cross tabulation to determine if gender and classroom types affect mathematics and reading outcomes.

Research Questions

Research Question 1: What is the trend in mathematics and reading student outcomes, over a 6 year period, in an urban middle school that has adopted single gender classroom structure?

*H_0*1: There is a negative or no trend in mathematics and reading student achievement scores, over a 6-year period, in an urban middle school that has adopted single gender classroom structures.

*H_a*1: There is a positive trend in mathematics and reading student achievement scores, over a 6 year period, in an urban school that has adopted single gender classroom structures.

Research Question 2: Within an urban middle school, is there a relationship between students' mathematics and reading outcomes and gender, over a period of 6 years?

*H_0*2: There is no relationship between students' mathematics and reading outcomes and gender.

*H_a*2: There is a relationship between students' mathematics and outcomes and gender.

Research Question 3: Do student mathematics and reading outcomes in an urban middle school, which has adopted single gender instruction, differ from those of other schools in the same district, with gender-heterogeneous groupings?

*H_0*3: There is no difference between student mathematics and reading outcomes in an urban middle school, which has adopted single gender instruction, compared to other schools in the same district, with gender-heterogeneous groupings.

$\mathrm{H_a}$3: There is a difference between student mathematics and reading outcomes in an urban middle school, which has adopted single gender instruction, compared to other schools in the same district, with gender-heterogeneous groupings.

Special Terms

Charter school: A school that is not subject to the rules, regulations and statutes of public schools, but receives public funds in accountability practices (National Education Association, 2013).

Differentiated instruction: The use of a variety of teaching strategies to address diverse student learning needs (Alber, 2014).

Heterogeneous grouping: A nonhomogeneous mixture of students, not categorized by achievement, proficiency or other specified factors (Hermann, 2014).

Single gender instruction: Instruction where students are separated into classes based on their gender. All academic instruction occurs solely with the members of students' genders (Austin Independent School District, 2011).

Assumptions

The assumption exists that the school, staff, and students involved in this quantitative study have not taken any actions that would skew the historical data analyzed in this study, such as tampering with data. I also assume that teachers in the program knew how to teach same sex classes. The assumption also exists that the state assessment data is accurate. These assumptions can be made because of the following guidelines put in place by the OSSE (2014), which oversees test security in the state:

> Each Local Educational Agency (LEA) must develop, maintain, or adopt a test administration and test security plan to ensure that administrative and school personnel, as well as the community, are aware of the importance of test security. Test administration and test security plan must adhere to the state security

> procedures…If the LEA develops its own plan, policies and procedures must meet or exceed state policy and procedures, and it must submit its plan for review and approval to the OSSE Office of Data Management and Assessment. (p.2).

Administered by the District, the standardized test falls under the guidelines of the NCLB Act of 2001, ensuring the best enhanced management controls possible over the data that are being used to make key judgments (Office of the State Superintendent of Education, 2014). Through national legislation and local administrative oversight, test results are deemed valid and correct.

Limitations

By focusing solely on the outcomes of the DC CAS, results were only as accurate as the ability of this standardized test to predict outcomes in reading and mathematics. The accuracy of the results was further limited by the conditions present during the time of the assessment's implementation. As such, these results may not apply to current conditions. This limitation was couched in the lack of access to more current student outcomes assessments. Although single gender education continued past 2014, public information was not available to assess the program's progress.

Another possible limitation of this quantitative study was student attrition, due to moving away from the school or dropping out of school, during the 2009–2014 school years. Because comparison data for this study were gathered from student outcomes assessment, it was important that individual student enrollment was stable. Students who remained enrolled and provided scores across the 2009 – 2014 school years provided consistent data points for comparison. Fluctuations in enrollment may have hindered the precise measurement of the outcomes; because the study was comprised of a relatively large sample, minor fluctuations in enrollment did not greatly impact averages across groups.

Administrators' lack of direct control over the teachers' instructional methods was another possible limitation within this study. A teacher with inadequate mastery of instructional best practices may have yielded below average student performance results, regardless of the make-up of the class. This lack of mastery of instructional best practices, coupled with a lack of control over external factors affecting students' achievement, may have affected student outcomes on the DC CAS. Without a consistent administrative framework for classroom instruction, it was difficult to ensure consistency in how instruction occurred in individual classrooms.

Inconsistencies in testing environment were another potential limitation of the study. Adverse testing environments, specifically, conditions in the testing room which might have interfered with students' ability to focus such as talking, climate in the classroom, or disruptions from other testers, might have negatively affected students' assessment outcomes. However, because of the strict OSSE guidelines, it has been assumed that if such a problem had arisen, it would have been appropriately filed as a "Test Security Violation" (OSSE, 2014). All such violations would have invalidated those students test scores, which would not have been included in this study.

When single-gender and heterogeneous classrooms were compared within an ex post facto design, threats to the internal validity may have be present, such as minority social and economic well-being, classroom attendance, and student attrition rates, and results could have been skewed. Without randomization, the group differences in study groups may have significantly altered the results. Additionally, confounding variables, such as socioeconomic status and school attendance, could have been difficult to determine, which may have harmed internal validity of the results. Participation in experimental studies was difficult due to ethical considerations; however, employing an ex post facto design allowed me to overcome potential obstructions to research such as loss of instructional time and securing parental consent (Silvia, 2006). As a result, causal relationships determined through studies of this design must be further examined by subsequent research, which has total control of confounding variables. Finally, the study used an ex post facto design; as such, the assumption of randomized sampling is violated in this study.

However, several measures have been taken to overcome these delimitations. Selecting a program that has already been implemented, and using an ex post facto design have rendered the study rendered feasible. This research may serve as the foundation for future studies to delve further into differences in student outcomes assessment based upon participation in single gender and heterogeneous classrooms. Review of public data for Urban Charter was conducted to ensure that its population was relatively diverse and thus as translatable as possible given the nature of the study. The population for this research includes one urban middle school, which utilizes single gender classroom structures as well as the remaining schools in the district, which were used as a comparison group. The sample drawn from this school, which was utilized in the current study, was aligned to the demographics of the school population and was approximately the size of an average grade within the school. I did not have a role in administration of the assessment. Because of this, and my lack of involvement in gathering the data, my potential bias on the data has been mitigated.

Scope and Delimitations

The scope of this research is restricted to students within a specific school district. Section 2 details the student population's specific numbers, grade levels, sociocultural and racial demographics. Also, data gathered were drawn from the DC CAS, which are standardized state assessments that do not vary from individual to individual, or amongst the groups of male and female students. All nonstate administered standardized assessment data were excluded in order to keep the assessment samples consistent and not attempt to expand these findings across different assessments. No additional inclusion or exclusion criteria were imposed within the study, beyond the guidelines set forth in the initial assessment. Because of this, the population assessed is perhaps not generalized beyond the district, set in the mid-Atlantic area of the United States. The diversity and cultural factors of the region in which the school selected for the study is located may limit the capability of this research to expand beyond this region.

Significance of the Study

The significance of this ex post facto quantitative study is that the students in the Urban School District had a history of low achievement scores in reading and mathematics. The district in question also had one of the largest achievement gaps of all urban school systems in the United States (District of Columbia Kids Count Action Center, 2012). In order to address these achievement gaps, an initiative to meet assessments was created and systematically addressed in the public school system. This initiative produced data encompassing standardized assessment data in reading and mathematics through the DC CAS (Office of the State Superintendent of Education, 2011). Because the AYP outcomes do not seem to have been met in the period from 2009-2014, it is essential for scholarship to develop future programs to better enable schools to meet state-set outcomes.

Researchers have critiqued interpretation and conclusion of gender differences in the brain and learning. However, these studies are the foundation, which led to the development of single-gender schooling (Barnett & Rivers, 2011; Eliot, 2011; Halpern et al., 2011; Jordan-Young, 2010). Since single gender education programs were implemented, researchers have questioned the data used to justify single-gender schooling. As a result, it has not been determined whether single-gender classrooms are effective as an instructional tool (Bigler & Signorella, 2011). Therefore, the possibility still exists that single-gender classrooms may provide a positive instructional setting for student engagement (Gurian et al., 2009).

Studying the relationship between single-gender education, and mathematic and reading academic achievement will contribute to a growing body of research based on participation in gender homogeneous classrooms. The goal of this research is to help administrators and educators determine if students from single gender classrooms tended to have higher test scores. Information from this study could help in determining best practices for increasing student outcomes on assessments. This research is significant to educators and the community at large because urban students are at high risk for academic failure (NAEP, 2012).

The learning outcomes of the district demonstrated a significant need for programs, which alter the current state of education in this location (Schneider & DeVeaux, 2010). The lowering budget for educational expenditures, highlighted by Oliff, Mai, and Leachman (2012), determines that the programs that are chosen show maximum efficacy in order to maximize these diminishing funds. If these programs do not show promise and improvement in student learning outcomes, it is imperative that the program be terminated and that different methods chosen as a means of lessening the educational problem in Washington D.C. Conversely, if the program has demonstrated positive effects among this sample size, these results would seem to suggest that only controversy surrounding single-gender schooling, as shown in Eliot (2011), Halpern et al. (2011), Barnett and Rivers (2011), and Jordan-Young (2010), has contributed to the discontinuation of new single-gender programs, rather than the actual efficacy of such programs.

This study provides educators and the broader community with reading and mathematics assessment data for this school's single-gender schooling experiment. Contributing to the body of knowledge surrounding this approach will thus significantly assist in determining educational practice. Changes to schooling would therefore have significant social impacts on students; transitioning from coeducational to single-gender schooling would have social impacts that would need to be further examined. In order to maximize potential for social change, the discussion of the results is focused to clearly translate the findings of the study to social practice. Further research into the social makeup of classrooms is needed to transfer the potential results.

Summary

The grouping variables for this study include gender (male/female) and school setting (single gender/heterogeneous). The dependent variables are mathematics and reading achievement score outcomes (below basic, basic, proficient, advanced). The relationship between these variables is that the single-gender classroom will affect the outcomes on standardized testing. Researchers noted that when gender differences are present in instruction, female students have increased outcomes in reading although falling behind in mathematics, and male students show the opposite effect (Jackson, 2010; Martino, Mills, & Lingard, 2005). Comparison schools in the district have similar demographics and are similar in terms of hetero-gender instruction. Section 2 of the study will proceed with a review of the relevant literature for this study. The methodology for this study will be outlined in Section 3 of the study.

Section 2: Review of Literature

This review is organized to critically explore the history and theory of single-gender education in the United States and abroad, report on the current state of the research efficacy, and outline a plan for further research. Areas explored include research on the theoretical base of social-cognitive theory, the history and theory of single-gender schooling, recent developments regarding gender and brain development, gender differences in instruction, and finally, single-gender schooling's benefits and the criticism of these findings.

This literature review includes searched electronic databases for citations, such as the Educational Resource Information Center, Lesson Planet, WorldCat, SpringerLink, JournalSeek, IngentaConnect, Google Scholar and Direct Open Access Journals. Books, research studies, peer-reviewed articles and other sources were gathered and used as references and citations for this study. Keywords: *single-gender education, student achievement, student statistics, urban student*, *single-gender schools, single-gender classrooms and single-gender programs*, were among the terms searched for in these search engines.

