Single Sex Mathematics Classes: A Critical Analysis of the Impact at a Secondary School

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Abstract

Single sex classes have recently been emphasized as an effective way to promote mathematics learning. Despite their popularity, the research on the effectiveness of such programs is mixed underscoring the need for additional research and discussion. This research is set in one of the twenty-five largest public school systems in the United States, where schools have recently been allowed to begin instructional initiatives with same sex classes in mathematics. Preliminary data on the effectiveness of one program will be highlighted. Achievement data, compared to traditional classes, will be considered to demonstrate the academic effectiveness of the project. Qualitative data analysis will provide a rich description of the affective issues relative to this innovation. The current project will be framed in critical analysis of the research literature and will discuss the potential benefits and disadvantages both from this current project and from the related literature.

Introduction

Single sex classes have been gaining the attention of educators across the United States. Such efforts fly in the face of coeducational proponents who argue that single sex classrooms reflect the real-world interactions required of students and are more likely to prepare students for cross-gender interactions and eventual integration into society (Mael, 1998). Schools are attracted by the purported claims that such classrooms hold the answer to poor academic results in mathematics as well as other subjects.

Research Perspectives

Research on single-sex classes is mixed and is marred by a large number of poorly conceptualized and executed studies. Salomone (2006) posits that the relationship between program planning, implementation, and assessment should guide the exploration of questions and methods related to such programs. Hubbard and Datnow (2005) conducted a systematic review of the literature where outcomes in the majority of cases were related to short-term academic achievement and short-term socio-emotinal development. The review found mixed results with 53% showing no difference and 10% showing mixed results. Likewise, Lee (1998), focusing on the school as the unit, found no consistent patterns of effects for promoting either single-sex or coeducational schools for boys or girls. Riordan (2002) posited that the effects of single-sex classrooms are relatively small when compared to the effects of socio-economic status and curriculum variables.

Hubbard and Datnow (2005) found in their anthropological study of single sex classes in California involving low-income and minority students schools' successes were more likely due to interrelated contributions of the organizational characteristics of the school, positive student-teacher relationships, and sufficient resources.

Little is known about the practices that comprise instruction in single-sex classrooms. Martino, Mills, & Lingard (2005) found that teachers in single-sex environments frequently modified their pedagogical practices and the curriculum to respond to stereotypical constructions about boys and girls perceived oppositional orientations to learning. Teachers' knowledge and assumptions about gender influence how they execute pedagogy in single-sex classrooms. Many of the instructional practices supported in single-sex classrooms could be found in any effective school (Bracey, 2006). One of the criticisms leveled about the research of same sex classroom initiatives is that they are poorly controlled research designs (Salomone, 2006) The lack of quality research designs makes it difficult to isolate variables that may impact the implementation of single sex classroom practices. .

Research Design

Research Questions

This study investigated preliminary findings related to the effectiveness single sex classes in algebra. More specifically, the study sought to respond to three broad questions:

1. Do single sex algebra classes positively affect the behavior of students?
2. Do single sex algebra classes positively affect the academic performance in algebra of at-risk students?
3. How do students in the single-sex algebra classes describe their experiences?

School Setting

The current study is set in an urban school district in the southeastern part of the United States. The district serves over 134,000 students in 172 schools. Students represent 161 different countries and 140 native languages. The secondary school which is the focus of this study serves approximately 2,500 students. The school population is diverse with 51% white and 37% black students with 27% eligibility for free or reduced-price lunch which is a federal program to assist households in low socioeconomic levels. The school has initiated freshmen academies to address challenges unique to ninth graders. In addition, single sex classes are being piloted in algebra and English. This instructional initiative has one male and one female algebra class with enrollment limited to students with lowest levels of achievement on eighth grade state-mandated mathematics scores (level 1 and level 2). Level 1 is defined as performance illustrative of two plus years below grade level and level 2 describes the achievement level of those students performing one year below grade level.

Procedures

First, student behavior data consisting of discipline referrals to the school administration and out-of-school suspension records for all level 1 and level 2 students (lowest levels of academic performance) for their eighth grade and first semester of ninth grade. Data for students in the single sex classrooms was disaggregated for comparison purposes.

Second, first semester exam data for Algebra 1A will be used to compare academic performance. The first semester exam is a district mandated assessment created at the school site as a common assessment administered to all Algebra 1A students. Scores for all students in the specific high school who were at level1 or level 2 upon entrance to ninth grade were obtained. Scores were disaggregated to compare the performance of the single-sex Algebra 1A students to the scores for the level 1 and level 2 students in coed Algebra 1A classes.

Third, open-ended surveys will be used to elicit responses from the students relative to their experiences within the single-sex algebra classes. The questions were formulated and field-tested by the researchers. Data from the surveys will be coded based on searching for themes and difference in the responses.

Results

School site administrators decided to initiate two single sex algebra classes during the 2008-2009 school year. It was believed by some administrators that single sex classrooms could reduce discipline problems and improve academic performance.

The rationale supporting the creation of the program was formed by a review of results from a similar initiative in some South Carolina schools, a desire to better serve at-risk students, and an interest in implementing instructional strategies which recognize gender differences in how students learn. The following table provides the means and standard deviations for the final numerical grades for Algebra IA. Algebra IA is the first part of the Algebra IA and Algebra IB sequence which earns the student a credit for Algebra I.

Table 1. Final Algebra IA Averages for Classes

	Male Algebra IA	Female Algebra IA	COED Algebra IA
Mean	73.38	77.58	64.6
SD	10.3	8.89	14.5

The same teacher taught a coeducational section and either the male or female same sex class. The class means are based on the final course averages which includes a school constructed (common assessment) final exam which is administered to all students at the completion of Algebra IA instruction. Therefore, all Algebra IA students at the school take the same final exam.

The coed scores are based on two sections. In one of those sections, three students out of 18 received a zero on their final exam. If we omit those scores from the data, the average for the coeducational classes is 72.75. This would raise questions about the efficacy of the reported results and the effectiveness of the instructional initiative. The 72.75 average is comparable to the all male class average of 73.35 and approximately five points lower than the all female class average.

Behavioral data in the form of number of referrals (in-school suspension and out-of-school suspension) is being collected for the entire academic year. Comparisons of behavior among the various class types will be made. Initial analysis of first semester data reveals little difference in overall number of referrals but shows a significant difference in the number of referrals when looking at male versus female with twice as many suspensions in each category.

Qualitative surveys will be administered at the end of the academic year. The qualitative surveys will provide data about the perceptions of the students and their teachers regarding their experiences in the single sex class.

Conclusions

Advocates of single-sex classrooms believe that responding to gender differences is a positive step in addressing the diverse needs of students and empower students to succeed. The researchers do not disagree with this basic premise; however, differentiation of instruction might be best conceived and implemented in all classrooms to reach all students. Hubbard and Datnow (2005) reported that the majority of single-sex classroom experiments served primarily nonwhite and high poverty students in urban areas. From a critical perspective, one might question the underlying motivation for such studies as perpetuating a bias toward low income students and more specifically towards minority students.

The data do not provide a substantive basis on which to base programmatic decisions relative to single sex classes. Despite the limited data and the incompleteness of the analysis process, the school is moving forward to expand the instructional initiative to additional sections of algebra and English, and include social studies and science classes for ninth graders. The researchers recommend caution in basing decisions about programs on limited data, particularly when potential variables such as teacher efficacy for particular approaches and the potential differential pedagogical approaches are not controlled for in designing studies on which to inform decisions about structuring of classes.

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