Theoretical base: Social Cognitive Theory

Social cognitive theory determines that the means through which a student learns is inextricably tied to environmental factors, because people mimic the actions of those around them (Bandura, 1989). In doing so, social cognitive theory sidesteps the issue of self-as-agent versus self-as-object, by turning the development of cognition into a series of conscious and unconscious replications of the actions a person observes dependent on perceived outcomes of success or failure (Bandura, 1989). Specifically, the means of assessing the successful adaptation of sociocultural norms is determined by self-efficacy. Bandura (1993) argued that the extent to which a person determines him or herself as successful within the environment has a significant influence on cognitive, motivational, affective, and selection processes. Whether or not a student feels that he or she has the capability to master academic activities controls a student's aspirations and motivation, therefore leading to higher outcomes.

Pajares (1996) further applied this theory to student learning in an attempt to understand achievement. Specifically, utilizing the self-efficacy component of Bandura's theory, Pajares examined how a person's assessment of his or her own self-efficacy corresponded with self-motivation and academic performance. Ultimately, Pajares determined that aspects of social cognitive theory significantly predicted academic achievement, and determined that this paradigm was appropriate for future academic research. Because gender bias has been determined as a significant social influence in the classroom (Sadker & Sadker, 1994), removing this kind of inhibition to self-efficacy would seem to also affect the academic achievement of students in educational settings.

Social cognitive theory infers that there is a correlation between an individual's knowledge attainment and that individual's observations through experiences and social interactions (Bandura & Bussey, 2004). Bandura and Bussey (2004) found that the primarily cultural development of gender significantly affected how the cognitive process informs one's function within a setting and how observations influence developmental outcomes. As related to student learning and education, Bandura and Bussey discovered that students were more likely to shape their conduct based on same gender interactions versus interactions with the opposite gender because of cultural biases on the part of superior's roles. Thus, by studying a program where these significant stereotypes are removed, the proposed research will examine if and how these social factors affect student outcomes through standardized testing.

Social cognitive theory has been used to explain how these kinds of expectations can profoundly affect success within the school. Bandura and Bussey (2004) found that the socialization process and mechanisms that produce gendered beings had significant effects on the potential for future success. Personal cultivation, self-conception, pursuance of social opportunities, and perceived constraint led to the choices that adults made in their careers and social lives. Specifically, men and women were found to be assigned different roles in society, with males taking high-status positions of power and effectiveness. Therefore, expectations of gender, as found by Sadker and Sadker (1994) in the schools, could intensely shape the direction of students, and in some cases, their capability to succeed.

Moreover, research has found that schools participated in the process of engenderment. Lee, Marks, and Byrd (1994) explained that the process of engenderment involves the association of prescript social roles, statuses, and norms with given biological differences. Schools, the researchers argued, participated in this process. Moreover, examining schools separated by gender (e.g. schools for boys, schools for girls, and coeducational schools), the researchers discovered that although all schools participated in an equal amount of sexism, different forms of sexism presented depending on the school type. When schools promoted gender equity in personal relations, enrollment and faculty hiring, sexism, and engendering were significantly reduced. Their findings also demonstrated that boys-only schools demonstrated the most severe forms of sexism, whereas coeducational schools reinforced sexism in aptitude toward different activities, such as boys considered better at chemistry. Although girls' schools were found to be the most egalitarian, the researchers found that at this time, they demonstrated adherence to the stereotype that girls depended on boys academic achievement and that women were less rigorous in their education than men (Lee et al., 1994).

Thus, historically, the school has been a site where gender stereotypes have influenced curriculum and also inculcated the development of students. Therefore, by isolating the removal of this potentially detrimental gender bias, as observed by Sadker and Sadker (1994), single-gender schooling programs follow social cognitive theory by removing perceptions of rewards following typical gender stereotypes, which affect self-efficacy, and therefore, outcomes. Social cognitive theory serves as the theoretical base for the ex post facto design of this study because the study takes gender-specific cognitive processes into account, and keeps them separate, or between groups.

Single-Gender Education History

Legal aspects of single-gender education. In 1972, Title IX of the Education Amendments of 1972 was passed in an attempt to remove restrictions on "democratic education" imposed by sex discrimination (Buek & Orleans, 1973). Buek and Orleans discussed that the legal model which underpins Title IX is similar to those of civil rights amendment Title VI, wherein the guidelines for Title IX and its violations are as follows: (a) discrimination must be perpetuated by the government, not only institutional error because of the nature of the funds coming from taxpayers (who cannot be excluded from programs their taxes provide), and (b) the federal government's spending power is governed by constitutional guidelines, such as the 5th and 14th amendment, which provide for due process and equal protection, respectively, and thus it is capable of determining what happens in institutions which it funds, such as colleges (Orleans, 1996). The basis of Title IX funding in civil rights legislation therefore typically precluded schools, which offered single-gender schooling from federal funding making single-gender classrooms in public schools relatively rare until the start of the 21st century.

However, in 2002, the NCLB allowed for experimentation with single-sex classes without penalty from Title IX, and in 2006, Title IX regulations were significantly expanded to allow single-gender public elementary and secondary education (Kiselewich, 2008). Kiselewich claimed that although these expansions received some critique based on constitutionality of the expansion of Title IX, single-gender schooling does satisfy the equal protection clause through its regulations of equality for single-gender programs. Drawing on the relevant legal documents, Kiselewich attempted to separate single-gender schooling from derogatory analogies with the "separate but equal" racial doctrine, instead proposing that single-gender schooling follow the same guidelines as athletic organizations under Title IX funding, where gender-separation is common practice as long as equal opportunity is given to both male and female athletes. By removing this kind of stigmatization, students would be allowed to reap funding, a significant benefit to the community.

History of single-gender programs after Title IX. Until the 21st century, schools in the United States had traditionally been coeducational; whereas private schools only offered single-gender education (Bigler & Signorella, 2011). Specifically, civil rights attitudes and women's liberation profoundly affected the ways people considered schooling among the genders. Sadker and Sadker (1994) systematically studied classroom practices and determined that in coeducational schools, gender bias significantly affected the capability of female students to succeed. Citing, for example, such instances of teacher bias toward boys as increased speaking time, increased teacher valuation of input, and increased encouragement to handle problems by themselves, Sadker and Sadker argued that systematic male dominance fundamentally affected the capability of girls to succeed in the public education system in multiple avenues. Preexisting expectations of boys and girls were found to inhibit their future success, leading the researchers to dub these practices a "hidden curriculum" (p. ix) that promoted a divide in academic success between the genders.

Because of these findings and the development of Title IX regulations, the National Association for Choice in Education (NACE) (2012) reported that in 2000 there were fewer than a dozen public single-gender classrooms/schools nationwide, perhaps because of fears that gender separation would perpetuate these sexist structures (Bigler & Signorella, 2011). However, the extensive years of American students failing in comparison to international students supported an increase in single-gender education (Dillon, 2010). Based on research supporting the efficacy of single-gender schooling, which will be discussed below, that number increased to 196 in the fall of 2005. After the resulting expansion of Title IX in 2006, by the fall of 2008, there were over 500 single-gender classrooms nationally (Bigler & Signorella, 2011).

Broader Problem

Gender and brain development. The sex of a fetus is determined in the intrauterine period (Swaab & Bao, 2013). Swaab and Bao (2013) discussed that during this time of development, a surge in the hormone testosterone results in a masculinization of the male brain. If no such surge occurs, the female brain develops. Further, the researchers explain that these developments co-occur with gender identity, sexual orientation, and neuropsychiatric disorders. These processes, however, are unconnected to the development of gender identity or sexual orientation (Swaab & Bao, 2013). Kommer (2009) described how female verbal skills are often better than male verbal skills in a preschool classroom setting. These findings may tentatively connect to the fact that girls seemed to have an enhanced level of hearing. Kommer also described how boys used the right side of their brain, which supported mathematics competencies, and girls utilized portions of their brains, which supported strengths in literacy.

In the classroom, differences in children’s behavior have been observed. For example, Charles and Bradley (2002) described the general predispositions of male and female students. Children typically accept the gender roles placed upon them by their community, of which some gender roles or stereotypes may include a female student’s desire to work as a team and discuss emotional issues, or a male student’s preference to compete with other students or work independently on an assignment (Charles &

Bradley, 2002). The presence of these different behaviors has led researchers to examine what neurological functions may also determine the differentiation.

Some researchers claim to have found differences in male and female brains that may lead to perceived differences in classroom setting and thereby in the acquisition of knowledge. Sax (2005) proposed that gender-neutrality is a significant detriment to children's successful development. Specifically, Sax suggested that between the two groups, boys and girls, the areas involved with peer relations, motor skills, spatial memory, and language develop at different times and rates and in a different order (Sax, 2005). These differences result in far different practice for education, a consideration which coeducational classrooms may find difficult to implement simultaneously. Sax's research has been significantly criticized, as noted by Halpern et al. (2011), reviewed later in this literature review.

In a meta-analysis of gendered-brain studies, Hill, Laird, and Robinson (2014) found that certain gender-specific networks existed in the constitution of working memory. Using data from the BrainMap database, Hill et al. downloaded whole brain coordinates from men and women and analyzed the brain map activity. Although most structures were roughly the same, the researchers found that females relied more on limbic and prefrontal structures, whereas males tended to include more of the parietal regions. Due to the essential nature of working memory in completing basic tasks, Hill et al. proposed that further research into these differences could unlock strategies intended to eliminate the gender gap, particularly in regards to academic performance. If these differences exist, they would clearly differentiate educational practice for successfully reaching males and females.

However, some literature does not support the difference between male and female cognition. Exemplifying this position, Brown (2013) examined the stereotypes of gender difference in cognition, and how these assumptions affect adults' behavior. As a result, she argued that these biases can be the process, which determines that gender differences in cognition will perpetuate. Regardless of the means through which the difference is processed, however, in practice it seems that the means by which males and females (whether influenced by culture or biology) are expected to process information successfully are different under the educational parameters of the current system.

Gender differences in instruction. Legewie and DiPrete (2012) found that boys underperformed compared to girls throughout the industrialized world. Attempting to find the reason for this disparity, the researchers used gender identity theory and classroom observation experience to develop a quasi-experimental research design, which measured the extent to which cultural definitions of masculinity and femininity influenced success in school. They found that peer group pressures, as well as broader societal norms concerning masculinity, may work to foster anti-school attitudes in male students although perceptions of school engagement as "un-feminine" inhibit girls' success less. Their research intimates that the gap in achievement between boys and girls internationally stems from this heightened sensitivity to cultural definitions of masculinity, reinforced in school settings (Legewie & DiPrete, 2012).

Particularly, these differences can be pronounced if a student is already subject to racial and/or socioeconomic factors that invite academic underperformance. James (2010) argued the reason African American male students in his study did not perform at proficient levels in an academic setting was not necessarily related to mastery of the presented material. Rather, underperforming male students may have learned in ways contrary to the traditional structure of a heterogeneous classroom. Those students did not typically form male-based relationships. James suggested that educators did not sufficiently address those challenges. In addition, boys may have been prematurely medicated for conditions, such as attention deficit hyperactivity disorder, which may have damaged regions of the brain. Piechura-Couture, Heins, and Tichenor (2013) suggested that single-gender instruction might help alleviate the overrepresentation of boys in special education programs. James (2010) also discussed the lack of male role models in the elementary school setting, stating that early elementary school-age children are taught by a disproportionate number of female teachers versus male teachers, which may influence boys' attitudes towards their place in the school.

Some researchers have suggested that male role models do not play as large a role as James (2012) suggests, but does speak to the dichotomization of gender roles and their effects on academic achievement. Bos, Goldberg, van Gelderen, and Gartrell (2012) studied the effect of male role models on youth who were raised in lesbian households in the United States. Half of the sample of the study had a male role model whereas the other half cited no male role model. Using qualitative methodologies, the boys were assessed on the Bem Sex Role Inventory, the State-Trait Personality Inventory, and the

Child Behavior Checklist. Ultimately, the presence of male role models was not shown to affect boys' psychological development. However, according to the parameters of the study, stereotypically feminine traits promoted curiosity and decreased internalizing problem behavior (Bos et al., 2012). These traits, coded as feminine, existed in this study regardless of biological sex. However, the assignation of these traits as feminine may counteract the profound sensitivity which male students have towards perceptions of masculinity, as cited by Legewie and DiPrete (2012).

On the other hand, Mead (2006) argued that the achievement gap cited by such studies does not adequately fit the data and represents an overreaction on the part of the field. Reexamining data from NAEP, Mead found that girls had lessened the inequity in education since the attempted implementation of non-sexist school environments, progressing more quickly than boys in some areas of assessment (e.g. reading comprehension). However, she reported that this progression only leveled the capability of girls to succeed in a less gender-biased environment, although remaining gaps could be addressed by lessening race and class inequalities. Although this study was not peer-reviewed, a senior policy analyst at Education Sector conducted it, an independent, non-profit think tank established by the American Institutes for Research to produce policy examination and unprecedented research (Education Sector, 2014).

Teaching strategies and gender. In the school environment, there are marked variances in the value male and female students assign to various academic tasks. Connell and Gunzelmann (2006) reported differential expectations from girls and boys related to behavioral and educational expectations, biological and brain-based variances, emotional and psychological variances, school climate and federal and assessment policies as potential factors, which may be inhibiting the capability of boys to be successful in the current educational system. Ultimately, through the findings of their review of the literature regarding single-sex education, the authors proposed that boys may benefit from a more experience-based curriculum, rather than the dominant verbal approach that is perhaps better suited to girls' learning styles. These differences suggest that the current coeducational setting may not be able to adequately serve both males and females at the same time.

In an attempt to lessen the perceived bias in the system toward girls' learning style, Clark et al. (2008) developed recommendations for improving education to serve this gender more equally based on a collaboration with a local middle school and staff (e.g. counselors, county supervisor of guidance, and teachers). Specific recommendations were developed for enhancement of learning environment, promotion of strength, and encouragement of positive attitudes towards learning environments. Ultimately, these recommendations were intended to enhance academic achievement and future planning. In particular, their research indicated that teachers should incorporate more active and hands-on activities to maintain boys' interest and end bias towards the verbal learning strategies which are attributed to girls' success. Such approaches could ensure that boys and girls alike receive the necessary, quality education to be successful throughout their academic careers (Clark et al., 2008).

Martino, Mills and Lingard (2005) likewise investigated instructional strategies for teaching boys. Attempting to evaluate single-gender programs, the researchers focused on interviews with administrators and educators in Australian programs. In these assessments, the researchers found that the pedagogical experiment of separating genders led to development of programs which only reinforced stereotypical assumptions about learning practices of boys and girls "supposed oppositional orientations to learning" (Martino, Mills and Lingard, 2005). Therefore, the researchers recommended that educators working in single-gender schooling programs be educated as to the actual difference between male and female students, instead of adhering to and thus re-inscribing gender-biased assumptions about cognition.

Cognitive difference and its implication for classrooms. Multiple researchers have addressed how taking cognitive difference into account will improve outcomes in student achievement. Bonomo (2012) suggested ways in which teachers, as they design lesson plans, may take research of psychological and neurological differences into account. Differences in learning, she argues, should significantly affect the ways in which a classroom is structured. When addressing a large group of students that shares many learning styles and instructional needs, teachers may have difficulty attempting to reach such a wide audience; however, accounting for learning styles can allow a teacher to plan and execute lessons in a more systematic and effective way.

Studying the gender difference in reading outcomes, Marinak and Gambrell (2010) examined third-grade average readers in order to determine the reasoning behind the gap in reading achievement between boys and girls. In order to assess this difference, Marinak and Gambrell used the factors of self-confidence in reading ability and perceived value of reading. Their qualitative research found that among this group, boys and girls on the same reading level were equally confident about their reading skills. Nevertheless, they discovered that girls value reading more than boys do. Boys are less likely to exert effort in areas they do not see as important; as such, their comprehension and verbal skills seemed to be delayed (Marinak & Gambrell, 2010).

Similarly, Gurian et al. (2009) justified the use of single-sex classrooms on the basis of multiple physical variances amongst the brains of female and male children by surveying literature on brain scans that demonstrated differences between brain development for boys and girls. For example, in previous qualitative research, King and Gurian (2006) found that when it came to language processing, boys tended to process incoming stimuli through the left hemisphere of their brains, although girls tend to build multiple processing centers throughout the brain. As such, King and Gurian determined that classroom practices such as increasing kinesthetic and experiential learning behaviors, providing more spatial representations of concepts, and allowing boys to focus on topics of their own choosing, could increase their outcomes and avoid discriminating against these different behaviors.

Based on these findings, Gurian et al. (2009) proposed language teaching to be undertaken on a gender-separated basis, because females have greater facility in terms of deploying verbal resources, which are germane to success in language courses. Gurian et al.'s literature review supported the conclusion that basic biological differences support single-gender classrooms in order to maximize student learning. The proposed differentiated instruction encompasses a strengths-based approach to instruction, which involves creating a plan for students based on their identified strengths, thereby increasing students' interest in academics. In subsequent quantitative research, King, Gurian, and Stevens (2010) reported that implementing single gender schooling in a school in Colorado, whose demographics were low income (50% qualifying for free or reduced-priced lunch, 30% English language learners, and high mobility at 43%) met with success. Specifically, the elementary school developed from failing the AYP standard for grades and test scores in 2007 to meeting them in 2009. Many of the strengths assessed with these plans are problematically aligned to male learning styles, as Gurian's and colleagues' research has been focused on increasing boys' achievement (Gurian & Stevens, 2010; King & Gurian, 2006; however, some research has refuted this perceived biological difference (Bigler & Signorella, 2011; Brown, 2013).

Moreover, the choice of curriculum materials may differ depending on the gender of the students. In order to address the aforementioned reading gap, Twist and Sainsbury (2009) studied middle-school students and found that girls and boys are interested in different genres of literature, as indicated by the differences between the items each sex tended to omit on standardized reading tests. Specifically, they suggested that it is important to focus attention on struggling populations in order to assess what areas can be expanded on (e.g. according to NAEP data, they find that African-American and Hispanic-American readers currently need the most focus). Developing these curricula which make learning accessible to different communities can lead to improved success, but specializing too much in diverse coeducational programs may leave out some students who do not learn in the same way (Brozo & Mayville, 2012).

Literature-based description of the research variables

Single-Gender instruction implementation and benefits. The possible benefits of single-gender education are of interest in light of growing educational gaps. Some of the most convincing research supporting single-gender education has focused on concrete measures, such as attendance rates, numbers of disciplinary referrals, and assessment data (Smith, 2010). However, some have cautioned that educators should place less focus on what makes students different and more on the similarities between students, in order to effectively educate all students (Noguera, 2012).

Other studies of single-gender schools have shown positive outcomes. For example, Sax (2010) found that maintaining a single-gender environment could drastically assist students in meeting state and national standards. In the same way, Gurian et al. (2009) surveyed recent collaborations between the Gurian Institute and educators across the country to develop programs for single-gender instruction. The Institute's teacher training program is based on the philosophy that male and female students learn in different manners. Studies such as King and Gurian's (2006) demonstrated that differentiated instruction was required for boys and girls. King et al. (2010) described a number of efforts to provide single-gender offerings at a variety of schools nationwide, both public and private. Although many of the initiatives were too new to fully assess at the time of publication, Gurian et al. (2009) and King et al. (2010) reported early successes, such as individual student gains and fewer disciplinary referrals for boys. Parent testimonials from the Gurian report claimed sons and daughters seemed more engaged with their studies than they had been in their previous coeducational schools. Also, students described feeling less anxiety in the classroom than in previous classroom experiences.

Gurian et al.'s (2009) research could have been biased because of the researchers' close affiliation to the school in question. A separate assessment of the South Carolina initiative confirms the Gurian group's preliminary claims, reporting higher achievement, better behavior, and a 76% approval rating among parents for single-gender schooling. (Rex & Chadwell, 2009). However, more independent research is still needed to validate or disprove these claims, when more factors are controlled. For example, isolating the variable of single-gender schooling might be more evident if the school remained the same, and the only factor that changed was the school type (i.e. coeducational to single-gender schooling). Moreover, Gurian et al.'s research requires validation from an independent source to the school.

Additionally, Hayes, Pahlke, and Bigler (2011) proposed that the single-gender educational environment affords urban students the opportunity to experience an effective setting, where they can learn by teachers using methods proven for their gender. Curriculum and instruction designed for teachers demonstrates knowledge of gender diversity in the classroom. Hayes et al., in collaboration with other researchers on instructional approaches, agreed with differentiated instruction implemented through various instructional techniques that meet the needs of minority students. Lesson plans could include whole group, small group, and individual direct instruction, hands-on activities, and independent work. Maintaining student engagement could affect student achievement, attendance, and behavior (Hayes et al., 2011).

Ferrara (2009) surveyed 28 elementary teachers to explore their perceptions of a single-gender program. Ferrara stated that single-gender education allows teachers to deal with increasing male disengagement from school. By allowing teachers to use gender-appropriate and kinesthetic learning techniques, which are aligned to boys' developmental needs for quick-paced and dynamic learning activities, the single-gender classroom presents the opportunity to enhance male student achievement. Girls were found to have similar benefits: Ferrara (2009) suggested that single-gender education for females has a significant tendency to increase academic achievement. By tailoring their learning in terms of content, the single-gender paradigm has the benefit of decreasing traditional stigma, which has historically caused girls to avoid studying "non-traditional" female subjects such as computer science, physics, and woodworking. Thus, the single-gender classroom, according to Ferrara, brings tangible advantages to both male and female students.

In general, research demonstrating the benefits of single-gender schooling has significant gaps. Multiple examinations relied on explaining the research bases of implementation of single gender education within these schools, yet the effects were too new to assess at the time of publication (Ferrara, 2009; Gurian et al., 2009; King et al., 2010). Therefore, Ferarra (2009), Gurian et al. (2009), and King et al. (2010) relied on teachers' initial assessments of students' success, as opposed to measures of actual student success.

Mixed results of single-gender instruction. Some of the literature regarding single-gender instruction has shown mixed outcomes, dependent on the context/time of the study done. Specifically, in interviews with teachers, Spielhagen (2011) found that in the implementation of a single-gender schooling program in an urban context in the southeastern United States, educators identified several factors determined whether a program would have positive outcomes: 1) adolescent developmental changes, 2) administrative support, and 3) professional development. Despite some negative reactions, educators in this sample suggested that single-gender schooling programs remain an option for educators in improving student outcomes.

Because of the newness of single-gender schooling, particularly in the United States, there may exist some factors that may impact the willingness of educators to attempt implementation of single-gender schooling. Using ex post facto quantitative analysis, Sullivan, Joshi, and Leonard (2010) studied a British group of students born in 1958 and determined that male students enrolled in a single-gender education program demonstrated neither positive or negative benefits. The 16 year-old female students demonstrated positive benefits from the program. Both male and female students demonstrated positive benefits from the program, directly related to the mastery of gender-atypical skills (Sullivan et al., 2010). However, due to the long tradition of this type of schooling, different contextual factors and the years referenced by this study, (e.g. social status and quality of education), these findings may not be translatable into the context of American public education.

Similarly, Jarrard (2011) determined through qualitative analysis of a series of interviews with educators involved in the implementation of single-gender schooling that perception of the programs were generally positive. However, Jarrard also suggested that the instructors' perceptions and biases of gender significantly influenced their treatment of the classes, and their ways of processing classroom situations. Both studies show different sides of single-gender schooling; with positive and negative perceptions manifesting after the program's implementation has progressed. Thus, long-term studies may be needed to fully understand the efficacy of these programs.

Additional results from these programs demonstrated the same weaknesses in methodology. Jarrard (2011) and Spielhagen (2011) utilized qualitative data from teacher interviews as the sole means of assessing the outcomes of programs. Though this information is valuable, an ex post facto design, such as Sullivan et al.'s (2010), demonstrated the most informative measure of longitudinal student success from single gender programs. As previously mentioned, Sullivan et al. conducted research in Britain; therefore, ex post facto design should be utilized in an American sample to verify the effectiveness of the single program, under the practices established at schools in the United States.

Single-gender instruction criticism. Single-gender education has detractors as well, such as Barnett and Rivers (2012), who criticized the single-gender movement. Eliot (2011) found flaws in the science of gendered learning differences, claiming single-gender instruction perpetuates stereotypes and deflects attention from more important aspects of schooling: available resources, the quality of teacher-student relationships, and the communication between home and school. Single-gender instruction has continued to generate controversy, as several recent studies have questioned the scientific basis of this pedagogical approach. The U.S. Department of Education has yet to formally state how single-gender classes are more beneficial than heterogeneous ones (Noguera, 2012), which leads to suspicion from the academic community.

Some studies have in fact found negative results of implementation of single-gender programs. In a dissertation, which provided a systematic mixed methods study of fifth-grade single-gender classes, Smith (2010) noted that the paradigm had shifted to be more accepting of single-gender programs. However, her findings compared the office referrals, academic achievement, and variances in attitude as related to science, mathematics and reading of students in coeducational classrooms and in single-gender classrooms at the same school. Smith (2010) determined that not only did placement in single-gender programs not determine academic achievement, but that behavioral issues, measured by referrals, were significantly higher in the single-gender classes. This study examined one grade in a single middle school; therefore, its findings require validation from future research and may not be generalized. However, if future research replicated these findings, they would be problematic considering the likelihood that students with behavioral issues do not typically do well in the long term in schools (Shapiro, 2011).

Criticism of single-gender education has become more prevalent since 2011. Halpern et al. (2011) asserted that research on gendered learning differences is pseudoscientific and results-based research studies supporting single-gender education have been flawed. Specifically, Halpern et al. (2011) noted that research on single-gender education was “often justified by weak, cherry-picked, or misconstrued scientific claims rather than by valid scientific evidence” (p. 1706). In particular, Halpern et al. cited the findings of Sax (2005), reviewed earlier in this chapter, as problematic because of the research's grounding in pseudoscientific assumptions about boys and girls. Jordan-Young (2010) examined the literature on neuroscience in more detail, asserting the complexities of brain development are beyond the grasp of single-gender classroom supporters.

In fact, in her systematic review of the neuroscience, Jordan-Young (2010) found that the theory did not hold up across the different studies, as would have been necessary to give the theory weight. Additionally, Barnett and Rivers (2011) discovered flaws in research suggesting the brains of boys and girls are different in ways that are not of any relevance in education in their systematic critique of extant data on the phenomenon. The researchers call into question the idea of verbal and mathematical abilities being unevenly distributed among the sexes. Essentially, Barnett, Rivers, Halpern, and Jordan-Young found issues with the findings of neurological differences between genders, and thereby disqualified single-gender programs as options for improving student outcomes. Single-gender education only exacerbates these gaps, when educators should focus on building the overlapping abilities of boys and girls. Not only is single-gender education founded on a flimsy scientific basis, these critics maintain, the nature of it furthers stereotypes and institutionalizes sexism (Halpern et al., 2011).

Potentially more detrimental, some of the critics of single-gender schooling write that these practices can actually institutionalize gender stereotypes. Jackson (2010) adopted the perspective that single-gender classrooms are detrimental to boys and girls because they support gender stereotypes. In turn, single-gender classrooms force students to conform to teaching and pedagogical strategies based on assumptions of gender traits, which might not necessarily be in tune with their biology. These findings are supported by qualitative analysis of curriculum materials by Martino et al. (2005), who discussed that teachers in single-gender programs specifically adopted pedagogical materials, which reinforced biased attitudes towards gender participation in schools.

Another critic of the biological arguments favoring single-gender notes that arguments made by advocates of single-sex education, which contend that the biological and neurological structures, as well as the hormonal differences between boys and girls, create a need for such an approach, are not legitimate (Eliot, 2011). Eliot (2011) claimed this position is based on misinterpretation and selective use of isolated studies, which are not representative of the broader body of knowledge regarding the biology and psychology of youth. Eliot also maintained that segregation on the basis of sex and gender runs counter to the objectives of education in a democratic society. Eliot proposed that especially in terms of classes like physical education, there is no basis in biology or educational effectiveness for sex separation in schools. Rather, her qualitative findings show that it is possible to build an effective and integrated mainstream classroom, germane to the educational needs of boys and girls alike. Doing so requires an engagement with the literature on contemporary best pedagogical practices in this regard (Eliot, 2011).

Implications of Studying the Problem

Single-gender classrooms have come into question in recent scholarship. In order to move forward or discontinue such programs, further data are imperative regarding single-gender classrooms and their outcomes. By focusing on this aspect, however, the study does not focus specifically on racial disparities, which have been identified as problematic for this particular area, although this school does demonstrate a diverse population

Thus, the scientific basis of single-gender education has been the focus of significant controversy in the literature. Biologically-based theories that boys and girls learn differently are still in the experimental stages, utilizing brain-scan technology (Bigler & Signorella, 2011; Gurian et al., 2009). There is conflicting evidence from both sides of the issues as to the efficacy of these programs, and their effects upon the student populace. Experiments with instituting single-gender instruction in the United States have produced positive results in some cases (Ferrara, 2009, Gurian et al., 2009), though the research is not conclusive and has been challenged by some scholarship (Barnett & Rivers, 2011; Eliot, 2011; Halpern et al., 2011; Jordan-Young, 2010).

Many researchers conducted qualitative explorations of teachers' and students' perceptions of single-gender schooling, rather than assessing the outcomes of specific programs through post-test designs (Ferrara, 2009; Gurian et al., 2009; Jarrard, 2011; Smith, 2010). Qualitative examinations have consisted of understanding teachers' perceptions of students' experiences; student data are frequently left unexamined, excluding assessment data and classroom observations (Ferrara, 2009; Gurian et al., 2009; Jarrard, 2011; King & Gurian, 2006; Smith, 2010; Spielhagen, 2011). When quantitative analysis has been conducted to assess programs, ex post facto design is utilized in order to provide a non-interventionist means of understanding pedagogical experiments without harming students (Sullivan et al., 2010). As a result of the lack of student experiences within single-gender schooling, additional in-depth research is required for understanding the pedagogical worth of single gender schooling. To provide the most comprehensive picture of the student outcomes, longitudinal mathematics and reading outcomes will be examined for both genders to determine what outcomes stemmed from the program at Urban Charter.

More in-depth analyses of actual results will potentially aid educators concerned about ensuring the best educational prospects for these students, particularly in areas which seem to promote low achievement for students, such as Washington D.C. (District of Columbia Kids Count Action Center, 2012; Perazzo, 2013). Ex post facto quantitative data may assist in providing this more in-depth overview of the influence of single gender schooling, as demonstrated in research conducted by Sullivan et al. (2010); thus, the proposed study addresses the gap in quantitative examinations of single-gender schooling. The methodology for this study will be thoroughly discussed in Section 3.

Section 3: Methodology

Introduction

Although the number of studies on single-gender education has increased, there continues to be limited empirical evidence on its effectiveness. (Bigler & Signorella, 2011). The current study is an attempt to make such an assessment in a low-income, urban district with a history of academic underperformance. The following section delineates and explains the research design and approach. Also included in the section are descriptions of the population and sampling procedure, instrumentation and materials, data collection and analysis, and measures taken for protection of participants' rights involved in the study.

Research Methodology and Design

This research design was based upon an ex post facto, quantitative model (Creswell, 2005). Students were neither randomly selected nor randomly assigned to the two groups (single-gender vs. whole district). District archival data were the source. The method was to analyze the achievement trends in the single-gender education program in comparison to heterogeneous classrooms at a local school, in a large urban community. Publically available, district archival data were collected and analyzed over the historical period from 2009-2014.

Setting and Sample

The population for this research was restricted to one urban middle school, including 110-135, sixth through eighth grade students per year. Sixth grade averaged 25 students in each of two classrooms. Seventh and eighth grade classes averaged 15-20 students, in each of two seventh grade and two eighth grade classes. The demographics were aligned to that of the school. The entire instructional staff was considered highly qualified, as defined by the No Child Left Behind Standards. Sixty-five percent of the students were identified as African American. Thirty-four percent of the students were identified as Hispanic/Latino. One percent of the students were identified as other. The school averaged a 24% rate of English Language Learners. Ninety-six percent of the students were identified as low income. Thirteen percent were identified as receiving special education services. The district averaged 2300, 2200 and 2400 students respectively, in sixth, seventh and eighth grades. Of those students, 70% were African American, 15% were Hispanic, 4% were identified as other, and 10% were Caucasian. There were 18% of the students that received special education services and 10% received English learner services. A total of 70% were identified as low income.

G*Power 3.1.7® was used to assess the required sample size in order to find significance (Faul, Erdfelder, Buchner, & Lang, 2013). With a power of .80, an alpha level of .05, the required sample size in order to find significance for chi-square test of independence with a moderate effect size was 122 participants (Faul et al., 2013). Historical reading and mathematics state assessment data were gathered on those 110-135 middle schools students at Urban Charter School.

All students who participated in a single-gender classroom at the school, in years 2009-2014, were included. The range of 110-135 middle school students included in the study was chosen because that was the approximate number of individual students who attended a single-gender middle school class during the time period of 2009-2014. Each student was only counted once.

Instrumentation and Materials

Annual state assessment data were collected on Urban Charter School encompassing a 6-year period of data. Students' reading and mathematics assessment data across the 6 years enabled a trend comparison between the single-gender charter school and the whole non-charter district. The students' achievement assessment data were retrieved from a publically accessible website. Data on the website were validated by the Public Charter School Board and the Office of the State Superintendent of Education for the district and has been a part of public record. Data were combined across the years to create single analyses for differences by classroom type. The Office of the State Superintendent of Education for the state, the reporting agency for the state's education department, analyzed the state assessment data before released to the schools and general public. The public website allowed the user to select the district, year of assessment, data report type, type of school, school level, specific school and grade level data. Subgroup data, such as race, gender, English language learners, special education identifications and economic status were also available. Urban Charter School was administered the same state assessment as the district chosen in this study. The urban school district and Urban Charter School had similar student populations.

Mathematics and reading achievement score outcomes were used as overall academic achievement, the dependent variable of concern for the study. The test scores were converted to ordinal scale outcomes: below basic, basic, proficient, and advanced. These data were treated as ordinal in nature.

District of Columbia Comprehensive Assessment System (DC CAS)

The DC CAS was the annual student assessment that gauged student-learning outcomes based upon common core standards (District of Columbia Public Schools, 2015). The DC CAS measured student achievement over a variety of grade levels in mathematics, reading, science and composition. This study encompasses data from the mathematics and reading tests for the 2009–2014 assessment administrations. The mathematics and reading tests were given in Grades 3-8 and again in grade 10.

Reliability scores were provided for the 2011 DC CAS administration. For the reading assessment, the Cronbach's alpha coefficient for reliability ranged from 0.91 to 0.93 for Grades 3-8 and 10 (Office of the State Superintendent of Education, 2011). For the mathematics assessment, the Cronbach's alpha coefficient for reliability ranged from 0.91 to 0.93 (OSSE, 2011). These results indicated that the items showed acceptable reliability and items were performing as expected in assessing student knowledge and skills.

Data Collection and Analysis

Data were entered into SPSS® version 22.0 for Windows (IBM, 2013). The first level of analysis was descriptive statistics where the percentages of students proficient were computed for mathematics and for reading across 6 years by single-gender charter and whole district. The data from each spring state assessment, from 2009-2014 were collected. For tables 1 and 2, data for grade levels 6-8 were combined, and were then used to identify the percentage of students at or above grade level, for each year included in the study. For tables 3 and 4, all grade level data were combined as a collective of all

6 years, because the focus was on gender and proficiency levels. The number of students at each proficiency level, for each of the six years, was added, to calculate a total number of students at each proficiency level. The percentages were then calculated from those totals. For tables 5 and 6, the grade level data remained combined, because the focus was on district level data, school level data and proficiency levels. The single gender charter data were not part of the whole district data set. The standard error of proportion was computed for each percentage. Then a 95% confidence interval was calculated for each percentage. This minimized the probability of making a type-I error when comparing differences between two or more percentages.

Research Question 1: What is the trend in mathematics and reading student outcomes, over a 6 year period, in an urban middle school that has adopted single gender classroom structure?

$H_0$1: There is a negative or no trend in mathematics and reading student achievement scores, over a 6-year period, in an urban middle school that has adopted single gender classroom structures.

H_a1: There is a positive trend in mathematics and reading student achievement scores, over a 6 year period, in an urban school that has adopted single gender classroom structures.

To examine research question one, the percentages of students at district defined proficiency or advanced levels were computed for mathematics and reading student proficiency levels over a 6 year period for the urban school of interest. The proficiency levels were assessed for single gender classrooms over this time period. The percentages of proficient and advanced students were examined for a trend by comparing across 6 years. Confidence intervals (CI) of 95% were used to determine if the percentages were statistically different from one another. Where confidence intervals overlapped, no difference could be determined. Where no differences were found, no trend in the magnitude of percentage could be concluded.

Research Question 2: Within an urban middle school, is there a relationship between students' mathematics and reading outcomes and gender, over a period of 6 years?

$H_0$2: There is no relationship between students' mathematics and reading outcomes and gender.

H_a2: There is a relationship between students' mathematics and outcomes and gender.

To assess mathematics and reading outcomes and their difference between the genders, two chi-square tests were conducted. A chi-square was the suitable analysis because I was interested in the association between two ordinal variables (Pallant, 2010). Two chi–square tests (one for mathematics outcomes and one for reading outcomes) were conducted to test whether there was a substantial relationship between the independent variable, gender (male vs. female) and the dependent variable of achievement test outcomes (below basic, basic, proficient, and advanced) for both mathematics and reading. That is, was the pattern of proficiency levels different for females compared to males?

Preceding analyses, the assumptions of chi–square were measured. For the test to function appropriately the anticipated rates were to be not too small and data were to come from random samples of multinomial mutually exclusive distribution. Traditionally, cautiousness in chi–square analysis was that no cell should have an anticipated occurrence of less than one and anticipated occurrences below five should not make up more than 20% of the cells (Pagano, 2010). Additionally, observations were to be independent of each other.

Research Question 3: Do student mathematics and reading outcomes in an urban middle school, which has adopted single gender instruction, differ from those of other schools in the same district, with gender-heterogeneous groupings?

$H_0$3: There is no difference between student mathematics and reading outcomes in an urban middle school, which has adopted single gender instruction, compared to other schools in the same district, with gender-heterogeneous groupings.

$\mathrm{H_a}$3: There is a difference between student mathematics and reading outcomes in an urban middle school, which has adopted single gender instruction, compared to other schools in the same district, with gender-heterogeneous groupings.

To assess mathematics and reading outcomes and their difference between the individual school and the overall district, two chi-square tests were conducted. As with research question two, chi-square was the suitable analysis because I was interested in the association between two ordinal variables (Pallant, 2010). Two chi-square tests were conducted to test whether there was a spastically significant relationship between the independent variable, school (individual urban school vs. overall district without the one school) and the dependent variable of achievement test outcomes (below basic, basic, proficient, and advanced). The data from the charter school in question were not included in the district data for comparison. Separate chi–square tests were conducted for the outcome variables of reading achievement scores and mathematics achievement scores. The chi-square tests determined if the percentages of proficiency levels for the charter school were different from percentages of the district. As with research question two, prior to conducting the analyses the assumptions of the chi–square test were evaluated.

Ethical Considerations

Ethical considerations for this study included ensuring the individual student data remained confidential. No student-specific, identifying demographic information were shared. Full disclosure and content was not an ethical consideration for this study, due to the non-inclusion of surveys or information gathering activities such as student interviews.

Ethical principles were considered in the implementation of this study. In planning the research, results were not misleading and the study was ethically acceptable. Data were not falsified or fabricated. Appropriate citations were written for research conducted by other professionals. The research for this study was not conducted by an institution and did not receive federal funding. Thus, it was not required to meet corresponding guidelines. In this study, students in the sample were not personally identified. This eliminated the need for individualized informed consent. This study utilized archival data which was previously published and available to the general public. As the data utilized for the current study were publically available, the electronic data has been stored on my computer until the completion of the study at which time it was deleted. However, as these data were public and historical, the data will continue to be available on the state website from which it was obtained.

Section 4: Results

The findings related to each research question are reported in this section. The research tools used in this study are described and the collection instruments are identified. Measures obtained in this study are reported and the justifications of any revisions or adjustments to standardized research tools are made in this section. The results in this research study are based on a single gender education program, in a low-income, urban middle school with a history of low academic achievement in reading and mathematics.

$H_0 1$: There is a negative or no trend in mathematics and reading student achievement scores, over a 6-year period, in an urban middle school that has adopted single gender classroom structures.

Results of the descriptive statistical analyses revealed that at Urban Charter School, the highest reading scores were exhibited in 2009 with 69% of students scoring at a proficient level or above. School level assessment data in reading were presented as percentages. See Table 1. The lowest reading scores at Urban Charter School were exhibited in 2012 with 54% of the students scoring at or above proficiency levels. The highest mathematics scores were exhibited in 2013 with 76% of students scoring at a proficient level or above. School level assessment data in mathematics were presented as percentages. See Table 2. The lowest mathematics scores at Urban Charter School were exhibited in 2014 with 65% of the students scoring at or above proficiency levels.

A consistent trend was not identified among the scores for Urban Charter School. However, although mathematics and reading scores did fluctuate between decreasing and increasing from 2009-2014, in comparing scores in 2009 to those for 2014, I noted that there was a decrease. The percentage of students performing at or above proficient in reading was 69% in 2009 and 59% in 2014. It should be noted that the number of students tested increased from 88 students to 104 students respectively. In mathematics, the trend was much more level from 2009 to 2013. There was a drop in the percentage of students performing at or above proficient from 74% in 2009 to 65% in 2014. The number of students tested in mathematics also increased from 88 students to 105 students, respectively. The large variability between percentages across years, where all 95% confidence intervals overlapped, justified accepting the null hypothesis that there was no trend in proficiency increase. However, a trend that was apparent was in the variability between percentages as the years progressed. There was observed greater variability for the last 3 years in reading and in math.

Table 1
Percentage of Sixth, Seventh and Eighth Grade Students Scoring at or Above Proficient at Urban Charter School for Reading by Year

Year	Percent at or Above Proficient	95% Confidence Interval	Number of Students
2009	69	58.8%-79.2%	88
2010	66	55.5%-76.5%	88
2011	57	46.3%-67.7%	92
2012	54	40.4%-67.6%	59
2013	63	52.9%-73.1%	97
2014	59	49.1%-68.9%	104

Table 2
Percentage of Sixth, Seventh and Eighth Grade Students Scoring at or Above Proficient at Urban Charter School for Mathematics by Year

Year	Percent at or Above Proficient	95% Confidence Interval	Number of Students
2009	74	64.3%-83.7%	88
2010	72	62.1%-81.9%	88
2011	71	61.2%-80.8%	93
2012	72	60.0%-84.3%	59
2013	76	67.0%-85.0%	98
2014	65	55.4%-74.6%	105

$H_0 2$: There is no relationship between students' mathematics and reading outcomes and gender.

Two chi-square tests of independence were conducted to determine the relationships between students' gender and their mathematics and reading achievement. The reading achievement was an aggregate of 6 years of data. The number of students at each proficiency level, for each of the six years, was added, to calculate a total number of students at each proficiency level. The percentages were then calculated from those totals. Prior to conducting each chi-square test, the assumption of adequate cell size was assessed by viewing expected values. For the assumption to be met, all cells must have expected values above 1.00, and no more than 20% of the cells should have expected values that are less than 5.00. This was the case for both tests, and thus the assumption was met.

The first chi-square test addressed mathematics proficiency and gender. See Table 3. The variable mathematics proficiency had four levels: below basic, basic, proficient and advanced. The variable gender had two levels: female and male. The results of the chi-square were significant, $\chi^2(3) = 14.68$, $p = .002$, suggesting there was a relationship between mathematics proficiency and gender. The pattern of female outcomes for the four proficiency levels was different from the male pattern. Thus the null hypothesis was rejected.

For females, more participants were in the proficient category for mathematics proficiency level than expected, although there were fewer subjects in the below basic, basic, and advanced categories than expected. For the males, there were more students than expected in the below basic, basic, and advanced categories of mathematics proficiency than expected, although there were fewer than expected in the proficient category.

Table 3
Chi-Square Results Between Mathematics Proficiency and Gender

Mathematics Proficiency	Female	Male	$\chi^2(3)$	*p*
Below basic	14 [21] (5% [8%])	27 [20] (10% [8%])	14.68	.002
Basic	50 [60] (19% [22%])	68 [58] (26% [22%])		
Proficient	175 [154] (65% [57%])	129 [150] (49% [57%])		
Advanced	30 [34] (11% [13%])	38 [34] (15% [13%])		

Note. For each cell, numbers outside brackets represent observed values, although numbers in brackets represent the expected values of the cell. Percentages of participants at each proficiency level (both observed and expected) are included in parentheses for each gender. $\chi^2(3)$ denotes the degrees of freedom for the chi-square test.

A second chi-square test addressed reading proficiency and gender. See Table 4. The variable reading proficiency had four levels: below basic, basic, proficient and advanced. The variable gender had two levels: female and male. The results of the chi-square tests were significant, $\chi^2(3) = 17.27$, $p = <.001$, suggesting there was a relationship between reading proficiency and gender. The pattern of female outcomes for the four proficiency levels was different from the male pattern. Thus, the null hypothesis is rejected.

For females, more participants fell under the proficient and advanced categories for reading proficiency level than expected, although there were fewer subjects in the below basic and basic categories than expected. For the males, there were more students than expected in the below basic and basic categories of reading proficiency than expected, although there were fewer than expected in the proficient and advanced categories.

Table 4
Chi-Square Results Between Reading Proficiency and Gender

Reading Proficiency	Female	Male	$\chi^2(3)$	*p*
Below Basic	7 [17] (3% [6%])	27 [17] (10% [7%])	17.27	<.001
Basic	80 [87] (30% [33%])	92 [85] (35% [33%])		
Proficient	155 [142] (58% [53%])	125 [138] (48% [53%])		
Advanced	25 [21] (9% [8%])	17 [21] (7% [8%])		

Note. For each cell, numbers outside brackets represent observed values, although numbers in brackets represent the expected values of the cell. Percentages of participants at each proficiency level (both observed and expected) are included in parentheses for each gender. $\chi^2(3)$ denotes the degrees of freedom for the chi-square test.

$H_0$3: There is no difference between student mathematics and reading outcomes in an urban middle school, which has adopted single gender instruction, compared to other schools in the same district, with gender-heterogeneous groupings.

Two chi-square tests of independence were conducted to determine differences in percentages between the charter school and the school district. The student achievement data were an aggregate of 6 years of data. The data from each spring state assessment, from 2009-2014 were collected. Data for grade levels 6-8 were combined, due to the minimal number of students tested in each grade level included in this study. The combined grade level data were then used to identify the percentage of students at or above grade level, for each year included in the study, as seen in tables 1 and 2. For tables 3 and 4, all grade level data were combined as a collective of all 6 years, because the focus was on gender and proficiency levels. Raw data are available in the Appendix A. For tables 5 and 6, the grade level data remained combined, because the focus was on district level data, school level data and proficiency levels. Raw data are available in the appendix B. Prior to conducting each chi-square test, the assumption of adequate cell size was assessed by viewing expected values. For the assumption to be met, all cells must have expected values above 1.00, and no more than 20% of the cells should have expected values that are less than 5.00. This was the case for both tests, and thus the assumption was met.

The first chi-square was conducted to determine the differences between mathematics proficiency and school type. See Table 5. The variable mathematics proficiency had four levels: below basic, basic, proficient and advanced. The variable school type had two levels: The Urban School District and Urban Charter School. The result of the chi-square was significant, $\chi^2(3) = 330.75$, $p = <.001$, suggesting that there were differences between mathematics proficiency and school type. The pattern of proficiency for Urban Charter School was different from the district. For Urban Charter School, there were more students than expected in the proficient and advanced categories of mathematics proficiency, although there were fewer than expected in the below basic and basic categories. Thus the null hypothesis was rejected.

Table 5
Chi-Square Results Between Mathematics Proficiency and School Type

Mathematics Proficiency	Urban School District	Urban Charter School	$\chi^2(3)$	p
Below basic	1094 [825] (16% [12%])	182 [263] (8% [12%])	330.75	<.001
Basic	2147 [2533] (31% [37%])	489 [805] (22% [37%])		
Proficient	2414 [2740] (35% [40%])	1245 [871] (57% [40%])		
Advanced	1190 [750] (17% [11%])	274 [239] (13% [11%])		

Note. For each cell, numbers outside brackets represent observed values, although numbers in brackets represent the expected values of the cell. Percentages of participants at each proficiency level (both observed and expected) are included in parentheses for each school type. $\chi^2(3)$ denotes the degrees of freedom for the chi-square test.

A second chi-square was conducted to assess the relationship between reading proficiency and school type. See Table 6. The variable reading proficiency had four levels: below basic, basic, proficient and advanced. The variable school type had two levels: The Urban School District and Urban Charter School. The results of the chi-square was significant, $\chi^2(3) = 219.31$, $p = <.001$, suggesting there was a relationship between reading proficiency and school type. Thus, the null hypothesis was rejected.

Table 6
Chi-Square Results Between Reading Proficiency and School Type

Reading Proficiency	Urban School District	Urban Charter School	$\chi^2(3)$	p
Below basic	939 [825] (14% [12%])	146 [263] (7% [12%])	219.31	<.001
Basic	2624 [2533] (38% [37%])	714 [805] (33% [37%])		
Proficient	2465 [2740] (36% [40%])	1146 [871] (53% [40%])		
Advanced	820 [750] (12% [11%])	169 [239] (8% [11%])		

Note. For each cell, numbers outside brackets represent observed values, although numbers in brackets represent the expected values of the cell. Percentages of participants at each proficiency level (both observed and expected) are included in parentheses for each school type. $\chi^2(3)$ denotes the degrees of freedom for the chi-square test.

These results indicated that in the Urban School District, more participants fell under the below basic, basic, and advanced categories for reading proficiency level than expected, and there were fewer subjects in the proficient category than expected. For Urban Charter School, there were more students than expected in the proficient category of reading proficiency, although there were fewer than expected in the below basic, basic, and advanced categories.

Conclusion

Within this study, I investigated differences in mathematics and reading student achievement score percentages as an aggregate of 6 years of data. For research question one, statistically significant differences in percentages were not noted over the 6 year period. An increase in variability in proficiency was observed over time for both reading and mathematics scores. There was no definitive source of this increase. A more diverse sample of students could have led to a wider range of observed scores in the latter years of the sample. A full explanation and discussion is provided in Section 5. For Research Question 2, I conducted two chi-square tests of independence. For each of the analyses, I rejected the null hypothesis, indicating that there was a significant relationship between gender and both mathematics proficiency [$\chi^2(3) = 14.68$, $p = .002$] and reading proficiency [$\chi^2(3) = 17.27$, $p < .001$]. Comparisons between the observed and expected values in each cell revealed that the observed proficiency levels deviated from what was expected by a large margin for many cases for both males and females. Additionally, for reading proficiency, an observed trend showed that for the proficient and advanced categories, there were more girls in each level than expected although there were fewer boys than expected, although the inverse of this trend was observed for the below basic and basic proficiency levels. There was no such trend for mathematics scores. For Research Question 3, I conducted two more chi-square tests of independence in order to examine the differences between school type and both mathematics and reading proficiency. Again, I was able to reject the null hypothesis for both analyses, indicating that there was a significant relationship between school type and both mathematics proficiency and reading proficiency. As detailed above, these differences were displayed by a number of observations, which showed a large deviation from the expected values for both the Urban School District sample and the sample from Urban Charter School. For both mathematics and reading proficiency there were fewer students than expected in the below basic and basic categories in the Urban Charter School, although no such differences was observed in the Urban School District. Results of the analyses conducted for the three research questions guiding the study have been presented in this section. But, the results of this study are inconclusive and further research is recommended. A discussion of these results and their implication for future research and practice is provided in Section 5.

Section 5: Discussion, Conclusions, and Recommendations

Overview

At Urban Charter School, academic deficiencies, based upon low standardized assessment scores in reading and mathematics, led to proposals for change using practices and strategies that had shown pedagogical benefits in scholarship current in 2006. The change selected for Urban Charter School was in gender-based instruction, and a single-gender education program became a viable option because of its relatively low initiation costs and support by scholarship conducted around that time (Charles & Bradley, 2002; Connell & Gunzelmann, 2006). In 2006, students were separated by gender in Grades 6-8. This study intended to assess the outcomes of this pedagogical experiment, with data ranging from 2009-2014. This study was designed to determine whether the single-gender initiative was useful for Urban Charter School, and help to determine a plan of action for the school's future allocation of resources.

An ex post facto quantitative research design was utilized for this study, as it was not possible to randomly assign participants to the grouping variable for the study, which was the school setting. This research design was used due to the fact that each of the grouping variables was not randomly assigned or manipulated, as the data were archival (Creswell, 2005). This study also relied on posttest, quantified data (Creswell, 2005). The purpose of this ex post facto quantitative study was to identify methods to improve student academic achievement scores, as measured by mathematics and reading state assessment data. To review the data of the single-gender education program in this study, archival data were collected and analyzed over the period from 2009-2014 because the archival data were the only data available and because the use of this anonymous data set helped to ensure the confidentiality of the participants.

The population for this research was restricted to Urban Charter School, including an average of 110-135 sixth through eighth grade students per year. Students' reading and mathematics state assessment data were an aggregate of 6 years of data. This allowed for reading and mathematics data to be analyzed and the difference of male and female student achievement to be determined within the single-gender program at Urban Charter School. The students' achievement assessment data were retrieved from a public access website (District of Columbia Public Schools, 2015).

Data were entered into *SPSS*® version 22.0 for *Windows*® (IBM, 2013). The research variables and sample demographics utilized in the analysis was conducted through descriptive statistics. Ordinal data were calculated by percentages and frequencies (Howell, 2010).

Research Question 1: What is the trend in mathematics and reading student outcomes, over a 6 year period, in an urban middle school that has adopted single gender classroom structure?

$H_0$1: There is a negative or no trend in mathematics and reading student achievement scores, over a 6-year period, in an urban middle school that has adopted single gender classroom structures.

A consistent trend was not identified among the scores for Urban Charter School. However, although mathematics and reading scores did fluctuate between decreasing and increasing from 2009-2014, in comparing scores in 2009 to those for 2014, I noted that there was a decrease. The large variability between percentages across years, where all 95% confidence intervals overlapped, justified accepting the null hypothesis that there was no trend in proficiency increase. However, a trend that was apparent was in the variability between percentages as the years progressed. There was observed greater variability for the last 3 years in reading and in mathematics. A consistent trend was not identified among the scores for Urban Charter School.

Research Question 2: Within an urban middle school, is there a relationship between students' mathematics and reading outcomes and gender, over a period of 6 years?

$H_0$2: There is no relationship between students' mathematics and reading outcomes and gender.

Two chi-square tests of independence were conducted to assess whether there were relationships between students' gender and their mathematics and reading achievement scores over a period of 6 years. The first chi-square was conducted to assess the relationship between reading proficiency and gender within Urban Charter School. The relationship simply denotes an association between gender and subject area. Although external factors, such as prior learning or the home environment could have influenced outcomes, the results of the chi-square were significant, suggesting there was a relationship between mathematics proficiency and gender. For females, more participants were in the proficient category for mathematics proficiency level than statistically expected, although there were fewer students in the below basic, basic, and advanced categories than expected. This may have been the case, due to the mathematics state assessment requiring more reading than on previous state assessments. The mathematics assessment had more word problems. Girls have historically performed better in subjects requiring literacy skills, than boys (Taylor, 2004). The incorporation of reading into mathematics instruction and problem solving could have increased those outcomes. Male student scores may have decreased because of the inclusion of increased literacy elements on the state assessment. For the males, there were more students than expected in the below basic, basic, and advanced categories of mathematics, although there were fewer than statistically expected in the proficient category. Several possibilities may have influenced the results. For example, there are direct connections between auditory processing capacity and literacy achievement and males are typically delayed in their auditory processing development (Rowe & Rowe, 2006). The new state assessment required much more reading on the mathematics assessment through word problems and required brief constructed responses.

A second chi-square was conducted to assess the relationship between reading proficiency and gender within Urban Charter School. The results of the chi-square were significant, suggesting there was a relationship between reading proficiency and gender within Urban Charter School. For females, more participants fell under the proficient and advanced categories for reading proficiency level than statistically expected, although there were fewer subjects in the below basic and basic categories than expected. Although the reported changes were small, the relationship was significant. For the males, there were more students than statistically expected in the below basic and basic categories of reading proficiency, although there were fewer than expected in the proficient and advanced categories. The pattern of female outcomes for the four proficiency levels was different from the male pattern. Thus the null hypothesis was rejected. Additional details are found in Section 4.

Research Question 3: Do student mathematics and reading outcomes in an urban middle school, which has adopted single gender instruction, differ from those of other schools in the same district, with gender-heterogeneous groupings?

$H_0$3: There is no difference between student mathematics and reading outcomes in an urban middle school, which has adopted single gender instruction, compared to other schools in the same district, with gender-heterogeneous groupings.

The pattern of proficiency for Urban Charter School was different from that of the District. For Urban Charter School, there were more students than expected in the proficient and advanced categories of mathematics proficiency, although there were fewer than expected in the below basic and basic categories. Thus the null hypothesis was rejected. The results of the second the chi-square tests were significant, suggesting there was an association between reading proficiency and school type. The single gender school, Urban Charter School, had more students who performed at the proficient level than expected and the Urban School District had fewer students who performed at the proficient level than expected. But, many factors could have been responsible for the relationship, including parental support, motivation, instructional staff, curriculum or other influences. These results indicated that in the Urban School District, more participants fell under the below basic, basic, and advanced categories for reading proficiency level than expected, although there were fewer subjects in the proficient category than expected. For Urban Charter School, there were more students than expected in the proficient category of reading achievement, although there were fewer than expected in the below basic, basic, and advanced categories.

Interpretation of Findings

As noted in Section 4, mathematics and reading state assessment data were reviewed for Urban Charter School, covering a span of 6 years. For research question one, a consistent trend of increasing or decreasing was not noted over the 6 year period, however, a general decrease was noted in comparing the 2009 and 2014 mathematics and reading scores. There was a decrease in the overall averages calculated between the three grades in Urban Charter School. I looked for any movement in results over time. Thus, although there was a decrease noted in comparing the 2009 and 2014 mathematics and reading scores, further research may be needed to determine the merits of any statistical significance. For research question two, comparisons between the observed and expected values in each cell revealed that the observed proficiency levels deviated from what was expected by a large margin for many cases for both males and females. For research question three, comparisons showed a large deviation from the expected values for both the Urban School District sample and the sample from Urban Charter School, which will be detailed below.

Results presented in Section 4, are aligned with the theoretical framework presented in this study, which described Bandura's social cognitive theory. Social cognitive theory describes how environmental factors determine the means through which a student learns, because people mimic the actions of those around them (Bandura, 1989). Bandura (1993) argued that the extent to which a person determines him or herself as successful within the environment has a significant influence on cognitive, motivational, affective, and selection processes. Whether or not a student feels that he or she has the capability to master academic activities controls a student's aspirations and motivation, therefore leading to higher outcomes if the created spirit of the class is one of achievement. It could be argued that through single gender education, students replicate the actions of their same sex peers. A single gender class could be structured with instructional best practices that meet the needs of those male or female students. Students could then feel more successes with their same gender peers. If striving for academic success was considered the norm in a single gender education environment, students' efforts could lead to higher outcomes (Bandura, 1993).

The female students at Urban Charter School demonstrated such findings. Female students had historically underperformed on mathematics state assessments, such as their 20% proficiency rate in 2006 (District of Columbia Public School, 2015). Based on the assessment data as an aggregate of 2009-2014, female students scored at 76% advanced and proficient and males scored at 64% advanced and proficient. On the 2015 NAEP mathematics assessment, there was no significant difference in the percent of eighth grade male and female students at or above the proficient level (National Center for Educational Statistics, 2015). In years prior, specifically 2000-2013, male students outperformed female students on the NAEP assessment in mathematics, demonstrating a significant difference in the percent of eighth grade male and female students performing at or above the proficient level. In reading, female students outperformed male students on the NAEP assessment, demonstrating a significant difference in the percent of eighth grade female and male students performing at or above the proficient level. Dating back to 1998, female students have outperformed male students in reading, by as much as 13% (National Center for Educational Statistics, 2015).

Urban Charter School's single gender education program outperformed the Urban School District in mathematics, 70% to 52%, with the percent of proficient and advanced students, as an aggregate of 2009-2014. Urban Charter School also outperformed the Urban School District in reading, 61% proficient and advanced to 48% proficient and advanced respectively. Once again, with the other possible factors affecting student outcomes, it cannot definitively be concluded that there was a positive relationship between student achievement and the implementation of the single gender program. Practical application of the data could allude to the need to implement single gender education for female students at schools with similar demographics or increase the amount of opt-in programs available. But, further research is needed. Ogden (20111) completed research, which compared a middle school single gender program to a coeducational model. Ogden found that the largest gains over a 3 year period, for students who attended the school for 1, 2 or 3 years, were with females students in the coeducational setting and female students in the single-sex setting. Ogden also found that the largest gains over a 3 year period, for students who attended the same school for all of middle school, were female students and male students in the single-sex class.

In addition to the limitations listed throughout section 5, single-gender education's validity as an educational approach, has been challenged by researchers.

Eliot (2011), Halpern et al. (2011) and Barnett and Rivers (2011) asserted that research on gendered learning differences overestimates the biological differences between boys and girls. When single-gender and heterogeneous classrooms are compared within an ex post facto design, threats to the internal validity may also be present, such as minority social and economic well being, classroom attendance, and student attrition rates, and results can be skewed. Without randomization, the group differences in study groups may significantly alter the results. Additionally, confounding variables, such as socioeconomic status and school attendance, will be difficult to determine, which may harm internal validity of the results.

Implications for Social Change

This study can positively impact the educational community by providing educators and the community at large with additional research on single-gender classroom student achievement, which can provide schools with additional data around relationships between single education programs and student achievement. The significance of this ex post facto quantitative study, as related to the local setting, is the fact that the Urban School District for this study has one of the largest achievement gaps of all urban school systems in the United States (District of Columbia Kids Count Action Center, 2012). This initiative produced data encompassing standardized assessment data in reading and mathematics through the DC CAS (Office of the State Superintendent of Education, 2011). Adequate Yearly Progress outcomes were not met in the period from 2009-2014. Research which addresses the programs currently being implemented, is essential, in an attempt to develop future programs, which may better, enable schools to meet state-set outcomes.

Tangible improvements also include enriched educational experiences for students, directly related to improved reading and mathematics skills, as measured by state assessments. By reviewing the results in Section 4 of this study, a school can determine if further research on a single gender education program could be of benefit to their student population and student achievement. If interested in additional study, it may prove beneficial for the school to determine causality, based on the presence of external variables, such an instruction, environment and leadership. Additional limitations resulted from the use of only publically available data. Detailed student specific data could support more conclusive results. In order to maximize potential for social change and translate the findings of the study to social practice, additional research should be conducted. As outlined above, the findings appeared significant for female students' achievement in reading and mathematics at Urban Charter School in comparison with the achievement of male students. The findings also appeared significant for Urban Charter School as a whole, in comparison with other schools in Urban School District, being that Urban Charter School had greater proficiency rates than the Urban School District. Yet, further research into these aspects and many others constituting the social makeup of classrooms may be needed to transfer potential results. These aspects may include race, special education services rendered, English Language Learners, economic status, instruction and other external and social factors.

Recommendations for Action

As discussed, it is recommended that a school with similar demographics and academic concerns review the results in Section 4 of this study, to determine if further research on a single gender education program could be of benefit to their student population and student achievement. Next, the school could determine causality, based on the presence of external variables, such as instruction, environment and leadership. With the use of student specific data, the school could then determine the level of implementation for their students. Based on more conclusive results, the school could determine if full, partial or no implementation of a single-gender education program would be the best next step for their students. For Urban Charter School, although there were some signs of positive results, the results as a whole were inconclusive, as mentioned in section 4 of this study. As stated above, the results in this study were strictly relational. There are many external variables that could have caused the students to achieve at various levels, not related to single-gender instruction. The results suggest that the single gender education program performed differently with reading and mathematics achievement, specifically with the female students, when compared to the males and with the school as a whole, when compared to the district. Additional research may prove beneficial, to assess the causes of these differences in results. Although the results of this study are inconclusive and further research is recommended, single gender education may be a viable alternative for some schools. Any school stakeholders in an urban setting should pay attention to the results of this study to identify additional areas of research they deem important. The results will be readily available online and will also be disseminated to the Urban School District and Urban Charter School, to be shared as administrators deem appropriate to develop their own level of next steps for research.

Recommendations for Further Study

Several topics in the area of single gender education that may need additional examination include the following:

- An analysis of assessment data for male and female students, comparing data before and after the implementation of a single gender education program at a specific school
- A qualitative survey or discussion with students, instructional staff or school administration, focused on their views and experiences with single gender education at their school
- A comparison of assessment data for schools with only single gender education programs
- A comparison of assessment data for single gender education programs with different student demographics

Conclusion

The results from the study were inconclusive. A consistent trend was not identified among the scores for Urban Charter School. More female participants were in the proficient category for mathematics proficiency level than statistically expected, and there were fewer students in the below basic, basic, and advanced categories than expected. There were more male students than statistically expected in the below basic and basic categories of reading proficiency, and there were fewer than expected in the proficient and advanced categories. The results of the chi-square tests were significant, suggesting there was a relationship between reading and mathematics proficiency and gender. There were more Urban Charter School students than expected in the proficient and advanced categories of mathematics proficiency, although there were fewer than expected in the below basic and basic categories. Urban Charter School also had more students who performed at the proficient level in reading than expected and the Urban School District had fewer students who performed at the proficient level than expected. The results of the second chi-square tests were significant, suggesting there was an association between reading proficiency and school type; however further research is needed to explain the reasons for the differences. When the reasons are identified, a more definite conclusion may be drawn. Until further research is complete, some possible benefits of single gender education in urban middle schools may include an increase in the female student performance in mathematics and higher reading proficiency rates school wide, when compared to heterogeneous programs in the same urban school district.

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Appendix A: Urban Charter School State Assessment Data 2009-2014

Year	Subgroup	Grade Level	# of tests takers	Math Below Basic	Math Basic	Math Proficient	Math Advanced	# of Tests Takers	Reading Below Basic	Reading Basic	Reading Proficient	Reading Advanced
2008-2009	All	3	48	3	14	24	7	48	3	20	24	1
2008-2009	All	4	34	1	7	9	17	34	1	9	15	9
2008-2009	All	5	42	1	10	27	4	42	1	11	28	2
2008-2009	All	6	32	6	4	17	5	32	1	9	21	1
2008-2009	All	7	28	4	3	17	4	28	1	8	15	4
2008-2009	All	8	28	1	5	22	0	28	1	7	19	1
2008-2009	All	All Grades	212	16	43	116	37	212	8	64	122	18
2008-2009	Female	3	24	2	7	11	4	24	1	9	13	1
2008-2009	Female	4	17	0	2	6	9	17	0	5	6	6
2008-2009	Female	5	26	0	7	16	3	26	0	4	20	2
2008-2009	Female	6	19	5	2	11	1	19	1	5	13	0
2008-2009	Female	7	14	2	0	11	1	14	0	3	9	2
2008-2009	Female	8	16	1	1	14	0	16	0	4	12	0
2008-2009	Female	All Grades	116	10	19	69	18	116	2	30	73	11
2008-2009	Male	3	24	1	7	13	3	24	2	11	11	0
2008-2009	Male	4	17	1	5	3	8	17	1	4	9	3
2008-2009	Male	5	16	1	3	11	1	16	1	7	8	0
2008-2009	Male	6	13	1	2	6	4	13	0	4	8	1
2008-2009	Male	7	14	2	3	6	3	14	1	5	6	2
2008-2009	Male	8	12	0	4	8	0	12	1	3	7	1
2008-2009	Male	All Grades	96	6	24	47	19	96	6	34	49	7
2009-2010	All	3	48	8	18	19	3	48	6	16	23	3
2009-2010	All	4	43	4	8	20	11	43	7	4	27	5

table continues

Year	Subgroup	Grade Level	# of tests takers	Math Below Basic	Math Basic	Math Proficient	Math Advanced	# of Tests Takers	Reading Below Basic	Reading Basic	Reading Proficient	Reading Advanced
2009-2010	All	5	36	2	8	21	5	34	2	11	19	2
2009-2010	All	6	32	3	10	13	6	32	2	8	19	3
2009-2010	All	8	24	1	4	17	2	24	1	6	14	3
2009-2010	All	All Grades	215	20	53	112	30	213	20	56	119	18
2009-2010	Female	3	29	3	14	11	1	29	1	11	15	2
2009-2010	Female	4	20	1	2	12	5	20	2	0	15	3
2009-2010	Female	5	14	0	2	12	0	14	0	5	8	1
2009-2010	Female	6	19	0	7	7	5	19	1	4	12	2
2009-2010	Female	7	17	1	3	12	1	17	1	5	10	1
2009-2010	Female	8	14	0	2	12	0	14	0	4	9	1
2009-2010	Female	All Grades	113	5	30	66	12	113	5	29	69	10
2009-2010	Male	3	19	5	4	8	2	19	5	5	8	1
2009-2010	Male	4	23	3	6	8	6	23	5	4	12	2
2009-2010	Male	5	22	2	6	9	5	20	2	6	11	1
2009-2010	Male	6	13	3	3	6	1	13	1	4	7	1
2009-2010	Male	7	15	1	2	10	2	15	1	6	7	1
2009-2010	Male	8	10	1	2	5	2	10	1	2	5	2
2009-2010	Male	All Grades	102	15	23	46	18	100	15	27	50	8
2010-2011	All	3	56	10	32	13	1	56	14	21	21	0
2010-2011	All	4	42	4	19	18	1	41	3	12	25	1
2010-2011	All	5	36	7	14	12	3	36	7	12	17	0
2010-2011	All	6	36	2	13	15	6	35	3	9	21	2
2010-2011	All	7	32	2	7	17	6	32	2	14	14	2
2010-2011	All	8	25	0	4	16	5	25	1	10	11	3
2010-2011	All	All Grades	227	25	89	91	22	225	30	78	109	8

table continues

Year	Subgroup	Grade Level	# of tests takers	Math Below Basic	Math Basic	Math Proficient	Math Advanced	# of Tests Takers	Reading Below Basic	Reading Basic	Reading Proficient	Reading Advanced
2010-2011	Female	3	27	5	15	6	1	27	5	8	14	0
2010-2011	Female	4	22	2	11	8	1	22	2	6	13	1
2010-2011	Female	5	18	1	8	9	0	18	1	5	12	0
2010-2011	Female	6	15	2	5	6	2	14	1	3	9	1
2010-2011	Female	All Grades	110	10	41	51	8	109	9	35	61	4
2010-2011	Male	3	29	5	17	7	0	29	9	13	7	0
2010-2011	Male	4	20	2	8	10	0	19	1	6	12	0
2010-2011	Male	5	18	6	6	3	3	18	6	7	5	0
2010-2011	Male	6	21	0	8	9	4	21	2	6	12	1
2010-2011	Male	7	15	2	6	4	3	15	2	6	7	0
2010-2011	Male	8	14	0	3	7	4	14	1	5	5	3
2010-2011	Male	All Grades	117	15	48	40	14	116	21	43	48	4
2011-2012	All	3	40	6	24	9	1	40	6	21	12	1
2011-2012	All	4	24	3	7	12	2	24	4	8	12	0
2011-2012	All	7	32	2	11	17	2	32	1	11	17	3
2011-2012	All	8	27	2	2	19	4	27	3	12	9	3
2011-2012	All	All Grades	123	13	44	57	9	123	14	52	50	7
2011-2012	Female	3	23	4	13	5	1	23	4	9	9	1
2011-2012	Female	4	10	0	2	8	0	10	0	3	7	0
2011-2012	Female	7	13	0	4	9	0	13	1	1	9	2
2011-2012	Female	8	16	1	0	12	3	16	0	7	7	2
2011-2012	Female	All Grades	62	5	19	34	4	62	5	20	32	5
2011-2012	Male	3	17	2	11	4	0	17	2	12	3	0
2011-2012	Male	4	14	3	5	4	2	14	4	5	5	0
2011-2012	Male	7	19	2	7	8	2	19	0	10	8	1

table continues

Year	Subgroup	Grade Level	# of tests takers	Math Below Basic	Math Basic	Math Proficient	Math Advanced	# of Tests Takers	Reading Below Basic	Reading Basic	Reading Proficient	Reading Advanced
2011-2012	Male	8	11	1	2	7	1	11	3	5	2	1
2011-2012	Male	All Grades	61	8	25	23	5	61	9	32	18	2
2012-2013	All	3	47	3	28	15	1	47	1	21	25	0
2012-2013	All	4	38	2	13	20	3	38	1	15	18	4
2012-2013	All	5	43	1	24	15	3	43	4	16	22	1
2012-2013	All	6	45	3	16	22	4	44	7	19	17	1
2012-2013	All	All Grades	226	11	87	106	22	225	14	83	113	15
2012-2013	Female	3	25	1	17	6	1	25	1	9	15	0
2012-2013	Female	4	21	2	6	11	2	21	0	8	11	2
2012-2013	Female	5	21	1	11	8	1	21	1	8	11	1
2012-2013	Female	6	22	1	5	13	3	22	1	12	8	1
2012-2013	Female	7	16	0	3	10	3	16	0	2	8	6
2012-2013	Female	8	11	0	1	7	3	11	0	2	8	1
2012-2013	Female	All Grades	116	5	43	55	13	116	3	41	61	11
2012-2013	Male	3	22	2	11	9	0	22	0	12	10	0
2012-2013	Male	4	17	0	7	9	1	17	1	7	7	2
2012-2013	Male	5	22	0	13	7	2	22	3	8	11	0
2012-2013	Male	6	23	2	11	9	1	22	6	7	9	0
2012-2013	Male	7	16	2	1	11	2	16	1	4	10	1
2012-2013	Male	8	10	0	1	6	3	10	0	4	5	1
2012-2013	Male	All Grades	110	6	44	51	9	109	11	42	52	4
2013-2014	All	3	62	13	23	17	9	63	15	26	21	1
2013-2014	All	4	47	9	15	22	1	47	7	24	16	0
2013-2014	All	5	42	8	19	12	3	42	4	19	18	1
2013-2014	All	6	39	8	14	16	1	39	7	15	17	0

table continues

Year	Subgroup	Grade Level	# of tests takers	Math Below Basic	Math Basic	Math Proficient	Math Advanced	# of Tests Takers	Reading Below Basic	Reading Basic	Reading Proficient	Reading Advanced
2013-2014	All	7	38	1	10	21	6	37	1	12	21	3
2013-2014	All	8	28	2	4	19	3	28	0	9	17	2
2013-2014	All	All Grades	256	41	85	107	23	256	34	105	110	7
2013-2014	Female	3	33	6	12	9	6	34	7	15	12	0
2013-2014	Female	4	26	5	10	11	0	26	2	13	11	0
2013-2014	Female	5	29	8	12	6	3	29	4	11	13	1
2013-2014	Female	6	16	1	9	6	0	16	1	6	9	0
2013-2014	Female	8	14	0	2	11	1	14	0	4	8	2
2013-2014	Male	3	29	7	11	8	3	29	8	11	9	1
2013-2014	Male	4	21	4	5	11	1	21	5	11	5	0
2013-2014	Male	5	13	0	7	6	0	13	0	8	5	0
2013-2014	Male	6	23	7	5	10	1	23	6	9	8	0
2013-2014	Male	7	19	1	6	9	3	19	1	7	10	1
2013-2014	Male	8	14	2	2	8	2	14	0	5	9	0
2013-2014	Male	All Grades	119	21	36	52	10	119	20	51	46	2

table continues

Appendix B: Urban School District State Assessment Data 2009-2014

Year	Tested Grade	Reading # of Test Takers	Reading % Below Basic	Reading % Basic	Reading % Proficient	Reading % Advanced	Math # of Test Takers	Math % Below Basic	Math % Basic	Math % Proficient	Math % Advanced
2014	6	2184	19%	39%	37%	6%	2182	20%	33%	28%	19%
2014	7	2299	10%	38%	35%	17%	2298	16%	31%	37%	15%
2014	8	2365	13%	38%	37%	12%	2365	12%	30%	40%	18%
2014	All	18394	16%	36%	37%	10%	18431	17%	32%	34%	17%
2013	6	2240	24%	37%	33%	7%	2243	20%	33%	29%	18%
2013	7	2347	10%	37%	33%	20%	2351	17%	30%	35%	18%
2013	8	2249	16%	36%	35%	13%	2228	14%	29%	42%	15%
2013	All	18617	17%	35%	36%	11%	18610	18%	32%	33%	16%
2012	6	2335	21%	41%	31%	7%	2334	20%	36%	28%	15%
2012	7	2249	16%	41%	29%	15%	2247	18%	31%	37%	14%
2012	8	2368	19%	38%	33%	10%	2359	18%	32%	39%	11%
2012	All	18667	19%	37%	34%	10%	18635	20%	34%	33%	13%
2011	6	2295	20%	40%	34%	6%	2297	19%	39%	28%	14%
2011	7	2407	15%	41%	30%	14%	2409	19%	32%	36%	13%
2011	8	2335	18%	39%	30%	12%	2335	18%	31%	41%	10%
2011	All	19370	19%	37%	34%	10%	19348	21%	35%	32%	12%
2010	6	2408	13%	35%	44%	8%	2406	22%	35%	31%	11%
2010	7	2366	17%	45%	28%	10%	2358	23%	34%	33%	10%
2010	8	2438	18%	42%	32%	8%	2431	26%	35%	32%	7%
2010	All	19524	15%	39%	38%	8%	19500	21%	34%	33%	13%
2009	6	2985	17%	41%	37%	6%	2985	24%	40%	26%	10%
2009	7	2549	16%	47%	28%	9%	2549	30%	36%	27%	7%
2009	8	3026	19%	45%	30%	6%	3026	29%	38%	28%	5%
2009	All	21524	15%	41%	37%	7%	21524	24%	37%	29%	10%